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Ventilation Analysis of EM-100, CSI-3000, OXY LIFE II and Bag-Valve Mask in Virtual Reality Ambulance Simulation

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ABSTRACT

Background/Objectives: The purpose of the study is to investigate the effective ventilation delivery that affects the rate of resuscitation.

Method/Statistical Analysis: The National Fire Service Academy conducted Virtual Reality ("VR") based ambulance simulations from April 17, 2018 to April 28, 2018. The mean and standard deviations of mean ventilation and airway pressure were analyzed using descriptive statistics and ANOVA and SPSS software 12.0 (SPSS Ins., Chicago, IL, USA) program.

Findings: When VR-based intubation was performed, the ventilation was 427 ml from Oxylator EM-100, 458 ml from MicroVenT CSI-3000 and 305 ml from OXY-LIFE II. For the airway pressure, Oxylator EM-100 showed 10.623 cmH2O, MicroVenT CSI-3000 showed 11.291 cmH2O and OXY-LIFE II showed 6.965 cmH2O. When tracheal intubation was performed on the VR base, Oxylator EM-100 and MicroVenT CSI-3000 showed adequate ventilation and airway pressure.

Improvements/Applications: This study suggests to use an oxygenator as an efficient ventilation method after intubation in ambulance during transport. Skilled practice and the method of use of rescuer is very important.

Keywords: *Virtual Reality, Oxylator EM-100, MicroVenT CSI-3000, OXY-LIFE II, RespiTrainer® Advance.*

Introduction

In addition to cardiac arrest, it is critical to provide airway maintenance and adequate ventilation for patients with very poor breathing or stopped breathing. Inadequate ventilation in a situation where airway maintenance is difficult and oxygen supply is unavailable is an important determinant of patient survival and normal function recovery and disability[1]. The most commonly used equipment for artificial ventilation is a back-valve mask when cardiopulmonary resuscitation (CPR) is performed in a cardiac arrest before arriving hospital, or when secondary respiration is needed due to poor respiration.

Airway maintenance, proper masking, and precise backpressure are required to deliver adequate ventilation volume using a bag-valve mask. Respiration varies depending on the ventilation method of the rescuer and is dependent on the ambulance movement or instability of the ambulance. Internal environment of the ambulance can also affect ventilation. According to recent guidelines, it is recommended that effective artificial ventilation in cardiac arrest should be maintained at a single ventilation of 500 to 600 ml (6 to 7 ml/kg)[2].

Hyperventilation and artificial respiration of excessive volume interfere with blood flow into the heart due to increased intrinsic pressures, so cardiac output

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decreases even though effective chest compression is performed. In addition, such decrease in cardiac output can reduce the blood flow of the brain and coronary arteries affecting the rate of revival and cause reflux of the gastrointestinal contents to induce reflux and inhalation complications[3,4]. It is difficult to supply an adequate amount of oxygen in moving ambulance, and since the seat of the rescuer is located on the patient's side, it is difficult to apply the C-E technique when ventilation is performed using a bag-valve mask. In addition, ventilation with a bag-valve mask after intubation with a specialized tube is difficult to maintain a proper amount of one-time respiration due to improper posture of paramedic.

According to Act on 119 Rescue and Emergency Medical Services, the automatic oxygen supply is a must-have device for 119 ambulances, and three models are currently available: MicroVenT® CSI-3000, Oxylator® EM-100 and Oxy-Life® II[5]. Automatic oxygen supply can assist ventilation either automatically or manually. Automatic oxygen supply is applied when patient's spontaneous breathing is irregular and auxiliary ventilation is needed while manual one can be applied to assist ventilation in patients who require CPR or artificial respiration. The manual oxygen supply is designed to deliver ventilation as long as the button or trigger is pressed or pulled, and there are two types of pressure and volume. The pressure type includes Oxylator EM-100 while volume type includes, MicroVenT CSI-3000 and OXY-LIFE II, and the ventilation and release pressure per hour are different by each product.

The oxygen supply supplies high pressure oxygen as long as the user presses the oxygen supply button or pulls the trigger, and the ventilation delivered to the lungs depends on the time the user presses or pulls. Oxylator, displayed in the existing ambulance vehicles, is based on the US Heart Association guidelines for 2000 and 2005, and is recommended to push or pull the oxygen supply button or trigger for 2 seconds. In the 2010 and 2015 American Heart Association guidelines, the artificial respiration method recommends respiratory assistance with a volume of 500 to 600 ml, which is equivalent to 1 second for adults to prevent over ventilation. However, the manual still introduces old ventilation method before 2005, so the user may cause over ventilation.

Previous studies related to oxygen supply include Comparison of one-time volume in demand valve and pocket mask ventilation[6], Demand valve ventilation in pneumothorax model[3], Comparison of bag-valve mask and demand valve ventilation[4], Comparison of bag-valve mask and demand valve ventilation[7], Comparison of ventilation and airway pressure using Oxylator EM-100[8] and Comparison of Oxylator ventilation, etc[9]. However, such previous studies have been limited to the comparison of oxygen supply with bag-valve mask ventilation in a situation where there is no moving.

This study compared the oxygen supply with ventilation using a bag-valve mask after endotracheal intubation in VR based ambulance. Since previous studies were conducted under fixed conditions, a comparison with VR-based studies is needed. Therefore, the purpose of this study is to provide basic data for efficient use of oxygen mask and bag-valve mask during transferring patient.

Materials and Method

Research Design and Data Collection: This study was a comparative analysis of ventilations of oxygen supply MicroVenT® CSI-3000, Oxylator® EM-100, Oxy-Life® II and back-valve masks with RespiTrainer® Advance in VR simulated ambulances. For this purpose, VR based simulation ambulance in the National Fire Service Academy was used and "Urban outside road scenario" was applied among the developed scenarios. Driving time was 60-80 km/h for 6 minutes. VR based simulation ambulance driving was conducted by the National Fire Service Academy's professor, and the same scenario was used.

Experiments compared the cases using MicroVenT® CSI-3000, Oxylator® EM-100, and Oxy-Life® II with a mask and the cases with a bag-valve mask. Also compared the cases using MicroVenT® CSI-3000, Oxylator® EM -100, Oxy-Life® II and the bag-valve mask after applying endotracheal intubation. The scenarios compared total 60 ventilations for 5 minutes.

For comparison of ventilations, endotracheal intubation was performed by one professor and one emergency first aid technician. Ventilation was performed by pressing and pushing Oxylator's oxygen supply button and trigger for 1 second and then collecting ventilation and airway pressure delivered to the lungs

using RespiTrainer® software (version 1.1, Ingmar, Pittsburgh, USA). The researchers used a stopwatch to practice the oxygen supply button and trigger for 60 seconds, followed by 60 times per each oxygen supply type[Figure 1]. During all ventilations, the investigator performed the test hiding the chest area so that the chest rising of RespiTrainer® Advance could not be seen. It was not easy to press the oxygen supply button for one second in a VR-based situation, although the preliminary experiment had enough practice to not exceed less than 0.9 seconds and more than 1.09 seconds.

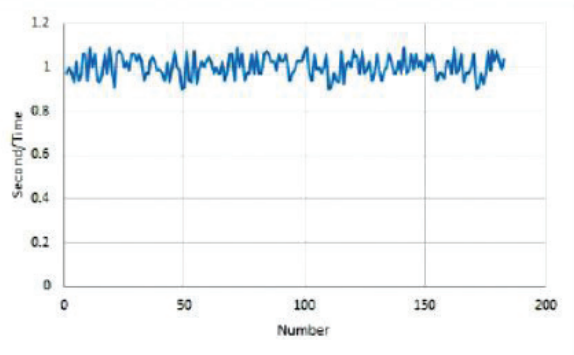

Figure 1: Pre-evaluation of Oxygen supply

Experimental tools

VR based Simulation Ambulance: The VR based ambulance designed to enable the education and training of emergency services in various road environments was developed as a fire research and development (R&D) project. VR based simulation ambulance implemented VR by applying Ambulance Driving Simulation S/W to computer controlled moving platform design[Figure 2]. Six scenarios have been developed to suit the surrounding environment, such as rural, urban and suburban environments, and are designed so that the rescuer can drive while monitoring scenarios set up outside the ambulance.

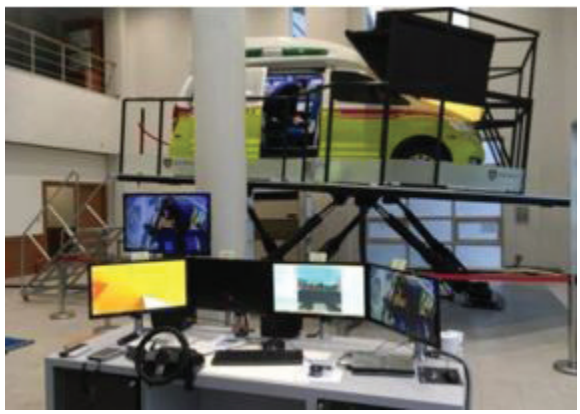

Figure 2: VR-based simulation ambulance

RespiTrainer: RespiTrainer® Advance (version 1.1, Ingmar, Pittsburgh, USA) is the equipment that is optimized for a wide range of special air intubation training and skills, and has realistic materials and anatomical structures. High-performance test lungs (QuickLung®) can achieve realistic lung capacity in adults, and software can be used to verify data such as ventilation and airway pressure. Airway resistance and compliance were set at 5 cmH2O/L/s and 50㎖/cmH2O, which are the mean values of healthy persons without lung disease[Figure 3].

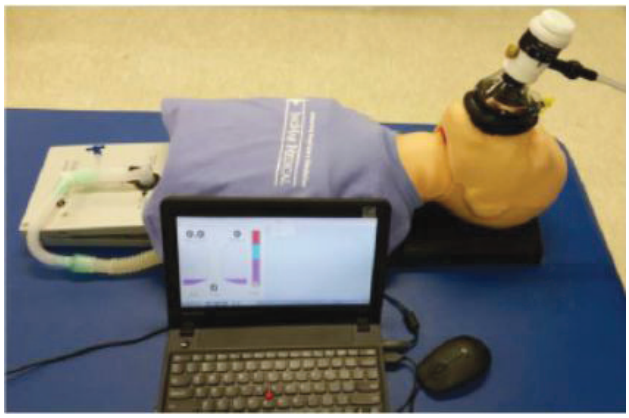

Figure 3: RespiTrainer® Advance

Automatic Oxygen Supply: The Oxylator EM-100 (Roswell, USA) has both automatic and manual pressure delivery methods and provides oxygen as long as the oxygen supply button is pressed while the airway pressure is set to 25-50 cmH2O. In this experiment, the manual method was used. After connecting the tube of Oxylator EM-100 to the oxygen aspiration system (MEF-22), the supply pressure in the airway was set to 25 cmH2O as recommended by the manufacturer. CSI-3000 (Chosun Instrument Inc., Korea) delivers compressed oxygen, which has both automatic and manual delivery methods. In passive mode, it can supply oxygen at a flow rate of 40 l/min and supplies oxygen as long as the oxygen supply handle is pulled. In this experiment, the manual method was used and the tube of CSI-3000 was connected to the oxygen aspiration system (MEF-22). OXY-LIFE II (SanCheong, Korea) is a product based on the 2000 guidelines of the American Heart Association. It delivers compressed oxygen in both the automatic and the manual modes and the oxygen is supplied as long as the manual button is depressed. In this experiment, the manual method was used, and the volume of respiration was set at 600 ml, and the tube of OXY-LIFE II was connected to the oxygen aspiration system (MEF-22).

Endotracheal Intubation: The tubes used for endotracheal intubation were Mallinckrodt® I.D. 7.5, and the depth of the intubation was fixed at 22 cm. The cuff was injected with 10 ml of air and fixed to the outside with a Thomas® Tube Holder to prevent loosing or moving.

Bag-valve mask (BVM): BVM was attached to a Laerdal® Silicone Resuscitator with a storage bag and the bag capacity was 1,600 ml.

Data Collection and Analysis

All experiments were conducted within a VR-based simulation ambulance and were conducted at the National Fire Service Academy from April 17, 2018 to April 28, 2018. All data were collected using respiTrainer® software (version 1.1, Ingmar, Pittsburgh, USA) to collect ventilation and airway pressure. The collected data were analyzed using SPSS software 12.0 (SPSS Ins., Chicago, IL, USA). The mean and standard deviation of ventilation and airway pressure were analyzed using descriptive statistics and ANOVA.

Results and Discussion

VR based endotracheal intubation was performed and the results of one-time respiration were analyzed. Back-Valve Mask showed ventilation of 380.750 ± 23.126 ㎖, with a minimum ventilation of 313 ㎖ and a maximum ventilation of 436 ㎖. The Oxylator® EM-100 showed an average ventilation of 427.766 ± 21.643 ㎖, with a minimum ventilation of 380 ㎖ and a maximum ventilation of 490 ㎖, which required an average of 1.011 seconds to press the oxygen supply button. CSI-3000 showed an average of 458.016 ± 28.978 ㎖ ventilation, 370 ㎖ minimum ventilation and 503 ㎖ maximum ventilation, and it took 1.026 seconds on average to press the oxygen supply button. Oxy-Life® II showed an average ventilation of 305.833 ± 16.508 ㎖, with a minimum ventilation of 267 ㎖ and a maximum ventilation of 353 ㎖, and an average of 1.014 seconds was required to press the oxygen supply button [Table 1].

Table 1: Comparison of Delivered Volume

Variables	Mean (ml)	Minimum	Maximum	Standard deviation	F	p	Scheffé
Bag-valve mask (a)	380.750	313.00	436.00	23.126	474.317	.000	a>d, a<bc
Oxylator EM-100 (b)	427.766	380.00	490.00	21.643			B<c, b>ad
MicroVenT CSI-3000 (c)	458.016	370.00	503.00	28.978			c>abd
OXY-LIFE®II (d)	305.822	267.00	353.00	16.508			d<abc

Table 2 shows the results of airway pressure analysis with VR-based endotracheal intubation. The back-valve mask showed an average airway pressure of 14.913 ± 1.151 cmH2O, with a minimum airway pressure of 12.70 cmH2O and a maximum airway pressure of 17.40 cmH2O. The Oxylator® EM-100 showed an average airway pressure of 10.623 ± .438 cmH2O, with a minimum airway pressure of 9.70 cmH2O and a maximum airway pressure of 11.90 cmH2O. CSI-3000 showed an average airway pressure of 11.291 ± 4.90 cmH2O, with a minimum airway pressure of 10.0 cmH2O and a maximum airway pressure of 12.20 cmH2O. Oxy-Life® II showed an average airway pressure of 6.965 ± .340 cmH2O, with a minimum airway pressure of 6.30 cmH2O and a maximum airway pressure of 7.70 cmH2O [Table 2].

Table 2: Comparison of Airway Pressure

Variables	Mean (cmH_2O)	Minimum	Maximum	Standard deviation	F	p	Scheffé
Bag-valve mask (a)	14.913	12.70	17.40	1.150	1357.863	.000	a>bcd
Oxylator EM-100 (b)	10.623	9.70	11.90	0.438			B>d, b<ac
MicroVenT CSI-3000 (c)	11.291	10.00	12.20	0.490			c>bd, c<a
OXY-LIFE®II (d)	6.965	6.30	7.70	0.340			d<abc

Effective oxygen delivery is recommended for 1 second at 5-6 ml/kg, but it is not easy to supply oxygen efficiently within a wavering ambulance. There are three kinds of oxygen supplies in the ambulance under the Act on Rescue and Emergency Service: Oxylator EM-100 which is pressure transmission system, MicroVent CSI-3000 which is volume system and OXY-LIFEII. In all three types, oxygen is delivered as long as the oxygen supply button is pressed or the trigger is pulled. Therefore, there is always a risk of over ventilation because the ventilation can be different according to the method used by the rescuer.

A previous study reports that ventilation using Oxylator EM-100, CSI-3000 and OXY-LIFE II after endotracheal intubation was 551 ㎖ for Oxylator EM-100, 527 ㎖ for CSI-3000, 369 ㎖ for OXY- LIFE® II of ventilation [9]. In the two models, it was identified that 1 minute respiration (500-600 ㎖) could be delivered while holding the oxygen supply button for 1 second, and the other one showed insufficient ventilation. In this study, ventilations were compared using VR based "Urban outside road scenario". Ventilations were average 427 ㎖ for Oxylator® EM-100, 458 ㎖ for CSI-3000 and 305 ㎖ for OXY-LIFE II. In comparison with the previous study, the mean ventilation were identified to be lower than the previous studies with Oxylator by 124 ㎖, CSI-3000 by 69 ㎖ and OXY-LIFE II by 64 ㎖ respectively. In the minimum ventilation, it was identified to show lower than the mean ventilation with Oxylator EM-100 by 135 ml, CSI-3000 by 131ml and OXY-LIFE® II by 74 mL respectively.

On the other hand, the ventilation was 380 ㎖ when using a bag-valve mask after endotracheal intubation. The mean ventilation of the previous studies ranged from 320 to 524 ml, and this study was conducted as a 1/3 bag compression method for delivering one-time volume based on the 2010 guidelines [10-13]. The reason for this is thought to be the difference depending on the degree of adhesion of the bag-valve mask and the degree of back-squeezing. In order to reduce hyperventilation and high volume and low volume, continuous education and quality control should be performed. On the other hand, in the case of intubation such as endotracheal intubation, manual ventilation using the oxygen supply is relatively easy to use compared with the ventilation with the bag-valve mask, especially, the oxygen could be easily supplied in the moving space when transferring the patient to the hospital from the accident scene.

Airway pressure above 20-25 cmH2O can lead to lung injury and reflux and inhalation complications [14,15]. Ventilation with VR based Oxylator EM-100 showed airway pressure of 10.623 cmH2O and CSI-3000 of 11.291 cmH2O. However, OXY-LIFE II showed 6.965 cmH2O, indicating that ventilation is provided at relatively low pressure. In previous studies, the airway pressure to deliver 496 ml of volume through endotracheal intubation was 11.67 cmH2O[8] and the airway pressure to deliver a volume of 537.97 to 488.19 ml was 11.34 to 10.61 cmH2O[9]. Therefore, the Oxylator EM-100 (10.623) and CSI-3000 (11.291) shown in this study are considered to have adequate airway pressure.

This study is a comparative analysis of the ventilation and airway pressure of Oxylator EM-100, CSI-3000, and OXY-LIFE II when using manual mode of oxygen supply in VR based firefighting ambulance. On the VR basis, when oxygen was used to provide ventilation with endotracheal intubation, Oxylator EM-100 showed 427 ㎖, CSI-3000 showed 458 ㎖ and OXY-LIFE II showed 305 ㎖ respectively. Considering the average weight of adults in Korea, Oxylator EM-100 and CSI-3000 showed adequate ventilation, but OXY-LIFE II was found to have low respiratory rate.

Conclusion

In this study, the researcher compared the ventilation delivery of VR based oxygen supply, which is designated as an ambulance essential equipment by the Act on 119 Rescue and Emergency Medical Services and could deduct following conclusion: When endotracheal intubation was performed, the volume of ventilation was 427 ㎖ for Oxylator EM-100, 458 ㎖ for CSI-3000, and 305 ㎖ for OXY-LIFE II. For airway pressure, Oxylator EM-100 showed 10.623 cmH2O, CSI-3000 showed 11.291 cmH2O, and OXY-LIFE II showed 6.965 cmH2O. When endotracheal intubation was performed on VR base, Oxylator EM-100 and CSI-3000 showed mean ventilation and airway pressure.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Emotional Intelligence, Emotional Labor and Exhaustion of the Clinical Nurses

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ABSTRACT

Background/Objectives: This is the descriptive research study to grasp the emotional intelligence, emotional labor and exhaustion of the nurse clinician and using possibility of emotional intelligence in nurse organization by identifying their relationships.

Method/Statistical analysis: The data were collected from May till December 2013. The data were collected via structural questionnaires gathered by 230 hospital nurses who consented to take part in the study, and 215 of them were analyzed except for 15 incomplete questionnaires and male nurses**.** Descriptive statistics, independent t-test, one way ANOVA and Pearson's correlation were used for analysis.

Findings: There were significant nagative correlations of emotional Intelligence with emotional labor(r=-.55, p<.001), and emotional intelligence and exhaustion(r=.31, p=.311),emotional labor and exhaustion(r=.18, p=.002)showed a positive correlation.

Improvements/Applications: This study concluded that emotional intelligence of clinical nurses reduce emotional labor and emotional labor increased the exhaustion. Nurses will expect the development of intervention programs to enhance the emotional intelligence of nurses.

Keywords: *Emotional intelligence, Emotional Labor, Exhaustion, Nurse, Clinician*

Introduction

There is a global efficiency of health care providers and the state of affairs is aggravating[1]. The World Health Organization estimates the topic of the health care worker decline, in particular the deficiency of nurses, and the deficiency of nurses may interrupt international exertion by improving the well-being and health of the universal people[2]. Consequently, most health-care associations are progressively undergoing emotional labor to regulate and suppress their emotions[3].

Emotional labor stands for expressions for members of organization and the regulation of feeling. Emotional labor has various negative repercussions, including increased turnover intention[4] decreased job satisfaction[5], and exhaustion[6].More recently, this is confronting a rise in the turnover ratio of Korean nurses as a consequence of the labor movement, and strenuous workplaces[5], which has caused shortage of experienced and skilled nurses. The current nursing shortage has been related to not only work, but also personal conditions, such as control over practice, hard work conditions, and poor collegial relationships[7].There is multiplying proof that psychological variables, like emotional intelligence, emotional labor, and exhaustion function important role in multiple results in clinician nurses[8].

Emotional intelligence is mainly described in terms of a useful ability to measure in practice nurses and cognitive process of social judgment[9]. Emotional intelligence may offer important new insights into efficiently reducing nurse stress, and improving their retention[10]. It is suggested that nurses are demanded to engage closely with their patients and comprehend patients' needs will benefit from having better levels of

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emotional intelligence. Distinctly, nursing profession contains the direct provision of care which can be adjured and emotionally exhausting[11].

Emotional labor is designated as an individual's capability to adjust to stressand adversity[4]. Nurses unavoidably go through emotional labor in being on their works, which contains sustained emotional rapport with patients[12]. Therefore, it is inevitable to endeavor to inhibit emotional labor from leading to exhaustion. In accordance with some researches that get studied the correlation between emotional labor and exhaustion, such features of psychosocial variables can regulate the correlation between emotional labor and exhaustion[5,6,10]. Exhaustion is a decline in personal accomplishment and related to feeling of emotional stress from contact with other people[13]. Nurse professions have been considered as one of the groups at risk of being affected emotional exhaustion due to the intensity of the stressors with regard to their job demands[3]. There is an actual distinction between nurses of the physiological and psychological strength of place of work stressors in each nurse and the nurses' opinions of these stressors[14.]

Thus, this research was to show the relationship among emotional intelligence, emotional labor and exhaustion of nurses in Korea. Currently, emotional intelligence, emotional labor and exhaustion have encountered as research problem in comparison with theoretical concepts, influencing various organizational components in the healthcare field[2]. This study is purposed to examine the correlationship among emotional intelligence, emotional labor, and exhaustion in nurse clinician in healthcare[24].

Methods

Design: This study is a cross-sectional research design that explored the relationships among emotional intelligence, emotional Labor, exhaustion of nurses in Korea.

Participants: The data was collected via structural questionnaires gathered by 230 hospital nurses who consented to participate in the study, and 215 of them were analyzed except for 15 incomplete questionnaires. The data was collected from May till December 2014. The data were analyzed with SPSS 23.0 statistical program. To investigate relationship in independent and dependent variables, correlation analysis was used.

Measurements

Emotional intelligence: The Wong and Law emotional intelligence scale, developed by Wong and Law[15], was used to measure the nurses' emotional intelligence level. There were a total of 12 items, which included the feeling of understanding of self-emotion, understanding of other's emotion, emotional control, and application of emotion. The questionnaire were grounded upon a five point scale (1 = strongly disagree, 5 = strongly agree). Higher scores imply a higher emotional intelligence level. Cronbach'sα for emotional intelligence in this research was .92

Emotional labor: Emotional labor scale, developed by Morris and Feldman Feldman[17], was used to measure the emotional labor. Emotional labor developed Morris and Felaman[16]was translated into Korean by Kim[17]. Emotional labor is consisted of 3 subscales which were composed of 9 questions of frequency, attentiveness, and dissonance. Overall 9 questions are grounded upon a 5-point scale (1 =strongly disagree, 5 =strongly agree). In this research, Cronbach's α of total questions was .90.

Exhaustion: MBI (Maslach Burnout Inventory) developed by Maslach and Jackson[18] was translated into Korean by Choi and Chung[19]. Exhaustion is consisted of 3 subscales, they are emotional exhaustion, depersonalization, and lower sense of personal accomplishment. Job burnout has 9 questions of emotional exhaustion, 5 questions of depersonalization, and 8 questions of lower sense of personal accomplishment. Overall 22 questions are grounded upon a five point scale (1 =strongly disagree, 5 =strongly agree). When the scale was developed, Cronbach's α of total items was .76. In this research, Cronbach's α of total items was .92.

Data Analysis

Data analysis was performed using the SPSS(version 23.0). The collected data was made statistics for descriptive statistics, t-test, ANOVA, Pearson's correlation.

Ethical Consideration: Preparing for collecting the data, the decision of participating was made by unit manager in nursing department of hospital. Nurses also taken the notice of this study containing the benefits, potential risks and purpose of this study and data collection procedure. Nurses who were unwilling to take part in this research, they could decline for participation whenever.

Results

Demographic characteristics: The general characteristics of the participants are indicated in Table 1.The average age of the participants was 26.80years. Of the 215 participants, 150 nurses (70.0%) were single. Regarding work department, most nurses worked in Medical ward (40.0%).Regarding religion, 97 nurses (45.0%) of the participants were christianity. Average clinical career is shown in Table 1. One to five years, 130 nurses (60.4%); five to 10years, 70 (32.5%); and more than 10years per day, 15 nurses (7.1%).

Table 1: General characteristics (N = 215)

Variable	Category	Mean ± SD, n (%)
		29.80 ± 4.51
Age	20~29	140(65.1)
	30~39	66(30.6)
	≥40 years old	9(4.3)
Marital state	Single	150(70.0)
	Married	65(30.0)
Work department	Medical ward unit	86(40.0)
	Surgical ward unit	65 (30.1)
	Intensive care unit	43(20.0)
	Emergency room unit	21(9.9)
Religion	Christianity	97(45.0)
	Catholic	30(14.0)
	Buddhism	8(3.7)
	None	80 (37.3)
Clinical career	1 to5years	130(60.4)
	5 to10years	70(32.5)
	≥10years	15(7.1)

Descriptive Statistics: Descriptive statistics for emotional intelligence, emotional labor, and exhaustion are demonstrated in Table 2. A score of emotional intelligence of the participants was mean 3.66points out of 5.0 and when seeing by sub domains, understanding of self - emotion was 3.55 points, understanding of other's emotion was 3.40 points, emotional control was 3.15 points, and application of emotion was 3.30 points. Emotional labor of the participants was on average 25.32 points out of 45.0 and when seeing by sub domains, frequency of emotion labor was 8.42 points emotional attentiveness was 8.76 points, and emotional dissonance was 7.52 points. Exhaustions of the participants was on average3.40 points out of 5, and seeing by subdomains, emotional exhaustion 3.40 points, the depersonalization was 2.99 points and low sense of personal accomplishment was 3.55 points.

Table 2: Mean and SD of Emotional intelligence, Emotional labor, and Exhaustion (N = 215)

Variable	M ± SD	Range
Emotional intelligence	3.66 ± 0.63	1~5
Understanding of self-emotion	3.55 ± 0.67	
Understanding of other's emotion	3.40 ± 0.64	
Emotion control	3.15 ± 0.68	
Application of emotion	3.30 ± 0.51	
Emotional labor	25.32 ± 4.81	9~45
Frequency	8.42 ± 1.88	
Attentiveness	8.76 ± 2.75	
Dissonance	7.52 ± 1.35	
Exhaustion	3.40 ± 0.67	1~5
Emotional Exhaustion	3.35 ± 0.81	
Depersonalization	2.99 ± 0.87	
Lower sense of personal accomplishment	3.55 ± 0.77	

Correlations: Table 3exhibits inter-correlations among major study variables. There were negative correlations between emotional intelligence and emotional labor(r=-.55, p<.001),and positive correlation between emotional intelligence and exhaustion(r = .31, p = .311) and emotional labor and exhaustion(r = .18, p = .002) significantly.

Table 3: Correlation among main variables (N = 215)

	Emotional intelligence	Emotional labor	Exhaustion
Emotional intelligence	1		
Emotional labor	-.55 (p<.001)	1	
Exhaustion	.31(.311)	.18(.002)	1

Discussion

The aim of this study is to investigate the correlation of emotional intelligence, emotional labor, and exhaustion of clinical nurses in Korea. Nursing is a strenous work and clinical situation expand nurses at an early stage in their studies to the practices of working as a healthcare provider.

In this study, the average emotional intelligence score was 3.66 points of 5.00.Although it is hard to make a comparison with these results with that previous study because different scale was utilized, this points was higher than the 5.42 points noticed among nurses working in USA[20]. These differences between these studies may be owing to differences in cultural properties because this research was implemented at tertiary teaching hospitals in Korea. This cause is assisted by a precedent research that identified that nurses doing a work at general hospitals in United States of America[20]intend to participate in less emotional labor than nurses doing their work at tertiary teaching hospitals.

In this research, the average score of emotional labor among subjects was 25.32 points. In the group of the three parts of emotional labor, attentiveness in the profession had the highest mean score, while dissonance had the lowest. Comparing previous study[21], this score was lower. It is hard to make a comparison these two studies because the previous research studied 3466 Finnish participants who were could not verify their work ethic feasibility. Nevertheless, the higher than-mean emotional labor scores and high exhaustion scores indicate that high emotional labor is induced by Korean nurses' practice environment.

The mean exhaustion score in this study was 3.40 points (of 5), representing that subjects undergo a moderate level of exhaustion. This exhaustion score is higher in tertiary teaching hospitals nurses in Korea than that found in nurses doing their work in a hemodialysis unit in Turkey[22]. Because it is not the same working environment as that for estimating exhaustion, it is hard to make a comparison, the score, but the higher level of exhaustion in participants in this study would result in the impact of emotional labor, which can be brought about the comparatively more severity of patients admitted in tertiary care hospitals. In previous research, exhaustion scores were higher than that of nurses in Greece general hospital (2.51 of a possible 5), too[23].Therefore, there were obvious characteristics comparing national level, suggesting that Korean nurses reported higher levels of exhaustion than nurses in western countries. This study suggests that it is required to adjust factors related to exhaustion among Korean nurses.

This finding would represent that clinical nurses make plentiful effort into managing their emotions as healthcare providers to efficiently care patients. Whereas, it might imply that nurses are to manage their emotions because of making decisions about nursing care. Accordingly, this finding insists that adequate nursing interventions are required to help reduce emotional distress in nurses while enhancing their capability.

Conclusion

This study is conducted to identify that the correlations among emotional intelligence, emotional labor and exhaustion of the clinical nurses. In order to reduce the emotional labor and exhaustion of the nurses, clinical nurses have to improve and utilize emotional intelligence. So that, the development of the nursing intervention programs which could enhance the emotional intelligence of the nurses are required. In case of education for clinical nurses, the implementation of nursing intervention programs should reduce the emotional labor and exhaustion. Accordingly, improving of emotional intelligence should be taken into account the positive effects on clinical nurses.

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Source of Funding: Namseoul University

Conflict of Interest: Nill

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Nurses' Professional Quality of Life

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ABSTRACT

Background/Objectives: This study is a descriptive research study to identify factors affecting quality of professional lives of nurses.

Method/Statistical Analysis: The subjects of this study were 177 nurses working in a general hospital in Korea, and the data collection was from February 01, 2018 to February 26, 2018. The collected data were analyzed by descriptive statistics, t-test, ANOVA, Pearson's correlation and multiple regression analysis.

Findings: As a result of the study, Quality of professional lives of nurses and Emotional labor(r=-.114, p=.016) showed negative correlation, and Emotional intelligence(r=.274, p=.000) showed significant positive correlation. Among emotional intelligence, self emotional appraisal(β=-.043, p=.000) and the use of emotion(β=-.394, p=.007) were found to affect the quality of professional lives of nurses.

Improvements/Applications: In conclusion, strategies for minimizing emotional labor and improving emotional intelligence are needed to improve the quality of professional life.

Keywords: *Emotional Labor, Emotional Intelligence, Nurses, Professional, Quality of life*

Introduction

Han at. al. [1] studied and published about emotional labor occupational groups for a total of 5,667 workers in 203 Korean occupations. Of the 30 high emotional labor groups, nurses were included and nurses experienced a high average emotional labor of 4.33 points. Among the medical care workers, nurses are experiencing the highest emotional labor after emergency medical staff [1], and emotional labor, emotional intelligence, and professional quality of life for nurses performing nursing at the forefront for the health of the subject need to be recognized.

Emotional labor refers to labor involving the suppression and control of emotions to express emotional expressions such as speech, facial expressions, and gestures as part of the job[2]. Currently, workers' suicide and high suicide accidents and stress caused by heavy and continuous emotional labor are becoming a big social problem. Recently, in Korea, an amendment to the Industrial Safety and Health Act called 'Emotional Laborer Protection Act' has been implemented in October 2018[3] and legal protection against emotional laborers has been started. As the industry becomes more sophisticated and service workers are increasing, their access to emotional labor for mental and physical health is an important issue, and it is also important that they have an interest in their quality of life. Recently, emotional labor was recognized as a specific labor and it was recognized for its importance however, nursing of patients is recognized simply as a duty of a nurse, such as professional consciousness or service spirit, and the understanding of emotional labor that is experienced during provision of nursing is still lacking.

Since the emotional labor of a nurse can not be omitted during the performance of a job, the emotional labor of the nurse must be actively managed[4]. In many previous studies, emotional labor affected Exhaustion[4,5,6], Increased job stress[7], Turnover intention[6], and Job commitment[8] of nurses and was reported to reduce the quality of nursing and the quality of professional life[9].

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Emotional intelligence is an emotional tendency that is mentioned as a countermeasure against stress that has harmful effects on an individual or organization[10], and it refers to the ability to recognize the emotions of oneself and others, synchronize oneself, and manage emotions well[11]. In the nursing field, various stresses occur, but the nurses with high emotional intelligence think positively and rationally to resolve the conflict effectively, to control emotional labor[12] by controlling emotions, and are highly engaged[13]. Therefore, nurses who provide physical and mental care for all age groups need emotional intelligence to be able to cope effectively with their work[14]. Therefore, the research that confirms the emotional intelligence affecting the professional lives of nurses will be meaningful.

Nurses who are experiencing psychological stress and stress frequently are exposed to emotional labor, which can negatively affect the quality of professional life. Emotional labor has been reported to cause Exhaustion[5] and to affect the quality of professional life[9]. Professional quality of life has been studied and applied to professionals in many industries[15,16], and in Korea, the quality of professional life is being studied in nurses such as emergency room nurse[17], oncology nurse[18], mental nurse[19], community health practitioners[20]. It is necessary to apply the concept of quality of professional life to understand how nurses nursing patients in various fields evaluate themselves and their work, and it is necessary to examine how emotional labor and emotional intelligence affect the quality of professional life.

Therefore, the purpose of this study is to investigate the effect of emotional labor and emotional intelligence on the quality of professional life for nurses. In addition, it was attempted to provide basic data for enhancing the understanding of nurses, alleviating the emotional labor of nurses, and establishing plans for adjusting and utilizing emotions.

Materials and Method

Design: This study is a descriptive study to investigate the effect of emotional labor and emotional intelligence of nurses on quality of professional life.

Subjects: The subjects of this study were 177 nurses working in a general hospital in Korea. The questionnaire was given to 200 subjects considering dropout rate, and of the collected questionnaires, 177 were used as the final analysis data, excluding 23 missing many responses.

Tool

Emotional Labor: The emotional labor measurement tool was based on the work of Morris and Feldman[21] developed by Kim[22]. This tool has 9 total items including 3 items of Frequency of emotional display, 3 items of Attentiveness to required display rules, and 3 items Emotional dissonance. Each item was answered with Likert 5 point scale, and higher score represents higher emotional labor. In Kim's (1998) study, Cronbach's α was .86, and Cronbach's α was .89 in this study.

Emotional Intelligence: The emotional intelligence scale used was the WLEIS (Wong & Law Emotional Intelligence Scale) tool developed by Wong & Law[23]. This tool consists of a total of 16 items including 4 items of self emotional appraisal, 4 items of others emotional appraisal, 4 items of use of emotion, 4 items of regulation of emotion. Each item is measured on a 5-point Likert scale, and higher score represents higher emotional intelligence. Cronbach's α was .87 at the time of tool development, and Cronbach's α was .94 in this study.

Quality of Professional Life: For Quality of professional life, Compassion satisfaction/Fatigue self test for Helpers developed by Figley[24] revised by Stamm[25] to ProQOL Version 5 was used. This instrument consists of empathy satisfaction and empathy fatigue, and empathy fatigue consists of exhaustion and secondary traumatic stress. It is measured in a 5 point Likert scale, and is composed of 10 questions for each area and total 30 items. The reliability of Cronbach's alpha=.84 was shown in this study.

Data Collection Method: The data collection period of this study was from February 01, 2018 to February 26, 2018, and the data collection place was a general hospital in Korea. The researcher visited the nursing departments of each hospital, explained the purpose of the research, and received permission from the head of department. After obtaining the consent of each ward nurse, only the data of nurses who agreed to participate in this study with written consent were collected. The completed questionnaire was put in an envelope and sealed by the researcher.

Data Analysis Method: Data were analyzed using SPSS/WIN 21.0. The relationship between the emotional labor, emotional intelligence, and quality of professional life of the subjects was analyzed using Pearson correlation coefficient and multiple regression analysis was used to determine the factors affecting the quality of professional life.

Results and Discussion

Results

General Characteristics of Subjects and Emotional Labor, Emotional Intelligence, and Quality of Professional Life according to General Characteristics: The general characteristics of the subjects are as follows. The average age of the patients was 26-30 years (43.5%), and most of them were female (88.7%). The most common marital status was unmarried (67.8%) and no religion (47.3%). And general nurses accounted for 88.7%, the majority. As shown in table 1.

The emotional labor, emotional intelligence, and quality of professional life according to general characteristics of the subjects are as follows. Emotional labor of the subjects showed differences in Gender(t=2.48, p=.000), and Emotional intelligence showed significant differences in Age(F=3.266, p=.023), Gender(t=-2.09, p=.000), Marital status(F=3.330, p=0.38), and Religion(F=1.014, p=.365). Quality of professional life showed differences in Gender(t=-3.48, p=.000) and Religion(F=3.688, p=.007). As shown in table 1.

Table 1: General Characteristics of Subjects and Emotional Labor, Emotional Intelligence, and Quality of Professional Life according to General Characteristics

General Characteristics		N(%)	Emotional Labor			Emotional Intelligence			Professional Quality of life		
			Mean ± SD	t/F	p	Mean ± SD	t/F	p	Mean ± SD	t/F	p
Age	20-25	78(44.1)	32.04 ± 5.70	.746	.526	71.76 ± 12.40	3.266	.023	99.13 ± 9.47	.526	.665
	26-30	77(43.5)	32.62 ± 4.97			67.25 ± 9.33			99.43 ± 8.02		
	31-35	16(8.6)	33.50 ± 2.28			66.13 ± 5.82			97.06 ± 2.62		
	≥36	6(3.2)	34.50 ± 0.84			64.67 ± 1.03			96.67 ± 1.03		
Gender	Female	157(88.7)	32.84 ± 4.46	2.48	.000	68.45 ± 9.53	-2.09	.000	98.23 ± 6.67	-3.48	.000
	male	20(11.3)	29.90 ± 8.17			73.7 ± 16.81			104.85 ± 14.90		
Marital status	Unmarried	120(67.8)	32.51 ± 5.25	.358	.699	69.15 ± 9.53	3.330	.038	98.30 ± 8.17	2.885	.059
	Married	55(31.1)	32.40 ± 4.76			69.51 ± 12.05			8.02 ± 1.09		
	Other	2(1.1)	35.50 ± 2.12			50.00 ± 25.46			13.44 ± 9.50		
Religion	Christian	30(16.9)	32.30 ± 5.77	3412	.800	72.30 ± 11.79	2.209	.070	100.07 ± 7.27	3.688	.007
	Buddhist	20(11.3)	31.35 ± 5.95			72.55 ± 12.05			103.30 ± 9.50		
	Catholic	31(16.7)	32.42 ± 4.46			68.10 ± 8.11			97.27 ± 6.53		
	No	88(47.3)	32.78 ± 4.51			67.18 ± 9.46			97.68 ± 7.64		
	Other	8(4.3)	33.50 ± 8.28			72.25 ± 18.90			105.13 ± 14.14		
Current position	Head nurse	7(4.0)	34.57 ± 0.79	1.101	.335	64.86 ± 1.07	1.014	.365	96.86 ± 1.07	.247	.781
	Charge nurse	13(7.3)	33.77 ± 2.45			71.92 ± 10.46			99.33 ± 3.39		
	Staff nurse	157(88.7)	32.31 ± 5.30			68.99 ± 10.89			99.06 ± 8.68		

Relationship between Emotional Labor, Emotional Intelligence, and Quality of Professional Life: Relationships between emotional labor, emotional intelligence, and job stress are as follows. As shown in table 1.

Quality of professional life had negative correlation with Emotional labor(r=-.114, p=.016) and significant positive correlation with Emotional intelligence(r=.274, p=.000). As shown in table 2.

Table 2: Relationship between Emotional Labor, Emotional Intelligence, and Quality of Professional Life (N = 177)

	Emotional Labor	Emotional Intelligence	Quality of Professional Life
Emotional Labor	1		
Emotional Intelligence	-.114(.129)	1	
Quality of Professional Life	-.181(.016)	.274(.000)	1
$^{*}p<0.05$, $^{**}p<0.01$			

3.1.3Factors Affecting the Quality of Professional Life of Subjects: Emotional intelligence factors affecting the quality of professional life were self emotionalappraisal(β=-.043, p=.000) and use of emotion(β=-.394, p=.007), and these variables were found to have an explanatory power of 19.7% for Quality of professional life. As shown in table 3.

Table 3: Factors Affecting the Quality of Professional Life of Subjects (N = 177)

Variables		β	t	p
Emotional Labor	Frequency of Emotional display	-.079	-.841	.401
	Attentiveness to required display rules	-.126	-1.150	.252
	Emotional dissonance	.092	.771	.442
Emotional Intelligence	Self Emotional Appraisal	.688	4.523	.000
	Other's Emotional Appraisal	-.043	-.373	.710
	Use of Emotion	.033	.266	.791
	Regulation of Emotion	-.394	-2.746	.007
		R^2=.197, F=5.858, p=.000		

Discussion

This study was attempted to determine the effect of emotional labor and emotional intelligence of nurses on quality of professional life.

In this study, the quality of professional life had a negative correlation with emotional labor and a positive correlation with emotional intelligence. This means that the higher the emotional labor, the lower the quality of professional life, and the higher the emotional intelligence, the higher the quality of professional life. Kim &Kim[9] also stated that the emotional satisfaction is lowered and the exhaustion is higher as the emotional labor is higher. Nurses experience negative emotions of emotional labor and are not satisfied with their work. This may affect the quality of nursing care for the nurses, and the nurses' own job satisfaction, quality of life, and exhaustion. Therefore, nurses need a variety of approaches to improve the quality of life related to their occupation with pride in their professional role. It is necessary to periodically check the emotional labor level [19] and develop a program for intervention. If emotional labor is not managed, physical and mental reactions such as anger, physical symptoms, and depression may appear in response to job stress, and at the organizational level, there may be neglect of work, an increase in mistakes, and thoughts of turnover, so emotional labor in nurses is an important issue that needs constant attention and resolution.

Emotional intelligence is the ability to recognize the emotions of oneself and others, synchronize oneself, and manage emotions well[11]. Satisfaction of empathy in the quality of professional life refers to getting satisfaction by helping others as professionals. As the results of this study, the higher the emotional labor level, the lower the degree of satisfaction obtained through professionally helping others. However, since emotional intelligence is the ability to recognize the emotions of oneself and others, emotional intelligence is expected to be a very important factor for emotional labor relaxation and quality of professional life improvement in nurses. It was found that emotional intelligence has a correlation with job satisfaction[26], and there should be a policy support and management plan for emotional intelligence improvement of emotional laborers such as nurses.

Among Emotional intelligence, Emotional self-understanding and Emotion utility were found to affect the quality of professional life. Emotional intelligence is the ability to accurately understand the emotions of oneself and others in various situations, and to control and utilize their own emotions as appropriate behaviors[23]. In particular, nurses are professionals who provide human-centered nursing care and should take appropriate action and cope with various stress situations, and they need high emotional intelligence to assess positively and respond in the right direction under any circumstances[27]. In a previous study[28], it was found emotional intelligence regulates the negative emotions experienced in the overall process of life, leading to positive emotions, and it was stated that higher emotional intelligence lead to higher life satisfaction and emotional stability. McQueen[29] also noted that emotional intelligence can be used to control emotional disharmony and emotional

labor in interpersonal relationships, because emotional intelligence can understand and manage emotions of oneself and others. One of the first things a nurse should understand in order to understand patients and others is self-understanding. Among the measures to improve emotional intelligence, the self-understanding process needs to be continually handled by nurses themselves and on an organizational level, and this is thought to be the most important basis for nurses to help them balance their work and life.

In summary, it was found that emotional self-understanding and emotional utility of emotional intelligence influence the quality of professional life of nurses.

This implies that emotional intelligence has a significant explanatory power in the quality of professional life of nurses. Therefore, it is necessary to improve the quality of professional life through education, training, and programs to improve the emotional intelligence of nurses. This study was meaningful in that the factors of emotional labor and emotional intelligence affecting the quality of professional lives of nurses were identified and the relationship between variables was attempted.

Conclusion

The purpose of this study was to investigate the effect of emotional labor and emotional intelligence of nurses on quality of professional life, and was attempted to provide basic data for enhancing the understanding of nurses, reducing the emotional labor of nurses, and establishing plans for adjusting and utilizing emotions. As a result, it was found that Emotional labor of nurses had a negative correlation with Quality of professional life, and Emotional intelligence was found to have a positive correlation. In addition, emotional intelligence and emotional utility among emotional intelligence were factors influencing quality of professional life. Based on the above results, the following is proposed. In order to improve the quality of professional life of nurses, it is necessary to develop emotional training programs that enhance the emotional intelligence of nurses.

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A Study on Empathy Ability, Communication Efficacy and Self-Directed Learning Ability of Nursing College Students: Before and After Education in Clinical Practice

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ABSTRACT

Background/Objectives: This study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice.

Method/Statistical Analysis: The subjects of this study were the third graders of nursing students attending the nursing department of a university in D city. The period of data collection was from Oct 1 to Oct 30, 2017. With the collected data, using SPSS/Win Program.

Findings: As a result, the scores of empathy, communication efficacy and self-directed learning ability were higher in the group which had subject education experience than that which had none. it is thought that as a method to improve the empathy, communication efficacy and self-directed learning ability of nursing students, it is necessary to have an experience with which they can identify the problems of the subjects through the direct interaction with them during clinical practice, and conduct the education necessary to them.

Improvements/Applications: It is necessary to develop and organize the programs so that nursing students can apply the contents which they learned to nursing practice effectively and constantly.

Keywords: *Empathy Ability, Communication Efficacy, Self-directed Learning Ability, Nursing Students, Education Experience, Clinical Practice*

Introduction

Nurses should give a trust to the subjects and caregivers by respecting and sympathizing with them as well as have the expertise and skills of nursing[1]. In addition, nurses should have competencies in communication, conflict management, and professional attitudes as well as theoretical knowledge and good nursing skills in nursing and family dynamics[2]. Among them, empathy is an important factor which has an effect on forming, maintaining and developing the emotional ties with a therapist who can consider in the patients' side and see the world from their point of view. The empathy, a positive emotion, is the ability to understand the world which the other person understands, and the true value of empathy is not only an understanding of the patients' physical needs but also a psychological reaction to them, which is very important to the nurses who should care them in the special circumstances. And the nurses should constantly develop and utilize their internal resources[3]. Furthermore, nurses should constantly have a therapeutic communication with the patients from hospitalization to discharge, and play a role of consulting and educating patients and caregivers as well as assess the patients' health in the clinical spot. Individual beliefs and conviction that one has the ability to communicate more successfully make a facilitating therapeutic relationship established in the process of consultation with the patient, influence the patients' positive change and lead the successful therapeutic process, so that a nurse becomes able to get rewards

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for nursing. Especially, there are study results that as the communication efficacy of the nurses gets high, the empathy does high as well, so that the effective and therapeutic communication becomes possible[4]. That is, it is considered that the communication experienced during clinical practice is a good opportunity to improve the communication efficacy as a nurse who should constantly have a therapeutic communication with the patients from hospitalization to discharge.

Self-directed learning ability means an ability that a learner leads and manages the planning, execution, and evaluation process of learning for himself or through interaction with learning collaborators in a learning situation, and evaluates the process and results of his own learning by setting the learning goals and by deciding the progress speed. This self-directed learning is especially necessary for nursing education curriculum which emphasizes clinical practice education as well as for school education, and the continuous learning is demanded in the clinical practice fields because of the characteristics of work even after nursing students graduate from undergraduate course[5]. That's because the nurses who are well trained for self-directed learning know and assess their current level of knowledge and skills, and by acquiring the information they need, they can have a problem-solving ability to solve the problems for themselves and enlarge themselves[6]. Therefore, it can be said that the self-initiative cultivation on learning is requested so that students can smoothly solve the problems with experienced nursing practice and communication in a very complicated nursing situation, and can grow constantly and professionally[7].

Today, as a medical environment has changed into a complex type which requires decision making ability, critical thinking and professional skills in order to solve the problems and decide at once in the clinical spots, it is necessary to establish a new role for nursing as a profession[8]. The reason why this role establishment is required is that nursing is a profession based on nurse practice. As a nursing profession is a special knowledge body which can be obtained through theory and clinical practice education, the nursing students must be educated so that they can create a nursing profession as a living nursing knowledge body by integrating and applying the knowledge, technology and attitude which they get to learn in a lecture room in clinical spots[9]. In order to accomplish the purpose of nursing education like this, the experience and ability of nursing students should be maximized.

Therefore, this study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice.

Materials and Method

Design of Study: This study is a descriptive survey study for identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status during clinical practice.

Subjects of Study: The subjects of this study were the third graders of nursing students attending the nursing department of a university in D city.

Study Tools

Empathy Measuring Tool: The tool which Park SeongHee(1997) adapted with Interpersonal Reaction Index which Davis(1980) constructed was used. This tool consists of two sub-factors, cognitive empathy and emotional one, with 28 questions in total, and the response of each question does 5- point Likert scale of ''not at all'(1 point) to 'very agree'(5 points), where the higher the score, the higher the empathy.

Communication Efficacy: In order to measure the communication self-efficacy of subjects, based on a total of 37 questions of Counseling Self-Estimate Inventory(COSE), the counsellor self-evaluation questionnaire, which Larson, et al.(1992) developed and Hong Soo Hyun(2001) adapted for psychotherapists, the communication efficacy scale which Park HyangJin(2013) retranslated into Korean was used. It is a 5-point Likert-type scale, where the higher the score, the higher the communication efficacy. The Cronbach's α value in this study was .78.

Self-directed Learning Ability: For self-directed learning ability, self-directed learning ability measuring tool for university students/adults among the lifetime ability measuring ones developed by Korean Educational Development Institute(KEDI)(Lee Seok Jae, et al., 2003) was used. This tool is composed of 3 ability elements and 8 sub-factors. It is meant that the higher the score, the higher self-directed learning ability. As for

the reliability of a tool, Cronbach's α value was .93 when it was developed, and that in this study was .92.

Method of Data Collection: The period of data collection was from Oct 1 to Oct 30, 2017. As for data collection method, after a researcher visited the subjects and explained the purpose and method of the study to them, a questionnaire was distributed to them who agreed to participate in the study, and the survey was conducted after explaining precautions and how to respond. After the purpose of study, privacy security, and that the survey would not be used for the purpose other than the study according to study ethics were explained to the subjects before collecting data, those who agreed on that took part in the survey.

How to Analyze Data: With the collected data, using SPSS/Win Program, the general characteristics of the subjects were analyzed with real number and percentage, the level of empathy, communication efficacy, and self-directed learning ability according to education experience during clinical practice were done with mean and standard deviation, and the difference according to the general characteristics were done with T-test, and ANOVA.

Results and Discussion

General Characteristics of Subjects: The general characteristics of the subjects are like [Table 1]. In the group which had no education experience during clinical practice, the average age was 21.48 years, 44(88%) were females, for the question of major satisfaction, those who answered "normal" were 20(40%), and those who answered "satisfied" were 20(40%), for that of the department selection motive, those who answered "high employment rate" were 18(76%), and for that of direct nursing performance experience status during practice, those who answered "yes" were 44(88%), which was highest.

In the group which had education experience during clinical practice, the average age was 22.0 years, 44(88%) were females, for the question of major satisfaction, those who answered "normal" were 14(28%), and those who did "satisfied" were 18(36%), for that of department selection motive, those who did "high employment rate" were 24(48%), for the period of clinical practice, those who worked for 3 months to under 6 months were 36(72%), and for that of direct nursing performance experience status during practice, those who answered "yes" were 48(96%), which was highest.

Table 1: General Characteristics of Subjects N = 100

Variables	Categories	Education Experience(No) Group	Education Experience(Yes) Group
		No(%)	No(%)
Age		21.48(.918)	22.0(1.500)
Sex	Male	6(12.0)	6(12.0)
	Female	44(88.0)	44(88.0)
Major Satisfaction	Very dissatisfied	2(4.0)	-
	dissatisfied	8(16.0)	8(16.0)
	Mean	20(40.0)	14(28.0)
	Satisfied	20(40.0)	18(36.0)
	Very Satisfied	-	10(20.0)
Department Selection Motive	Grade	6(12.0)	6(12.0)
	Aptitude and Hobby	12(24.0)	12(24.0)
	High Employment Rate	18(36.0)	24(48.0)
	Recommendation	10(20.0)	6(12.0)
	Others	4(8.0)	2(4.0)
Clinical Practice Period	Under 3 months	2(4.0)	2(4.0)
	3 months to under 6 months	38(76.0)	36(72.0)
	More than 6 months	10(20.0)	12(24.0)
Clinical Practice Organization	Advanced General Hospital	50(100.0)	48(96.0)
	General Hospital	-	2(4.0)

Conted…

Direct Nursing Performance Experience Status	Yes	44(88.0)	48(96.0)
	No	6(12.0)	2(4.0)
Direct Nursing Performance Type which is considered necessary	Nursing Skills	34(68.0)	36(72.0)
	Education	8(16.0)	4(8.0)
	Nursing Assessment	8(16.0)	6(12.0)
	Nursing Record	-	4(8.0)
	Others	-	-

Relationship between Empathy, Communication Efficacy and Self-directed Learning Ability: Examining the correlation between the variables, it was revealed that empathy had a net correlation with communication efficacy(r=.025, p<.001), and communication efficacy had a net one with self-directed learning ability(r=.283, p<.05[Table 2].

Table 2: Relationship between Empathy, Communication Efficacy and Self-directed Learning Ability

Variables	Empathy	Communication Efficacy	Self-directed Learnign Ability
Empathy	1		
Communication Efficacy	.525***	1	
Self-directed Learning Ability	.153	.283*	1
*p<.05, **p<.01, ***p<.001			

Difference in Empathy, Communication Efficacy and Self-directed Learning Ability According to the Subject Education Experience Status Experienced During Clinical Practice: As a result of examining the difference in empathy, communication efficacy and self-directed learning ability according to the subject education experience experienced during clinical practice, it is like [Table 3]. In the group which had no subject education experience during clinical practice, it was revealed that empathy was average rating 3.59 out of 5, communication efficacy was average rating 3.18 out of 5, and self-directed learning ability was average rating 3.36 out of 5. In the group which had subject education experience during clinical practice, it was indicated that empathy was average rating 3.75 out of 5, communication efficacy was average rating 3.32 out of 5, and self-directed learning ability was average rating 3.50 out of 5. As a result, the scores of empathy, communication efficacy and self-directed learning ability were higher in the group which had subject education experience than that which had none.

Table 3: Difference in the Level of Empathy, Communication Efficacy, and Self-directed Learning Ability by Groups

Variables	Categories	No Having Education Experience Group	Having Education Experience Group	t(p)
		Mean ± SD	Mean ± SD	
Empathy Ability		3.59 ± 0.39	3.75 ± 0.35	-1.574(.122)
Communication Efficacy		3.18 ± 0.22	3.32 ± 0.46	-1.286(.205)
Self-directed learning ability		3.36 ± 0.33	3.50 ± 0.40	-1.382(.173)
	Diagnosing Learning Desire	3.26 ± 0.39	3.28 ± 0.56	-.117(.907)
	Setting Learning Objectives	3.32 ± 0.67	3.77 ± 0.77	-2.194(.033)
	Grasping the Resources for Learning	3.46 ± 0.55	3.64 ± 0.75	-.985(.330)

Conted…

	Basic Self-management Ability	3.39 ± 0.55	3.61 ± 0.41	-1.576(.122)
	Selection of Learning Strategies	3.56 ± 0.44	3.65 ± 0.63	-.571(.598)
	Persistence of Learning Execution	3.27 ± 0.45	3.19 ± 0.61	.531(.122)
	Effort attributes for results	3.30 ± 0.48	3.30 ± 0.36	.000(1.000)
	Self-reflection	3.41 ± 0.51	3.80 ± 0.63	-2.404(.020)

Therefore, this study was attempted to provide the basic data for developing the effective teaching and learning strategies by identifying the difference in the empathy, communication efficacy and self-directed learning ability of nursing students according to subject education experience status which is experienced during clinical practice. The major results are as follows.

First, empathy score was higher in the group which had subject education experience during clinical practice than that which had none. As there are no prior studies which have examined empathy according to subject education experience status during clinical practice, it is difficult to compare with them directly. However, it is thought that this result came because they considered from the perspective of the subjects in the process of grasping and assessing the needs of the subjects in order to make education materials.

As empathy is a process that one not only feels the emotion and experience which the other person feels from his point of view but also expresses them positively, it can be said that empathy is nurses' ability that they can see the world in patients' place and from patients' point of view. This empathy is a factor which has an important influence on forming, maintaining and developing the emotional ties with the subjects, and the empathic attitude which respects the others personally, getting out of self-centered thinking and experiences their emotion in their behalf is a required ability to nurses as well. As the empathy score of nursing students who had subject education experience experienced during clinical practice was high in the result of this study, it could be identified that the education experience through interaction with the subjects during clinical practice is a teaching and learning method that can improve the empathy of nursing students.

Second, the group which had subject education experience during clinical practice showed communication efficacy score higher than that which had none.

Although it is difficult to compare with prior studies directly as there were none which have examined the communication efficacy according to subject education experience status during clinical practice, it is thought that this is a result of interaction in the process of forming trust relationship with subjects and caregivers for making parent education material during clinical practice period and of educating the caregivers of subjects. Communication efficacy refers to a belief that a counselor can effectively consult a client, and a self-confidence that he can help the client using the skills which he has. In the study of Jo Yin Yeong[10], as a result of examining the needs of the communication education, it was indicated that nursing students preferred the performance - based communication education. In addition, the role play was the most effective educational strategy for communication, which indicates that it is important to do a role directly in the education for improving communication based on the results of the prior studies and this one. As it was indicated that the communication experienced through a learning contract can improve the communication efficacy of nursing students, make them communicate with the patients effectively, and promote the therapeutic relationship, it could be identified through this study that clinical practice education which has subject education experience is a teaching and learning method which can improve the communication efficacy.

Third, the group with subject education experience during clinical practice had a higher self-directed learning ability score than that without it. Though as there are no prior studies which have examined the self-directed learning ability according to subject education experience status during clinical practice, it is difficult to compare with them directly, in the prior study[11] which examined the change in self-initiative, it is reported that a learning contract had a positive influence, such as the improvement of self-directed learning ability and understanding. In

addition, it was said that the nurses who are well trained for self-directed learning can know and assess their current level of knowledge and performance, and that by acquiring information necessary to them, they can solve the problems for themselves, and enlarge themselves[6].

This self-directed learning can improve the professional nursing skills of students in the first clinical practice education through the education which enhances the self-confidence of students and improves the independent learning ability of them. In the result of this study, it is considered that as the group having subject education experience had a high score of the self-directed learning ability, the clinical practice of nursing students utilizing the self-directed learning contract enhances self-initiative in the practice as a motive through contract and the proper application period is a teaching and learning strategy suitable for clinical practice education.

Conclusion

Given those results, it is thought that as a method to improve the empathy, communication efficacy and self-directed learning ability of nursing students, it is necessary to have an experience with which they can identify the problems of the subjects through the direct interaction with them during clinical practice, and conduct the education necessary to them. Especially, it is necessary to develop and organize the programs so that nursing students can apply the contents which they learned to nursing practice effectively and constantly. Therefore, various educational activities should be conducted in order to enhance these learning outcomes in nursing education course. Furthermore, it is considered that it is necessary to develop the systematic and effective clinical practice education programs which reflect the learning needs related with the clinical practice of nursing students and the training needs of the clinical field.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nill

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Study on Listening to White Noise of Nursing College Students and Improvement of Concentration

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ABSTRACT

Background/Objectives: This study was conducted to provide the basic data for improving the learning environment of nursing students by grasping the effect which the white noise positively influencing like this has on the improvement of the concentration of nursing students.

Method/Statistical Analysis: The subjects of this study were 284 nursing students in first and second grade of a university located in M city. Data collection was conducted from May 1 to May 15, 2018.With the collected data, using SPSS Program.

Findings: AS a result, White noise listening concentration showed a statistically significant difference in the sounds which are helpful to concentration(p=.000), care about the noise environment creation(p=.004), and white noise listening experience((p=.001).

Improvements/Applications: In conclusion, It is thought that it is necessary to create the environment and develop the programs which can arouse the positive change in the learning attitude of nursing students by actually using white noise.

Keywords: *White Noise, Listening, Study Method, Nursing Students, Concentration Improvement*

Introduction

Human beings live interacting with the environment surrounding the individuals, the effect of the environment on them is extensive, and all the behaviors of them are the result of the effect. Sound is one of the elements of environment which surrounds an individual as well. The noise among the types of sounds is a sound which makes people unpleasant as it is noisy, which takes up more and more of our lives as a society develops recently. That's why the noise is called an invisible pollution, the problem of noise pollution which causes people to experience the psychological and physical disabilities has arisen, and the concerns and complaints of people about the noise increase. With the interest in the noise increased recently, white noise, a positive noise, receives attention.

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White noise, which refers to the noise with a special spectrum, has a constant continuous spectrum regardless of frequency, and is a constant noise that the intensity of a component which is included per 1 octave within a scope of a set frequency emerges regardless of the location of frequency[1].

Listening to the white noise, the emission of α-wave increases in the brain, however, β-wave gets decreased. That is, it can be assumed that when one is psychologically, emotionally unstable, the white noise can arouse the positive change in learning ability by enhancing the concentration through the stability of mind. The white noise shows the uniform and constant frequency range on the whole, which rather covers the surrounding noise[1]and makes us get used to it. That is, it plays a role of a 'good' noise which doesn't interrupt with the work as it is considered natural sound always heard, and which brings about psychological stability and concentration[1].

Concentration is a behavior that makes an organism lean towards a receptor with the input of special stimulus, and a process of center processing in which the input is

transfigure[2]. Concentration becomes a base of all task learning as one concentrates one's consciousness so that one may complete the given task within a limited time which is given to one, and depending on the degree of acceptance of the learning contents within a specific time, there happens difference between when one concentrates well or when one doesn't[2]. Thus, it can be known that for learning, one should pay attention, focusing on the demand related with the handling of major tasks where the input of task learning is transfigured[2]. When one who has a high concentration is given a task or conducts one's work, one can get a positive result due to a high efficiency as one concentrates in order to complete the task within a given time[3]. In addition, one who has a good concentration can receive a positive assessment in a school and a society due to high efficiency whatever one does, which instills confidence, helps one grow emotionally smoothly, and makes one lead a life as a sound member of a society[4]. The higher concentration is, the higher the efficiency of learning is, which helps one have confidence in school life, form a positive emotion, and accomplish the purpose of other activities[3]. A method to cultivate concentration is to strengthen lower abdomen through brain education programs including brain gymnastics and meditation and to improve strength by controlling a brain wave[5]. If strength, which makes us endure a tough situation, is improved, as motivation to learn emerges naturally, and as it is easy to reach learning objectives, a self-directed learning attitude is formed[5]. In addition, when the class was given using a mental concentration training, after through mental concentration training, self-control ability was formed, concentration was strengthened, and the hydraulic power, understanding, and memory which influence the learning ability were improved, a brain wave became an alpha wave status, which increased concentration and improved academic achievement[6]. Thus, it can be known that the improvement in learning ability enhances confidence of learners with a formation of self-control ability, brings voluntary participation in learning, and improves learning achievement. When making one concentrate on the stimulus better, not distracting attention by repeating simple stimulus of light and sound, it is helpful to improve attention concentration[7].

According to the studies of Korean Industry Psychological Association, it was indicated that the white noise brings about the effect of concentration improvement(47.4%) and memory improvement(9.6%)[1]. As it has an effect that it can reduce the stress by 27.1% and learning time by 13.63% as well, the usefulness of it is widely known to studying students[1]. In reality, some celebrities, such as Ernest Hemingway who used to write novels at a regular cafe 'La Closerie des Lilas', Joanne Rowling who wrote Harry Potter wandering several cafes in Edinburgh, Jon Favreau who wrote the inaugural address of Barack Obama at Starbucks, used to go to cafes where they could hear the white noise in order to perform the writing work which needs concentration, which proves that.

Therefore, this study was conducted to provide the basic data for improving the learning environment of nursing students by grasping the effect which the white noise positively influencing like this has on the improvement of the concentration of nursing students.

Materials and Method

Design of Study: This study is a correlation survey research for grasping whether or not listening to white noise improves the concentration.

Subjects of Study: The subjects of this study were 284 nursing students in first and second grade of a university located in M city.

* The selection criteria of subjects: those who were highly available as subjects were conveniently sampled.

* The exclusion criteria of subjects: those who didn't take part in the survey were excluded.

Study Tools: As for a measuring tool for concentration, the questions in the questionnaire used in 'A Study on Learner Recognition Exploration of Environmental Sound of White Noise as a Learning Environment Element' by KoDaeWon(2015) were modified, supplemented, and used. It is meant that the higher a total score is the more effective white noise is in the improvement of concentration.

Method of Data Collection: Data collection was conducted from May 1 to May 15, 2018. As for data collection method, after a researcher visited the subjects and explained the purpose and method of the study to them, a questionnaire was distributed to those who

agreed to participate in the study, and the survey was conducted after explaining precautions and how to respond. After the subjects were explained about the purpose of study, privacy security, and that the survey would not be used for the purpose other than the study according to study ethics, the subjects who agreed on that took part in the survey.

How to Analyze Data: With the collected data, using SPSS Program, the general characteristics of the subjects were analyzed with real number and percentage, concentration level was done with mean and standard deviation, and the difference between the improvement of concentration according to the general characteristics of the subjects was done with T-test and ANOVA.

Results and Discussion

General Characteristics of Subjects: The general characteristics of this study are like Table 1. As for gender, there were 202 females(86%) and as for age, those who were over 20 years of age were 206(87.7%), and as for residence type, those who lived in a dormitory were 95(40.4%), which was highest. For the question of main study place, those who answered that it is the house, a quiet environment, were 104(44.3%), for that of how to study, those who did that they study 'Alone' were 136(57.9%), and for that of what sound helps the concentration, those who did that it is silence were 125(53.2%). In addition, for that of what sound interferes with concentration, those who did that it is the sound of babbling were 159(67.7%).

Table 1: General Characteristics of Subjects

Variables	Categories	No(%)	Mean ± SD
Gender	Male	33(14.0)	
	Female	202(86.0)	
Age	≦ 20	206(87.7)	19.44 ± 1.707
	21 ≦	29(12.3)	
Residence Type	Living with Parents	70(29.8)	
	Living apart from Family	68(28.9)	
	Dormitory	95(40.4)	
	Others	2(0.9)	
Main Study Place	School	70(29.8)	
	Reading Room	37(15.7)	
	Home(Road side)	14(6.0)	
	Home(Around Downtown)	19(4.3)	
	Home(quiet place)	104(44.3)	
How to Study	Alone	136(57.9)	
	With Friends	6(2.6)	
	Library	77(32.8)	
	Cafe	13(5.5)	
	Others	3(1.3)	
Sounds which are helpful to concentration	Silence	125(53.2)	
	Sound of rain	42(17.9)	
	Sound of Motorway	9(3.8)	
	Babble	20(8.5)	
	A book flipping sound	39(16.6)	
Sounds which interfere with concentration	Silence	14(6.0)	
	Sound of rain	4(1.7)	
	Sound of Motorway	25(10.6)	
	Babble	159(67.7)	
	Don't care	33(14.0)	

Conted…

Care about Noise Environment Creation	Care a lot	38(16.2)	
	Care a little	133(56.5)	
	Don't care	64(27.2)	
White Noise Perception	Yes	155(66.0)	
	Only Listened	70(29.8)	
	Have no Idea	10(4.3)	
White Noise Listening Experience	Yes	116(49.4)	
	No	119(50.6)	

White Noise Listening Concentration Level of Nursing Students of Japanese University: The white noise listening concentration level of nursing students showed average rating 3.15 out of 5[Table 2].

Table 2: White Noise Listening Concentration Level of Nursing Students of University

Variables	Mean ± SD	Range
White Noise Listening Concentration	3.15 ± 0.61	1-5

Difference in White Noise Listening Concentration Level according to General Characteristics of Nursing Students of University: The difference in white noise listening concentration level according to the general characteristics of nursing students is like Table 3. White noise listening concentration showed a statistically significant difference in the sounds which are helpful to concentration(p=.000), care about the noise environment creation(p=.004), and white noise listening experience((p=.001).

Table 3: Difference in White Noise Listening Concentration Level according to General Characteristics of Nursing Students of University

Variables	Categories	N	White Noise Listening Concentration	
			Mean ± SD	t or F(p)
Gender	Male	33	3.39(.446)	6.379(.012)
	Female	202	3.11(.624)	
Age	≤ 20	206	3.14(.606)	0.143(.706)
	21≤	29	3.19(.648)	
Residence Type	Living with Parents	70	3.06(.565)	0.801(.494)
	Living apart from Family	68	3.22(.717)	
	Dormitory	95	3.16(.560)	
	Others	2	3.18(.441)	
Main Study Place	School	70	3.13(.557)	0.890(.471)
	Reading Room	37	3.12(.525)	
	Home(Road side)	14	3.40(.643)	
	Home(Around Downtown)	19	3.32(.502)	
	Home(Quiet environment)	104	3.12(.673)	
How to Study	Alone	136	3.13(.648)	3.682(.006)
	With Friends	6	3.56(.920)	
	Library	77	3.06(.489)	
	Cafe	13	3.67(.471)	
	Others	3	3.02(.157)	

Conted…

Sounds which are helpful to cocentration	Silence[a]	125	2.91(.589)	15.437(.000) a(b,c,d,e
	Sound of Rain[b]	42	3.48(.454)	
	Sound of Motorway[c]	9	3.86(.467)	
	Babble[d]	20	3.44(.501)	
	Sound of Turning Over Pages of a Booke	39	3.24(.528)	
Sounds which interfere with con centration	Silence	14	3.29(.419)	0.802(.525)
	Sound of Rain	4	2.98(.369)	
	Sound of Motorway	25	3.24(.658)	
	Babble	159	3.11(.626)	
	Don't care	33	3.24(.579)	
Care about Noise Environment Creation	Care a lot[a]	38	2.89(.738)	5.541(.004) a(b
	Care a little[b]	133	3.25(.583)	
	Don't care[c]	64	3.10(.534)	
White Noise Perception	Yes	155	3.19(.663)	1.136(.323)
	Only Heard	70	3.06(.510)	
	Don't know	10	3.08(.237)	
White Noise Listening Experience	Yes	116	3.28(.640)	10.567(.001)
	No	119	3.02(.553)	

This study was conducted to provide the basic data for improving learning environment of nursing students by grasping the effect which the white noise positively influencing learning has on the improvement of the concentration of nursing students. The main results are discussed as follows.

First, the white noise listening concentration level of nursing students was average rating 3.15 out of 5, which was above-average. As there are no prior studies which have identified the concentration level after listening to white noise, direct comparisons are difficult. Kim SeongCheol[8] said that it can be expected that if white noise is used in performing tasks, it can shield the source of noise which affects the performance of tasks, and it can bring about the improvement of performance by enhancing the ability of adapting to the tasks. White noise worked as a factor which had a positive effect on language ability and numerical ability, which can be said a result that supported the prior studies that white noise condition had a valid effect especially in reasoning power. Therefore, as the performance ability of human beings can be increased by reducing the effect of white noise and noise selectively according to the characteristics and environment of learning, it is thought that the physical, mental health of learners can be improved.

Second, white noise listening concentration showed a statistically significant difference in the sound which is helpful to concentration(p=.000), caring about the noise environment creation(p=.004), and the experience of white noise listening(p=.001). Although this result is difficult to compare with that of prior studies directly, which can be said that this result supports the study of KoDaeWon[9]. who said it was identified that listening to white noise environmental sound forms the psychological response, arouses the tension of learning, can improve the learning motive level of learners, and plays a role which is helpful to learning by blocking the crucial noises, the elements which interfere with the attention concentration of learners.

Lee SeungHee[4]said that as natural sound meditation music programs contribute to increasing a learning attitude test score and improve the learning attitude, they can be positively used, there was the significant change in the attitude toward themselves, friends, and schools of subjects, and all these changes remained constant. Kwak Sang Dong[10]said that natural sound meditation music had a significant effect on improving the overall concentration, In addition, it can be said that the results of study have something to do with those of

KoDae Won[9]who said it was identified that listening to the environmental sound of white noise forms the psychological response, arouses the tension of learning, can improve the learning motive level of learners, and plays a role which is helpful to learning by blocking out the crucial noises, the elements which interfere with the attention concentration of learners. which is a result that has something to do with the study results that natural sound meditation music significantly affected the improvement of a selective attention, self-control, and a persistent attention, the sub-items of attention concentration.

Given these results, it is thought that it is necessary to create the environment and develop the programs which can arouse the positive change in the learning attitude of nursing students by actually using white noise, which is an ordinary sound, such as the sound of rain, that of a car, and that of turning over the pages of a book, surrounding the environment for improving concentration in educational spots.

Conclusion

This study was conducted to identify the relationship between white noise listening study method positively influencing learning and concentration improvement and to provide the evidence data for creating the environment for improving the concentration of nursing students. As it was identified through the results of this study that white noise environmental sound is an element which can produce effective results for learning free from negative perception that it is just a noise, it is considered that the method, environment creation, and programs which can make white noise listening study method be applied

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effect of Quality of Life and Hope on the Suicide Ideation of the Elderly: The Moderated Mediation Effect of Participation in Lifelong Education

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ABSTRACT

Background/Objectives: The purpose of this study was to investigate the moderating mediation effect of lifelong education on the mediation effect of hope on suicide ideation in the elderly. The subjects of this study were 280 elderly people living in S city of Chungnam-do, Korea.

Method/Statistical analysis: The collected data are analyzed using correlation analysis, frequency analysis, and moderating mediation effect.

Findings: First, the correlation analysis showed a positive correlation between quality of life and hope, but there was a positive correlation between quality of life and suicide ideation, hope and suicide ideation. Second, the hope of the elderly mediated the relationship between the quality of life and suicide ideation. Third, participation in lifelong education of the elderly moderated the relationship between quality of life and hope. Fourth, participation in lifelong education of elderly people moderated the mediating relationship of hope between quality of life and suicide ideation.

Improvements/Applications: Finally, based on the results of this study, it was suggested that a lifelong education program should be developed to lower the suicide intention of the elderly. In addition, we discussed regional comparisons through nationwide sampling, research on various age groups, and directions for research targeting only vulnerable groups.

Keywords: *Quality of Life, Hope, Suicide Ideation, Participation in Lifelong Education, Moderated Mediation Effect*

Introduction

In modern society, the average life span of humans is increasing due to the development of medical technology, and it is rapidly becoming an aging. There are various social problems such as pension and medical expenses increase, aged support, economic recession due to population aging, and we are looking for measures to solve this problem[1]. However, it is not enough to solve complex and rapid changing problems, which eventually leads back to the problems of the elderly[2]. In the case of the elderly, there are various reasons such as economic hardship after retirement, depression due to role loss, physical and mental pain due to chronic illness. For these reasons, there is a growing tendency to lead to suicide after failing to find a solution for these issues[3].

A suicide ideation is an act that voluntarily or intentionally takes to take one's life, and is meant to include all attempts to do or to have such an idea[4]. In particular, the suicide ideation of the elderly is more likely to lead to the attempt and it is more serious in the elderly groups than the other age groups[5]. The suicide rate of the elderly in Korea is increasing every year[6], and the social interest is increasing, because of being

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aware of the seriousness of the problems that they are facing in their elder years[7]. However, there is still a lack of research on the elderly problem, and it is necessary to continuously examine the factors that influence the suicide ideation of the elderly.

Recently, various studies have been carried out on the effect of quality of life on suicide ideation, and the results of the study showed that the lower the quality of life, the higher the suicide ideation[8]. In this respect, the quality of life is the value of life that is felt in the process of living, and has implications and comprehensive.

Satisfaction with the quality of life is a goal that individuals pursue throughout their lives and a criterion for judging the success of an individual [9]. The satisfaction of quality of life is very important to influence the life of an individual. In particular, the elderly are a more important population demographic, because they reflect both physical satisfaction and psychological state of mind.

In recent years, research on the impact of quality of life on hope has been on the rise, and it has been found that the higher the quality of life, the more positive the hope is[10]. Hope is the driving force of life and a force that allows a human being to have meaning[11]. Specifically, the higher the level of economic, social, and cultural aspects, the higher the hope of life for the elderly[12]. However, in old age, because of various problems, the hope of life is lowered in this age group, and the meaning of existence as a human being is lost[13]. Hope is the power to overcome these human mental limitations and serves to buffer suicide ideation in desperate situations[14]. Recently, according to the articles published in the elderly in Korea, the most important factor affecting the suicide of the elderly is no hope[15].

Thus, hope has a negative effect on the suicide ideation of the elderly, thereby reducing the incidence of suicide in this population, In this regard, lifelong education for the elderly is emerging as a countermeasure that is being discussed recently[16]. A variety of lifelong education programs centering on municipalities are becoming one of the ways to improve the quality of life of the elderly at all ages[17]. The proportion of lifelong education is increasing in order to meet these needs. However, support programs related to lifelong education have been steadily increasing, but the participation rate of lifelong education for the elderly is still poor. This is because the ages of the elderly are widespread, but it is only a uniform educational program and mere information delivery to meet the needs of various age groups. As the average life span of humans is extended, and the range of older people is widening, it will be the elderly's greatest concern how to spend this period of time. Recent research on lifelong education has shown that an educational strategy that can vigorously help the elderly in their long-term rather than short-term measures improves the quality of life of the elderly[18].

Based on the above studies, participation in lifelong education affects quality of life, and quality of life affects hope. Therefore, participation in lifelong education will have a significant effect on the relationship between quality of life and hope. As we have seen, hope is also influenced by quality of life and serves to reduce suicide ideation[19]. Through these relationship, the purpose of this study was to investigate the mediation effect of hope between the quality of life and suicide ideation among the elderly, to identify the moderating effect of lifelong education between quality of life and hope, and to investigate the moderating mediation effect of lifelong education on the mediation effect of hope on suicide ideation in the elderly.

Therefore, this study set up the following research questions.

First, what is the correlation between the main variables in this study?

Second, does the hope of the elderly mediate the relationship between quality of life and suicide ideation?

Third, does participation in lifelong education of the elderly moderate the relationship between quality of life and hope?

Fourth, does participation in lifelong education of elderly people moderate the mediating relationship of hope between quality of life and suicide ideation?

This study examines the positive effects of participation in lifelong education on the elderly, and examines whether it affects the lowering of suicide ideation by increasing quality of life and hope. These findings may have implications for policy recommendations to lower the suicide rate of the elderly.

Method

Research Model: Based on the previous research, the research model for the mediating effect of hope and the moderating mediation effect of lifelong education participation in the relationship between the quality of life and suicide ideation, was established in Figure 1.

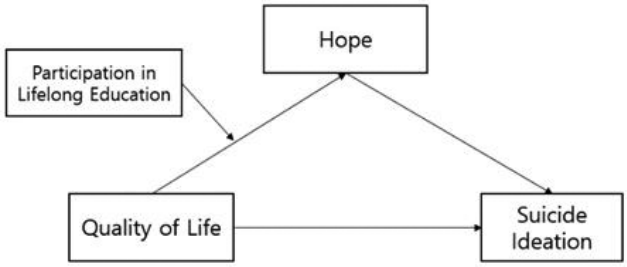

Figure 1: Research Model

Study subjects: The subjects of this study were 280 elderly people living in S city of Chungnam-do, Korea. The survey was conducted from July to October, 2017. A total of 266 copies of the collected questionnaires were used for the final analysis, except for those who responded unfairly.

There were 80 males (30.1%) and 186 females (69.9%) among all of the subjects participating in this study. The age was distributed in 149 subjects (56.1%) in the 70s and 117 subjects (44%) in the 80s or older. There were 142 (53.4%) who had a spouse, and 124 (46.6%) who did not have a spouse. The highest portion of education was noted in 109 subjects (41 percent) who had no schooling, and 103 subjects (38.7 percent) who had graduated from primary school, 24 subjects (9 percent) who had graduated from middle school, and 29 subjects (11.9%) who had graduated from high school.

Research Tools

Quality of life: The quality of life scale of the elderly was modified and supplemented by the researchers according to the scale of Heintzman[20], Lee[21], Kim[22] and Ahn[23]. This scale consists of 20 questions, which included the following examples: "I am satisfied with my appearance these days" and "I am satisfied with my position in my home." Each item is a Likert 5-point scale ranging from "Not at all (1 point)" to "Very well (5 points)." The higher the score, the higher the quality of life. In this study, the reliability of this scale was Cronbach's α=0.957.

Hope: We used hope scale which was developed and supplemented by Snyder et al.[24] and validated to suit the Korean situations by Choi et al.[25]. This scale consists of a total of 8 items, which include the following statements: "I can think of many ways to get out of trouble" and "I follow my own goals." Four of the items are a pathway thought, and four items are an agency thought. Each item is a Likert 5-point scale ranging from "not at all (1 point)" to "very well (5 points)." The higher the score, the higher the hope. In this study, the reliability of this scale was Cronbach's α= 0.947.

Participation in lifelong education: To measure participation in a lifelong education program, the researcher produced the scale through the facial validity of one expert. First, the lifelong education is divided into four areas: health education programs (elderly health maintenance, geriatric disease prevention, hand acupuncture, gymnastics, yoga, hypogastric breathing, gateball, dancing, climbing, etc.), hobby and cultural education programs (gardening, artificial flower, dyeing, cooking, song, Korean dance, movie appreciation, calligraphy, Korean music, flower arrangement, travel, instrumental farm music, baduk, etc.), social education programs (computer, Korean, Chinese text, human relations, writing, self-expression, living law, pension, property management, inheritance, remarriage, etc.) and professional knowledge programs for employment. In this respect, then each of these was measured by a Likert 5-point scale ranging from "not at all (1 point)" to "always very strongly (5 points)." The higher the score, the higher the participation in a lifelong education program.

Suicide ideation: The Suicide Ideation Scale developed by Harlow et al.[26] and translated into Korean by the Kim[27] was used in this study. Each item was measured using a Likert 5-point scale ranging from "not at all (1 point)" to "very well (5 points)"

The higher the score, the higher the suicidal ideation. The reliability of this scale, Cronbach's α, was 0.905.

General characteristics: Gender, age, family type, living conditions, and health status of the subjects were measured.

Data Analysis

The collected data were analyzed using a SPSS Win 23.0 and SPSS Macro PROCESS. Correlation analysis was performed to identify correlations among the main variables used in the study. The Models 7 of the SPSS Macro PROCESS proposed by Hayes were used to identify the moderating mediation effect.

Results and Discussion

Correlation of Main Variables

Table 1: The correlation coefficients and descriptive statistics

	1.	2.	3.
1. Quality of life	1		
2. Hope	.768**	1	
3. Suicide ideation	-.453**	-.454**	1
M	3.71	3.80	1.45
SD	.81	.90	.70

** P<.01

The results of the correlation analysis between the main variables are shown in Table 1. The results showed that quality of life and hope were positively correlated (p<.01), but correlations between quality of life and suicide ideation, and between hope and suicide ideation were negatively correlated (p<.01). Among them, quality of life and hope showed the highest correlation (r = .768, p <.01), followed by hope and suicide ideation (r = -.454, p <.01), and by quality of life and suicide ideation (r = -.453, p <.01). The overall correlation coefficient ranged from -.454 to .768, and it was judged that there was no multi - collinearity of major variables. The results were that the quality of life and hope have a positive effect, and the quality of life and hope have a negative impact on suicide ideation. The quality of life of the elderly is a result of subjective satisfaction in the whole life in psychological, physiological and environmental factors. In order to lower the suicide ideation of the elderly, a plan should be prepared to adapt to the aging process, and increase the quality of life, by various and specific methods.

Moderating mediation effect of participation in lifelong education on the relationship between quality of life and suicide ideation: In order to examine whether participation in lifelong education moderated the mediation effect of hope in the relationship between quality of life and suicide ideation in the elderly, we analyzed by using a Model 7 of the SPSS macro process proposed by Hayes. The results were shown in Table 2.

According to the results of the analysis, the quality of life had a significant positive impact on hope (β = .8614, p <.001), and hope had a negative impact on suicide ideation (β = -.2043, p <.01). In addition, quality of life had a significant negative impact on suicide ideation (β = -.2193, p <.01). Quality of life has a significant effect on hope, and hope has a significant effect on suicide ideation, indicating that hope plays a mediating role between quality of life and suicide ideation of the elderly. This is consistent with previous research that if quality of life increases and then hopes increase, thereby reducing suicide ideation in the elderly. Therefore, it is necessary to find ways to improve the quality of life through an adequate aging preparation process, before entering old age and to increase hope by solving the anxiety old age.

On the other hand, according to the moderating effect of participation in lifelong education, quality of life has a significant effect on hope (β = .8614, p <.001), and the interaction effect of quality of life (independent variable) and participation in lifelong education (moderating variable) has a significant effect on hope (mediating variable) (β = .1199, p <.05). This means that the higher the participation in lifelong education, the greater the effect of quality of life on hope.

The quality of life of the elderly has a very important effect on how to spend the elder years and discover what to do. Those elderly citizens who know how to improve their own quality of life will have hope for their old age, and the importance of lifelong learning for seniors to find relevant duties, responsibilities, hobbies or interests is increasing in importance day by day, which will stave off feelings of hopelessness in the elderly and provide them with more positive feelings of usefulness and hope in their elder years. In the present study, there was no direct effect of participation in lifelong education on hope, but the interaction term between quality of life and participation in lifelong education was found to have a significant effect on.

Table 2: The moderating mediation effect of participation in lifelong education on the relationship between quality of life and suicide ideation

Variables			β	SE	t	p
Mediating variable model(dependent variable: hope)						
Constant			3.7806	.0364	103.9503	.0000
quality of life	→	hope	.8614	.0464	18.5681	.0000
participation in lifelong education	→	hope	.0359	.0529	.6792	.4976

Conted…

quality of life x participation in lifelong education	→	hope	.1199	.0499	2.4014	.0170
Dependence variable model(dependent variable: suicide ideation)						
Constant			2.2300	.2545	8.7625	.0000
quality of life	→	suicide ideation	-.2193	.0734	-2.9898	.0031
hope	→	suicide ideation	-.2043	.0662	-3.0879	.0022

The conditional effect of the effect of quality of life on the hope, according to the specific value of participation in lifelong education, is shown in Table 3. As a result, the simple slope between quality of life and hope was significant in the range of participation in lifelong education from -.7040 (M-1SD) to .7040 (M + 1SD).

Table 3: The conditional effects according to participation in lifelong education

Participation in lifelong education	Effect	se	t	p	LLCI*	ULCI**
-1SD(-.7040)	.7770	.0532	14.6143	.0000	.6723	.8817
M(.0000)	.8614	.0464	18.5681	.0000	.7701	.9528
+1SD(.7040)	.9459	.0629	15.0486	.0000	.8221	1.0696

*LLCI=The lower limit of the indirect effect within the 95% confidence interval

**ULCI=The higher limit of the indirect effect within the 95% confidence interval

The effect of quality of life on hope was found to be significant in the overall range of participation in lifelong education. This implies that participation in lifelong education moderates the relationship between quality of life and hope in all areas.

In order to confirm the form of moderating effect of participation in lifelong education, is presented as a graph as Figure 2. Participation in lifelong education as a moderating variable was divided into three groups: high, medium, and low. And then the change of hope depending on the increase of quality of life is observed. In all groups participating in lifelong learning programs, hope increased, as the quality of life increased. Particularly, in a high group of participation in lifelong education, the rate of increase of hope increases with the increase of quality of life higher than in a low group of participation in lifelong education.

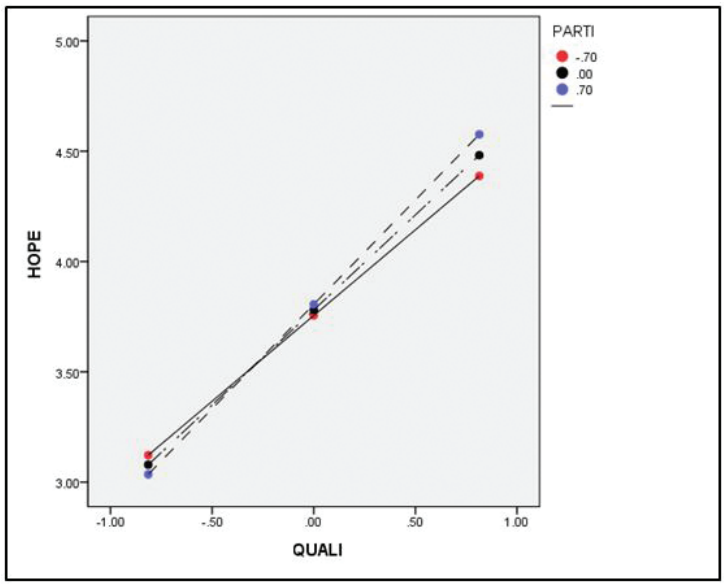

Figure 2: The moderating effect of participation in lifelong education on the relationship between quality of life and hope

Conclusion

The aim of this study was to determine whether the participation in lifelong education moderates the influence of increased hope through quality of life on suicide ideation. As a result, hope mediates the relationship between quality of life and suicide ideation, and participation in lifelong education shows the moderating mediation effect when hope affects suicide ideation while moderating the relationship between quality of life and hope. Based on the results of this study, it was discussed to lower the suicide ideation of the elderly by making lifelong education programs available to them, therefore improving their interest in life, and lowering their incidence of suicide ideation.

Based on the limitations of this study, the identified and reviewed suggestions for future research on this issue are as follows. First, this study has regional limitations in that it only covers participants who are elderly people, residing in the Chungnam province. In the future, a nationwide sampling will be necessary and then a regional comparison will be possible to determine comparisons and identify variances in the data. Second, as the average life expectancy of the human population increases, the age of the elderly should also increase. There is also a need for research that targets a wide range of ages in line with the increasing trend of more humans in the population living to old age. It is also necessary to study the effect of participation in lifelong education programs on the reduction of suicide ideation for vulnerable groups of people who may consider suicide, based on their lowered or reduced quality of life, such as in elderly populations. Third, this study has only studied regarding the participation of the elderly in overall lifelong education programs, but it should also be studied in the future to determine the differences according to the purpose, type and activities of possible lifelong education programs. Despite these limitations, this study was the first to elucidate the moderating mediation effect of participation in lifelong education programs, in relation to the suicide ideation of the elderly. Therefore, it is meaningful that this study provided new basic data in the development and system of the use of a lifelong education program to reduce the suicide ideation of the elderly.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nill

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Influences of Mindfulness on Career Exploration Behaviors: Exploration of Mediating Role of Career Worry and Procrastination

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ABSTRACT

Background/Objectives: The purpose of this study is to investigate whether the effects of mindfulness on career exploration behaviors are mediated by personal tendency of career worry and procrastination.

Method/Statistical analysis: To accomplish this research purpose, we surveyed four hundred and forty-four students of a university in Asan, Chungnam, Korea. They were asked to indicate their level of mindfulness, career worry, procrastination, and career exploration behaviors on a seven-point Likert-type scale. First, the validities of each measure was examined by performing exploratory factor analysis. Next, mediated moderation analysis was performed using Model 4 of the SPSS Process macro developed by Hayes.

Findings: The results of the analysis showed that the direct effect of mindfulness on career exploration behaviors was not significant. And the indirect relationships mediated by career worry and procrastination were significant. Intuitively, mindfulness was expected to have a direct impact on career exploration, but the results of this study did not confirm such an impression. The result of this study can be deduced that mindfulness represents a comprehensive psychological state, while career exploration represents a behavioral state in a limited domain of career.

Improvements/Applications: One of the main implications of this study is that college students can improve their career exploration behaviors by receiving a mindfulness training program.

Keywords: *Career anxiety, Career exploration, Career worry, Delayed behavior, Mindfulness, Procrastination*

Introduction

Many scholars in the career field have long emphasized the importance of career exploration [1]. However, the fact that many college students are not actively pursuing career exploration is also a long-standing problem [2]. There will be many factors that promote or inhibit career exploration behaviors.

The exploration for career is an activity that plans for future employment and practices actions related to it. Therefore, it is expected that some negative psychological states will act to suppress career exploration. One is career worry. Because career exploration behaviors are actions to prepare for the future, college students will have to feel uncertainty. Therefore, although there may be differences in that degree, college students will feel worried about their career. Studies of anxiety show that the higher the level, the weaker the cognitive, emotional, and behavioral problem-solving abilities [3]. However, except for Lee & Woo [4], it is difficult to find a study on the effects of career worry on career exploration. Another psychological state is procrastination. Although the behavior of exploring for one's own career is triggered by self-motivation, attitude variables such as an individual's will may play an important role in maintaining such behavior. Therefore, failing to set goals and plan to achieve them properly can be seen as a lack of self-regulation. From this point of view, it is necessary to deal with procrastination as a factor that can negatively affect career exploration, but it is difficult to find a study that examines the relationship between these two variables.

Researches on career exploration show that this variable consists of two attributes: exploration for oneself and

exploration for environment [5]. To do this exploration, they should be able to perceive their current situation as it is. The related constructive concept is mindfulness [6]. However, no studies have examined the relationship between mindfulness and career exploration.

As a result, the purpose of this study is to determine the relevance of mindfulness, career anxiety and procrastination to career exploration.

Literature Review

Mindfulness and Career Exploration: Mindfulness is a term from the Buddhist tradition and is a translation of 'sati' in the Pali language of ancient India. Sati has the meaning of full awareness (sampajanna). The full awareness here means that the mind recognizes clearly and correctly about the object without missing the attention to that. Modern researchers define mindfulness in a variety of ways. For example, by Kabat-Zinn [6p145], "An operational working definition of mindfulness is: the awareness that emerges through paying attention on purpose, in the present moment, and nonjudgmentally to the unfolding of experience moment by moment." Based on this definition, he proposed the Mindfulness-Based Stress Reduction (MBSR) program. In addition, Baer et al. [7] conducted a psychometric study integrating five existing mindfulness questionnaires. The results showed that the factors of mindfulness were 'Nonreactivity to inner experience', 'Observing/noticing/attending to sensations/perceptions/thoughts/feelings', 'Acting with awareness/automatic pilot/concentration/nondistraction', 'Describing/labeling with words', and 'Nonjudging of experience.'

Thus, due to the awareness that is the goal of mindfulness, we are able to have the ability not to be caught up in our internal experience by stopping the automatic and reflexive reactions triggered by our current experience and by having a psychological space to choose new reactions. This characteristic of mindfulness will enable college students to prevent themselves from reacting automatically to their needs in the present situation, to be aware of their own needs, and to make intentional and conscious decisions. As a result, it can be expected that the higher the level of mindfulness, the less anxious mind to capture in the chaos of uncertainty, the more disappearing the mind will be to delay action until you feel uncomfortable, and the career exploration behaviors will increase.

The influence of career worry and mindfulness on career exploration: The career worry in this study is conceptualized by limiting general worry to the field of career. The most common definition of worry is a series of thoughts and images that are somewhat uncontrollable related to negative emotions [8]. Thus, career worry can be referred to a series of uncontrollable thoughts and images associated with negative emotions within the boundaries of the career domain.

According to Borkovec [9], worried people tend to cognitively avoid problems rather than confront them, not only because they feel threatening and make a cognitively distorted assessment about external factors, but also because they perceive that they cannot exercise proper control when dealing with incidents. Lee & Woo [4] showed that the higher the level of career worry, the lower the career exploration. However, except for these studies, it is difficult to find a study on the role of career worry on career exploration.

On the other hand, mindfulness allows people to see the difference between 'objective reality' and 'self-constructed reality' by making a step back from experiences that induce immediate reactions, and let them observe that they are intervening in the process of constructing the experience. Mindfulness enables these cognitive processes to distance themselves from negative thoughts and emotions without identifying them with oneself [10]. Therefore, mindfulness can be assumed to be a negative relationship with anxiety. However, it is still difficult to find a study that directly proves the relationship between mindfulness and career worry. And if there is a negative relationship between mindfulness and career worry, career worry is expected to serve as a mediator in the process from mindfulness to career exploration. However, it is difficult to find a research that directly proves whether career worry plays such a role.

Procrastination and career exploration: Procrastination means self-defeating behavior that has difficulty in achieving the goal by failing to start or complete the task within the required timeframe due to the failure of self-regulation [11]. Considering that the chronic procrastination of college students may be a function of motivational as well as intentional factors and that some researchers suggest that procrastination is contrary to the characteristics of a high self-regulated learner, we can predict the relationship between procrastination and career

exploration. In general, self-regulated learners adjust their goal-setting process by setting self-initiated goals, motivating oneself, and evaluating progress information toward the goal. On the other hand, procrastinators are known to invest less time in preparing tasks for success, underestimate the total time spent completing tasks, and invest less time in finding the information they need [12]. These characteristics ultimately explain the dysfunctional relevance of procrastination in career exploration behaviors. Therefore, it can be expected that the higher the level of procrastination, the lower the level of career exploration.

On the other hand, as mentioned above, mindfulness stops the automatic and reflexive reactions induced by the current experience so that people do not depend on internal experience. During goal-striving activities, people experience not only the desire to achieve the initial goal, but also additional needs. Mindfulness not only keeps you from paying attention to your initial goals, but also makes you realize that your mind is moving from one desire to another. In other words, when people are tempted to move away from their initial career exploration behaviors and try to postpone it, mindfulness will recognize such a mind and bring it back to its initial behavior. Therefore, mindfulness will play a role in lowering the level of procrastination. It will also serve as a mediator in the process from mindfulness to career exploration. However, it is difficult to find a study that examines this relationship.

Method

Participants: Four hundred forty-four students from a university in Asan, South Korea responded to a self-report questionnaire. The distribution of the participating students is as follows: male 228(51.4%), female 210(47.3%), no response on sex 6(1.4%), the minimum age 18 years, the highest age 29 years, the mean age 21.2 years (SD=1.91).

Measures

Mindfulness: For the measure of mindfulness, this study used the scale that Park [13] produced for Koreans. This is a 20-item measure consisting of four dimensions of present-moment awareness, concentration, acceptance without judging, and decentered attention.

Career worry: The PSWQ (Penn State Worry Questionnaire) with 16 items of Molina & Borkovec [14] was modified to measure career worry. We measured the level of career worry by adding 'career' to each of the items.

Procrastination: The measure of Lay [11] was used to measure procrastination. This measure only includes items that measure behavioral aspects of delayed behavior. That is, it does not include questions related to academic procrastination, and cognitive reasons or emotional consequences of delayed behaviors. Therefore, this scale is effective to measure delayed behavior stably in various scenes.

Career exploration behaviors: In order to measure career exploration behaviors, the 28-item scale of Choi [15] was used that was applied to Koreans by combining several previous studies. This measures the frequency of various career exploration behaviors of college students. However, some of the items are not frequently performed by college students, and it will be unreasonable to ask for the level of such behaviors on a Likert-type scale. Therefore, we selected 16 questions and asked how often they have done career exploration behaviors that correspond to the contents of the question in past 12 months.

Seven-point Likert-type scale (1 = strongly disagree, 7 = strongly agree) was used to measure all the concepts used in this study.

Results

Validation of scales: Because mindfulness and career exploration behaviors consist of multidimensional scales, it was necessary to confirm whether or not to maintain such a structure in this study. Career worry levels of respondents were measured by adding 'career' to each item in the measure of Molina & Borkovec [14], which was designed to measure general worry. Since this measure was originally produced as a single-dimensional scale, it was necessary to confirm whether the same structure was maintained in this study as well. In the case of career exploration, this study only adopted a part (16 items) of the 28 items in the original scale of the Choi[15] a result, exploratory factor analysis was conducted to examine the dimensionality of the variables (mindfulness, career worry, and career exploration) used in this study. The principle axis factoring was used the factor extraction method and the number of factors was determined using scree plot and eigenvalues (> 1.0). The extracted factors were rotated using the Varimax method.

Factor analysis results of mindfulness scales show that four factors are appropriate as well as the original scale. The four factors accounted for 49.86% of the total variance. The percentage of variance of individual factors are as follows: decentered attention 16.59%, acceptance without judging 11.97%, concentration 11.09%, present-moment awareness 10.21%.

The factor analysis of career worry showed that 11 items of single factor were appropriate. Coincidentally, in Molina & Borkovec's PSWQ [14], all reverse items were removed. The single factor accounted for 50.95% of the total variance.

Factor analysis of career exploration behaviors shows that three factors are appropriate. The original scale of Choi [15] was composed of two factors (self-exploration and environment-exploration). However, the results of this study show that it is appropriate to divide self-exploration into two factors, self-seeking and advice-seeking. As a result, the three factors accounted for 48.41% of the total variance, and the percentage of variance of individual factors are as follows: information-seeking 25.58%, self-seeking 12.84%, and advice-seeking 1.60%.

Table 1 shows the basic statistics and Pearson correlation coefficients of the main variables used in this study. Unlike the initial expectation, career exploration did not have a significant correlation with career worry (r=.088, n.s.) as well as mindfulness (r=.024, n.s.).

Table 1: The basic statistics and Pearson correlation of the main variable

	M(SD)	A	B	C	D
A. mindfulness	4.506(1.032)	*.920*			
B. career worry	3.831(1.231)	-.565***	*.915*		
C. procrastination	3.994(.801)	-.461***	.230***	*.843*	
D. career exploration	3.651(.972)	.024	.088	-.214***	*.869*

Note: Italics are Cronbach's α coefficients. *** p< .001

The relationships among variables: The purpose of this study is to investigate whether career worry and procrastination function as mediating variables in the relationship between mindfulness and career exploration. For this, mediated moderation analysis was performed using Model 4 of the SPSS Process macro developed by Hayes [16].

Table 2 shows the results of mediated regression analysis for career exploration. First, regression model (R=.565, F(1, 442)=206.874, p < .001) with career worry as a dependent variable and regression coefficient (B=-.674, SE=.047, t=-14.383, p < .001, LLCI=-.766, ULCI=-.582) of mindfulness on career worry were significant. Second, regression model (R=.461, F(1, 442)=119.249, p < .001) with procrastination as a dependent variable and regression coefficient (B=-.358, SE=.033, t=-10.920, p < .001, LLCI=-.422, ULCI=-.293) of mindfulness on career worry were significant.

Third, regression model (R=.257, F(1, 440)=10.337, p < .001) with career exploration as a dependent variable was significant. The effect of the individual regression coefficient on the career search and the influence of the anxiety on career search was significant. When we examine the effect of individual regression coefficients, the influences of career worry (B=.108, SE=.044, t=2.458, p < .05, LLCI=.022, ULCI=.195) and procrastination (B=-.307, SE=.063, t=-4.864, p < .001, LLCI=-.431, ULCI=-.183) on career exploration were significant. However, the effect of mindfulness on career exploration (B = -. 014, SE = .058, t = -. 249, n.s., LLCI = -. 128, ULCI = .099) was not significant.

Table 2: Mediated regression analysis on career exploration

IVs	B	SE	t	LLCI	ULCI
DV = career worry					
Mindfulness	-.674	.047	-14.383***	-.766	-.582
DV = procrastination					
Mindfulness	-.358	.033	-10.920***	-.422	-.293
DV = career exploration					
Mindfulness	-.014	.058	-.249	-.128	.099
Career worry	.108	.044	2.458*	.022	.195
Procrastination	-.307	.063	-4.864***	-.431	-.183

Note: * p< .05; *** p < .001

The above results only provide information about each step from mindfulness through career worry to career exploration. This does not say whether the relationship between mindfulness and career exploration is direct or indirect. Therefore, we examined the direct effect and indirect effect of mindfulness on career exploration. First, the direct effects of mindfulness on career exploration were not significant (direct effect=-.014, SE=.058, t=-.249, n.s., LLCI=-.128, ULCI=.099). On the other hand, indirect effects (i.e, mindfulness → career worry or procrastination → career exploration) were significant, and the results are shown in Table 3. In summary, mindfulness influences career exploration indirectly through career worry and procrastination, but the direct effect of not mediating these two variables is not significant.

Table 3: Indirect effect of mindfulness on career exploration

Mediators	Indirect effect	Boot SE	LLCI	ULCI
Career worry	-.073	.032	-.136	-.010
Procrastination	.110	.027	.058	.166

Discussion

The purpose of this study was to investigate whether the effects of mindfulness on career exploration behaviors were mediated by career worry and procrastination. The results of the analysis show that mindfulness does not directly affect career exploration. In other words, the effect of mindfulness on career exploration was significant only in the indirect effect of career worry or procrastination. Intuitively, mindfulness is expected to have a direct impact on career exploration, but the results of this study did not confirm such an impression. The result of this study can be deduced that mindfulness represents a comprehensive psychological state, while career exploration represents a behavioral state in a limited domain of career.

This study will have theoretical implications in some aspects. First thing is that the effect of mindfulness on career exploration was verified. Second thing is that the effect of procrastination on career exploration was examined. Although some variables were identified that could influence career exploration, no research has yet revealed the effect of mindfulness or procrastination on career search. Third, it is that the effect of mindfulness on career exploration was only indirect effect mediated by two variables, career worry and procrastination. In other words, the state of mind that focuses on the present state shows the fact that it increases the level of career exploration behaviors by lowering the worry and making any action at the same time.

This theoretical implications will provide the following practical implications. First of all, it is possible to implement a program to raise the level of mindfulness to college students. In this study, mindfulness has been treated as a trait, but it can be also conceptualized as a state that can be changed to some extent through a program such as MBSR. Therefore, it will be necessary to prepare mindfulness training to improve college students' career exploration behaviors by lowering the levels of their career worry and procrastination. This study will serve as a basic study to understand why college students who take their first steps into society do not actively pursue career exploration behaviors.

Limitations of this study suggest some future studies. The first limitation of this study is that measure of an existing general worry was applied to the career domain. Though this scale can measure one side of the career anxiety, elaborate measurement will be difficult. Future research is needed to make a measure that enables sophisticated measurement of career worry. The second limitation is that only students at one university participated in the study. Therefore, it is difficult to completely rule out that the results of this study reflect the characteristics of the students attending the university. In the future, it will be necessary to engage university students from various universities in different regions.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Affecting Factors on Social Problem-Solving Ability of University Students

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ABSTRACT

Background/Objectives: This study is a descriptive research to identify the factors influencing university students' ability to solve social problems.

Method/Statistical analysis: From November 18 to December 16, 2017, 250 university students in Korea were surveyed and data was collected. Data was pulled from 213 questionnaires as 37 questionnaires were inappropriately responded. SPSS Win 22.0 Program was used for data analysis.

Findings: The social problem-solving ability of university students showed a positive correlation with social support ($r = .377$, $p < .001$) and self-efficacy ($r = .613$, $p < .001$), and negative correlation with fatigue ($r = -.311$, $p < .001$). As a result of stepwise multiple regression with general characteristics and major variables as independent variables the study identified the factors affecting the social problem-solving ability of university students. The most influential factors in the social problem-solving ability of university students were self-efficacy ($\beta = .498$, $p < .001$), fatigue ($\beta = -.210$, $p < .001$) and emotional support ($\beta = .325$, $p = .007$), indicating a total explanatory power of 42.8% ($F = 50.172$, $p < .001$).

Improvements/Applications: It is necessary to develop a program to improve the problem-solving ability of university students in the future, and further study additional variables and mediating factors affecting problem-solving ability.

Keywords: *Social problem-solving ability, self-efficacy, fatigue, emotional support, university, student*

Introduction

Social problem-solving skill is a self-directed cognitive-behavioral process that seeks to find effective solutions to everyday problems [1].

Not only does social problems refer to problems in certain areas of society, but it also uses the term social problems to emphasize the importance of social context that can be applied in all kinds of social situations as well as interpersonal and personal problems that occur in real life [2]. The higher the ability to solve social problems, the more likely it is to choose an efficient solution. Korean students usually live passive and dependent in a university-oriented environment until university admission, but after entering university, they are in a situation where they have to choose, decide, and be responsible for themselves, and experience great difficulties such as the appropriate academic and interpersonal methods and lifestyles in the newly required educational environment [3, 4]. In addition, recent deterioration in the job market caused by the difficulty of employment and rising youth unemployment led to various problems such as postponement of graduation or abandonment of jobs [5, 6]. University students are getting ready to leave their adolescence and go out to society, and their ability to solve problems will have a great impact on shaping a healthy and healthy society in the near future.

Many studies show that social problem-solving skills can effectively cope with various problems and

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stresses, thus eliminating psychological stress and behavioral maladjustment [7-9]. [10] said that having the ability to solve social problems naturally builds up the ability to solve tasks, including personal problems, interpersonal problems, or intergroup problems. On the other hand, the lack of coping skills necessary to solve the problem is related to psychological maladjustment and mental illness [11]. Therefore, rational problem solving is an important task that needs to be improved through university education to adapt to new changes and solve the problems faced by university students [12].

In the previous studies, most of the factors that affect the social problem-solving ability of university students were analyzed from one aspect such as personal internal factors, physical factors, social relations factors, and there are few studies that have identified the factors that affect problem solving in complex aspect such as internal personal, external, physical factors, social relations. In this study, we examined the self-efficacy [13] in personal internal factors, which is a value judgement that indicates a person's attitude toward him or herself and a subjective experience of being delivered to others and examined the fatigue symptoms in physical factors and social support in social relationship factors. We will try to find out which factors affect the problem-solving ability of university students.

Study Method

Study Design: This study is a descriptive survey study to identify the factors affecting the social problem-solving abilities of university students living in Korea.

Subjects and data collection: The participants of this study were university students of Korea, and the data was executed from 18 November to 16 December, 2017. G*Power 3.1.2. Program was used to get a sample size for this study. The required sample size was 138 with the significant level (α) 0.05, Power of test (1-β) 0.95, effect size (p) 0.3, and the number of predictors 5. In considering the dropout rate, 225 university students participated in the survey after informed consent. However, 23questionnaire had missing values and improper response, thus a total of 202 questionnaires were used for the data analysis of this study.

Measurements

Social problem-solving ability: The social problem-solving skills scale used in this study used the social problem-solving ability (SPSI-R) scale that was revised by the [14], translated by [15]. It consists of a total of 52 questions and a Likert 5 points scale. In this study, the tool reliability Cronbach's α was found to be .913.

Self-efficacy: The self-efficacy test used in this study used a self-efficacy scale developed by[16] that was translated and modified by [17].

It consists of a Likert scale with a total of 25 questions. In this study, the tool reliability Cronbach's α was found to be .926.

Social support: The social support measure used in this study, a Likert scale with a total of 25 questions, was developed by [18]. The subcomponents consist of seven questions about emotional support, six questions about information support, six questions about evaluation support, and six questions about tool support. In this study, the tool reliability Cronbach's α was found to be .962. In this study, the tool reliability Cronbach's α was found to be .962.

Fatigue: The fatigue measurement tools used in this study used a translation of the Subjective Symptom of Fatigue Test by [19], which was standardized by the Industrial Fatigue Research Committee of the Japan Society of Industrial Health. This tool consists of a Likert 5 points scale with 30 questions, 10 questions of physical symptoms, 10 questions of mental symptoms, and 10 questions of neurological symptoms.

Data Analysis

This study used SPSS/WIN 22.0 program for statistical analysis of the data, conducted descriptive statistics for the general characteristics, t-test and One-way ANOVA for difference analysis of variables according to the general characteristics, and analyzed the relation between variables with Pearson correlation coefficients. This study used stepwise multiple regressions for finding affecting factors on social problem-solving ability of university students.

Ethical Consideration: Prior to data collection, this study considered the ethical aspects by providing participants with the purpose and method of research, utilization of research results, survey data to be used only for the study purpose, anonymity and confidentiality of research participants, and a description of stopping during the creation of the questionnaire, and by receiving the consent from participants.

Results and Discussion

General characteristics (N = 202): As shown in table 1, the general characteristics of the subjects were female 150 (74.3%), male 52 (25.7%) and their mean age was 21.07 ± 1.72. There were 101 people (50.0%) who identified as religious, 101(50.0%) were non-religious, 76(37.6%) were the second born, 75(37.1%) were the first born, and 37(18.3%) were the third or more, and 14(6.9%) were the only ones. The final education level of the father was the most with 98 university graduates (48.5%), while the final education level of the mother was the most with 108(53.5%) high school graduates. The most common economic level was 'middle-class' with 106 students (52.5%). Father's job status was the most with 178(88.1%) 'Yes', and mother's job status also was the most with 139(68.8%). 88 respondents (43.6%) answered that they had education experience related to problem-solving. Among the types of education practice for problem-solving, 29 respondents named practical training (32.9%), 27 people named discussion (30.9 percent), 14 people named Simulation (15.9 percent), 13 named PBL (14.7 percent) and 5(5.6%) named counseling and reviewing opinions.

Table 1: General Characteristics (N = 202)

Characteristics	Categories	N (%), M ± SD
Gender	Male	52(25.7%)
	Female	150(74.3%)
Age(year)	Average	21.07 ± 1.72(18-26)
Religious status	Yes	101(50.0%)
	No	101(50.0%)
Rank among sibling	Only one	14(6.9%)
	First born	75(37.1%)
	Second born	76(37.6%)
	Third or more	37(18.3%)
The final education level of the father	Below middle school	9(4.5%)
	High school graduate	78(38.6%)
	College/ University graduate	98(48.5%)
	Graduate school and higher	17(8.4%)
The final education level of the mother	Below middle school	5(2.5%)
	High school graduate	108(53.5%)
	College/ University graduate	79(39.1%)
	Graduate school and higher	10(5.0%)
The economic level	High	3(1.5%)
	Upper middle	51(25.2%)
	Middle	106(52.5%)
	Lower middle	37(18.3%)
	Low	5(2.5%)
Father's Job status	Yes	178(88.1%)
	No	24(11.9%)
Mother's Job status	Yes	139(68.8%)
	No	63(31.2%)
Education experience status related to problem-solving	Yes	88(43.6%)
	No	114(56.4%)
The types of education related to problem solving	PBL	13(14.7%)
	Simulation	14(15.9%)
	Discussion	27(30.9%)
	Practical training	29(32.9%)
	Others	5(5.6%)

Descriptive Statistics for variables: As shown in table 2, the social problem-solving abilities of the study subjects averaged 182.46 ± 24.09 points out of the total score of 52–260 and were 3.51 ± 0.46 points in terms of 1–5 points. Self-efficacy averaged 81.37 ± 13.49 points in the 24-120 points range, and social support averaged 103.51 ± 13.73 points on the 25-125 points, and fatigue scored 51.13 ± 13.02 points on average from the total core range of 30-120 points.

Table 2: Descriptive Statistics for Variables (N = 202)

Variables		Total Score Range	M ± SD (Min-Max)	Grade Range	M ± SD (Min-Max)
Social Problem-Solving Ability	Positive problem solving-orientation	5-25	19.24 ± 2.89 (10-25)	1-5	3.85 ± 0.58 (2.00-5.00)
	Negative problem solving-orientation	10-50	32.23 ± 7.89 (11-49)	1-5	3.22 ± 0.79 (1.10-4.90)
	Rational problem-solving skill	20-100	72.31 ± 10.64 (39-98)	1-5	3.62 ± 0.53 (1.95-4.90)
	Impulsive-careless response	10-50	34.30 ± 6.11 (20-49)	1-5	3.43 ± 0.61 (2.00-4.90)
	Avoidance response patterns	7-35	24.19 ± 5.15 (8-35)	1-5	3.46 ± 0.74 (1.14-5.00)
	Total Score	52-260	182.46 ± 24.09 (113-236)	1-5	3.51 ± 0.46 (2.17-4.54)
Self-efficacy		24-120	81.37 ± 13.49 (47-119)	1-5	3.39 ± 0.56 (1.96-4.96)
Social Support	Emotional support	7-35	29.57 ± 4.24 (14-35)	1-5	4.22-0.61 (2.00-5.00)
	Evaluation support	6-30	24.96 ± 3.76 (11-30)	1-5	4.16 ± 0.63 (1.83-5.00)
	Information support	6-30	24.58 ± 3.56 (12-30)	1-5	4.10 ± 0.59 (2.00-5.00)
	Instrumental support	6-30	24.49 ± 3.62 (12-30)	1-5	4.08 ± 0.60 (2.00-5.00)
	Total Score	25-125	103.51 ± 13.73 (50-125)	1-5	4.14 ± 0.55 (2.00-5.00)
Fatigue	Physical fatigue	10-40	18.72 ± 5.18 (10-32)	1-4	1.87 ± 0.52 (1.00-3.20)
	Mental fatigue	9-36	15.95 ± 4.90 (9-39)	1-4	1.77 ± 0.54 (1.00-4.33)
	Neurotic symptoms	11-44	16.47 ± 4.59 (11-34)	1-4	1.50 ± 0.42 (1.00-3.09)
	Total Score	30-120	51.13 ± 13.02 (30-96)	1-4	1.70 ± 0.43 (1.00-3.20)

Social problem-solving ability related to education experience: As shown in table 3, analysis of differences between the social problem-solving ability and its subcomponents according to the general characteristics of this study showed that the differences in education status related to the problem resolution are different.

The social problem-solving ability of university students is higher (t=2.611, p=.010) for those who receive problem solving education. Among the sub-factors, there was a significant difference in negative problem orientation (t=2.233, p=027) and rational problem-solving skills (t=2.132, p=034). In other words, university students with problem-solving training had higher scores for negative problem-solving orientation. However, this could be interpreted as lower for reverse conversion. Reasonable problem-solving skills also showed higher scores for university students with training related to problem-solving.

Table 3: Social problem-solving ability related to education experience (N = 202)

Variables	Education	M ± SD	t(P)
Social problem-solving ability	Yes	187.45 ± 22.03	2.611(.010)*
	No	178.59 ± 24.99	
Positive problem-orientation	Yes	19.63 ± 2.64	1.684(.094)
	No	18.94 ± 3.04	
Negative problem-orientation	Yes	33.63 ± 7.24	2.233(.027)*
	No	31.15 ± 8.23	
Rational problem-solving skill	Yes	74.11 ± 10.08	2.132(.034)*
	No	70.90 ± 10.90	
Impulsive-careless responses patterns	Yes	34.88 ± 6.10	1.172(.242)
	No	33.86 ± 6.11	
Evasive response pattern	Yes	24.75 ± 4.90	1.353(.178)
	No	23.76 ± 5.32	

*p<.05

Correlation among main variables: As shown in table 4, the correlation between study variables, the social problem-solving ability of university students was positively correlated with self-efficacy (r = .613, p <.001) and social support (r = .377). Fatigue (r = -. 311, p <.001) was found to have a significant negative correlation.

Table 4: Correlation among Main Variables (N = 202)

	Social problem-solving ability	Self-efficacy	Social Support
Self-efficacy	.613**	1	
Social Support	.377**	.368**	1
Fatigue	-.311**	-.243**	-.161*

*p<.05, **p<.01

Factors influencing on social problem-solving: In order to identify the factors affecting the social problem-solving ability, which is a dependent variable of the study subjects, a stepwise multipurpose regression analysis was conducted with the self-efficacy, emotional support, evaluation support, information support, material support, physical fatigue, mental fatigue, neurotic fatigue, educational experience related to problem solving, age, and gender as independent variables.

As shown in table 5, problem solving education experience and gender were included in the regression equation after treating variable numbers. And the multiple regression analysis was carried out by satisfying the results of testing the normality and homoscedasticity of residuals. Multiple regression analysis showed that self-efficacy (β=.498) had the greatest effect on university students' ability to solve social problems. Mental fatigue(β=-.210) and emotional support(β=.155) were added to have an explanatory power of 42.8%(F=50.172, p<.001).

Table 5: Factors Influencing on Social Problem-Solving (N = 202)

Variable	B	S.E.	β	t	p	Adj. R2
Constant	100.024	12.695		7.879		
Self-efficacy	.894	.107	.498	8.384	<.001	.371
Mental Fatigue	-1.034	.278	-.210	-3.720	<.001	.409
Emotional support	.884	.325	.155	2.724	.007	.428
F(p) = 50.172(p<.001), Durbin-Watson = 1.814						

Discussion

In this study, A regression analysis shows that among many input independent variables, the most influential factor in solving a university student's social problems was his or her sense of self-efficacy. Next, mental fatigue negatively affected and emotional support positively affected problem-solving abilities. In other words, the higher the self-efficacy, less mental fatigue, and more emotional support, the higher the ability of solving social problems.

The analysis that higher the self-efficacy, the higher the problem-solving ability is supported by many papers. In a study to identify factors that influence the self-efficacy of university students on dealing with stress and solving social problems, [20] said that university students who have high self-efficacy tend to use various coping strategies for stress to define problems and focus on problem-oriented coping mechanisms that analyze problems objectively and help solve social problems. This is the same for high school students [21], middle school students [22], and troubled teenagers [23].

Although the study by [20] stated that there were gender differences in the emotional domain, which is a lower area of social problem resolution, in this study, there were no differences in social problem resolution ability related to gender, sibling order, religion, economic level, and education level of parents, etc. There were only significant differences in the general characteristics of subjects correlated to education related problem resolution. This suggests that social problem-solving skills can be improved by increasing the self-efficacy of problem-solving by education rather than by conditions and circumstances. According to the participants, the types of education that helped solve social problems were action learning 32.9%, discussion 30.9%, simulation 15.9%, and problem-based learning 14.7%. Through education related problem resolution, university students can improve their self-efficacy by practicing and discussing practical issues related to problem resolution, and thus improve their social problem-solving ability. Therefore, considering the importance of social problem-solving ability of university students, it is necessary to apply various teaching methods focusing on practice and discussion to improve social problem-solving ability.

The second most influential factor in university students' ability to solve social problems was mental fatigue among other sub - factors of fatigue. Youth unemployment has become one of the serious social problems of Korean society [8] as, university students to work harder than before to get a satisfactory job and have high stress in preparation for employment. In addition, various mental fatigue is accumulated due to financial problems such as university adaptation, interpersonal relationship, tuition and living expenses. [24] also found that mental health such as somatic symptoms, anxiety, insomnia, and severe depression were significantly associated with social problem-solving based on the fact that physical activity affects problem-solving abilities [25], and those who learn problem-solving skill are more effectively able to cope with stress [9], in addition to the improvement of physical activity, improvement of problem solving ability by improving coping ability of mental fatigue through the education related to problem-solving can be a practical solution. In addition, among the sub-factors of social support, emotional support rather than evaluation, information, and material support appears to be a factor influencing university students' social problem solving. When university students have problems, it was found that they needed to support in solving problems on their own rather than giving advice on assessments or results.

Conclusion

This study is a descriptive survey to identify the factors affecting the social problem-solving abilities of university students living in Korea.

The study is meaningful in that it provided basic data on how university students can improve their social problem-solving skills by identifying factors affecting their ability to solve social problems in Korean society. However, since this study is a result of convenience extraction of some university students in Korea, it is necessary to be cautious in applying the extension, and it is recommended to repeat research that can confirm and extend the results of this study.

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Ethical Clearance: Not required

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Conflict of Interest: Nil

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Smartphone Addiction, Self-Control, and Learning Flow of Nursing Students

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ABSTRACT

Background/Objectives: This study is a descriptive correlation study that investigated the relationship of smartphone addition, self-control, and learning flow among nursing students.

Method/Statistical Analysis: The data was collected for 5 days from December 4 until December 8, 2017. In this study, 181 first-year students attending a nursing college in W city were convenience-sampled.

Findings: In this study, the smartphone addiction score of the nursing students was 2.27 out of 4,self-control 3.84 out of 5, and learning flow2.91 out of 5. Analysis of the correlation among smartphone addiction, self-control, and learning flow showed that smartphone addiction and learning flow had negative correlation (r=-.357, p<.001); self-control and learning flow positive correlation (r=.408, p<.001); and self-control and smartphone addiction negative correlation (r=-.511, p<.001).

Improvements/Applications: Therefore, development and application of manuals to prevent smartphone addition are required and various practical programs which can be evaluated and improve learning flow must be applied.

Keywords: *Smartphone, Addiction, Self-Control, Learning Flow, Nursing*

Introduction

Now, we live in the society that we feel various and positive changes with smartphones. But, as the use of smartphones increased rapidly and became common, its negative consequences cannot be ignored, either. Smartphones have been common as we first find them as soon as wake up in the morning and look at them before we go to sleep. We have led a convenient life based on the smartphones which provide all kinds of information utilizing applications for us as their right function and share them in real time, but side effects including decreases in our ability to function in daily life due to the risk of addiction such as tolerance, withdrawal symptoms, loss of control functionare also serious[1,2].

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The study on university students' smartphone use motivation by Yang and Lee[3]has found that smartphones are used in various ways as factors of information acquisition, communication, service integrity, fashion and ostentation, permanent information activities, habituation, and usage convenience were extracted. On the other hand, Diana et al[4]argued that people who tend to identify themselves with cellular phones and think of them as their means of entertainment and pleasure have an effect on cellular phone addiction. It has found that the overuse of smartphones have a bad effect on university life, interpersonal relations, mental health, functions of fingers, and nerve learning flow as university students' use of time is free[5,6].

For nursing students, self-control can be an important ability when doing activities such as correct judgements, time utilization, exact information acquisition in dealing with patients' health problems in nursing fields. Self-control has an effect on smartphone addiction[7]and there are mediating effects among them[8]. The study of Cho[9] has found that there is a negative correlation between

smartphone addiction and self-control. And Park et al[10]argued that the amount of time to use smartphones per day and self-control are the factors which explain smartphone addiction. However, it is impossible that smartphones are not allowed to be used in modern times because they are the very important communication means. Therefore, smartphones must wisely be used by adjusting the amount of time to use them.

Universities of the health and medical treatment field have run performance-oriented curriculums to cultivate talented persons with ability and expertise required for medical institutions and led students to learning flow by developing various teaching methods. It's because learning flow is the important factor which boosts learning performance[11]. University students' behavior which interrupts learning flow these days can be the overuse of smartphones. The students who are overdependent on their smartphones including using them or replying to text messages immediately even during class and always keeping them in their hands are often founded. And it is difficult for them to make face-to-face conversation with their families or friends even though they are with them. The study of Han[6]has found that there is a inverse correlation between smart addiction and learning flow and a positive correlation between learning flow and academic achievement. Obsession and overuse of smartphones cause maladjustment even in terms of physical, psychological, social, and interpersonal relationships[12,13]. In the precedent studies, studies on smartphone addiction and learning flow were conducted in regard to cognitive domains and there are few studies on nursing students' relationships between smartphone addiction and learning flow. Various studies which consider environmental, physical, and emotional factors need to be conducted.

Accordingly, this study tries to examine correlations among smart addiction, self-control, and learning flow targeting nursing students and provide base line data for program development which can prevent smart addiction and improve learning flow by strengthening self-control.

Materials and Method

Research Design: This study is a descriptive correlation study that investigated the relationship of smartphone addition, self-control, and learning flow among nursing students.

Subjects: In this study, 181 first-year students attending a nursing college in W city were convenience-sampled. This study distributed questionnaires to 191 persons, and then total 181 questionnaires were used for analysis after excluding 10 questionnaires with insufficient responses.

Research Tools

Smartphone Addiction: In this study, to measure the level of smartphone addiction, the standardized adult smartphone addiction scale developed by National Information Society Agency[14] was used. This tool is the Likert 4-point scale, composed of total 15 questions. Cronbach's α value of this tool was 0.87.

Self-control: Self-control was measured by using the scale developed by Park[15]. This tool is the Likert 5-point scale, composed of total 28 questions. Cronbach's α value of this tool was 0.90.

Learning Flow: In this study, to measure learning flowof university students, the 'Learning Flow Scale for Adults' developed and validated by Kim et al[16] was used. This tool is the Likert 5-point scale, composed of total 29 questions. Cronbach's α value of this tool was 0.94.

Data Collection: The data was collected for 5 days from December 4 until December 8, 2017.

Results

Characteristics of the subjects: Subjects' smartphone addiction levels have found that most of nursing students are 'a general user group' as 81.8%, 'a potential risk group' is 10.5%, and 'a high risk group' is 7.7%. The amount of time to use smartphones has found that more than 3 years is 91.7% and the amount of time to use smartphones per day has found that 'more than 3 hours' is 51.9%[Table 1].

Smartphone addiction, self-control, and learning flow of nursing students: In this study, the smartphone addiction score of the nursing students was 2.27 out of 4,self-control 3.84 out of 5, and learning flow2.91 out of 5 [Table 2].

Nursing students' smartphone addiction, self-control, and learning flow according to the general characteristics: The variables which show significant differences in smartphone addiction according to nursing students' general characteristics have found to be academic grade ($F=7.63$, $p<.01$), smartphone addiction levels ($F=73.49$, $p<.001$), and the amount of time to use smartphones per day ($F=6.22$, $p<.001$). The variables

which show significant differences in self-control have found to be college life satisfaction (F=7.29, p<.01), academic grade (F=6.88, p<.01), and smartphone addiction levels (F=16.11, p<.001). The variables which show significant differences in learning flow have found to be college life satisfaction (F=7.57, p<.01), academic grade (F=37.22, p<.001), and smartphone addiction levels (F=6.02, p<.01) [Table 3].

Table 1: Characteristics of the Subjects (N = 181)

Variables	Categories	N (%)
College life satisfaction	Satisfied	67 (37.0)
	Moderate	107 (59.1)
	Dissatisfied	7 (3.9)
Academic grade	High	36 (19.9)
	Middle	121 (66.9)
	Low	24 (13.3)
Levelof smartphone addiction	General user group	148 (81.8)
	Potential riskgroup	19 (10.5)
	High riskgroup	14 (7.7)
Amount of time to use smartphone (years)	<1	5 (2.8)
	1-2	4 (2.2)
	2-3	6 (3.3)
	≥3	166 (91.7)
Amount of time to use smartphone per day	<1	2 (1.1)
	1-2	26 (14.4)
	2-3	59 (32.6)
	≥3	94 (51.9)

Table 2: Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students (N = 181)

Variables (range)	M ± SD
Smartphone Addiction(1-4)	2.27 ± 0.45
Self-Control(1-5)	3.84 ± 0.49
Learning Flow (1-5)	2.91 ± 0.52

Relationship of smartphone addiction, self-control, and learning flow: Analysis of the correlation among smartphone addiction, self-control, and learning flowshowed that smartphone addiction and learning flowhad negative correlation (r=-.357, p<.001); self-control and learning flowpositive correlation (r=.408, p<.001); and self-control and smartphone addiction negative correlation (r=-.511, p<.001) [Table 4].

Table 4: The Relationship between the Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students (N = 181)

	Learning flow r(p)	Smartphone addiction r(p)
Smartphone addiction	-.357 (<.000)	
Self-control	.408 (<.000)	-.511 (<.000)

Table 3: Smartphone Addiction, Self-Control, and Learning Flow in Nursing Students according to General Characteristics (N = 181)

Variables	Categories	Smartphone Addiction				Self-control				Learning flow			
		M ± SD	t/F	P	Scheffe'	M ± SD	t/F	P	Scheffe'	M ± SD	t/F	P	Scheffe'
Collegelife satisfaction	Satisfied[a]	2.18 ± 0.47	2.24	.110		4.01 ± 0.46	7.29	.001	b<a	3.10 ± 0.53	7.57	.001	b<a
	Moderate[b]	2.33 ± 0.42				3.74 ± 0.47				2.79 ± 0.49			
	Dissatisfied[c]	2.34 ± 0.61				3.67 ± 0.57				2.95 ± 0.49			
Academic grade	High[a]	2.09 ± 0.47	7.63	.001	a,b<c	4.07 ± 0.49	6.88	.001	b,c<a	3.44 ± 0.46	37.22	.000	b,c<a, c<b
	Middle[b]	2.27 ± 0.42				3.81 ± 0.43				2.84 ± 0.45			
	Low[c]	2.54 ± 0.43				3.63 ± 0.61				2.52 ± 0.39			
Level of smartphone addiction	General user group[a]	2.14 ± 0.36	73.49	.000	a,b<c, a<b	3.92 ± 0.45	16.11	.000	c<a,b	2.97 ± 0.51	6.02	.003	c<a
	Potential Riskgroup[b]	2.74 ± 0.08				3.65 ± 0.37				2.74 ± 0.51			
	High risk group[c]	3.09 ± 0.19				3.25 ± 0.53				2.53 ± 0.53			
Amount of time to use smartphone (years)	<1	2.23 ± 0.46	0.39	.757		3.74 ± 0.59	0.12	.948		2.74 ± 0.45	0.24	.865	
	1-2	2.08 ± 0.43				3.90 ± 0.69				2.95 ± 0.17			
	2-3	2.17 ± 0.36				3.79 ± 0.56				3.00 ± 0.50			
	≥3	2.28 ± 0.45				3.84 ± 0.48				2.92 ± 0.53			

Conted…

Amount of time to use smartphone per day	<1[a]	2.60 ± 0.28	6.22	.000	b<d	3.71 ± 0.61	0.93	.428		2.22 ± 0.66	1.97	.121	
	1-2[b]	2.02 ± 0.46				3.80 ± 0.53				3.00 ± 0.42			
	2-3[c]	2.19 ± 0.42				3.93 ± 0.45				2.98 ± 0.52			
	≥3[d]	2.39 ± 0.42				3.80 ± 0.49				2.87 ± 0.54			

Discussion

The study was tried to examine correlations among smart addiction, self-control, and learning flow targeting nursing students and provide base line data for program development which can prevent smart addiction and improve learning flow by strengthening self-control.

The average of nursing students' smartphone addiction 2.27 points out of 4, which is higher than 1.96 points of Kim and Kim[17]investigated by the same scale targeting nursing students and is lower than 2.53 points of Park et al[18]. Therefore, various methods including exchanging opinions about maleficence of the overuse of smartphones, setting time and places to refrain them from using smartphones, doing activities or hobbies to be able to be with families except using smartphones, installing applications to help them use smartphones wholesomely are thought to be sought.

In the study, nursing students' self-control 3.84 points out of 5, which is higher than 3.42 of Kimand Son[19]even though the same tool was not used in it. The study of Son[20]which was intended for general university students reported that self-control has an effect on learning performance. Therefore, the intervention program which can improve university students' self-control is required to be applied.

Nursing students' learning flow in the study has found to be 2.91 points out of 5, which is lower than 3.46 of Kim[21]that measured learning flow by using the same tool targeting general students. These results are thought that learning flow was measured to be low as the subjects of the study are the freshmen who did not complete their majors and it is judged that the importance of liberal arts is low by itself. The curriculums of the freshmen of the departments of nursing science mostly consist of liberal arts. And when they become sophomores, they are supposed to learn their majors in earnest. But, it is thought that more detailed and flexible curriculums need to be run by utilizing video lectures with smartphones and organizing basic subjects in majors from freshmen to lead nursing students to enthusiasm for and immersion in their studies.

Nursing students' smartphone addiction and learning flow showed a negative correlation and their self-control and learning flow did a positive correlation, and their self-control and smartphone addiction did a negative correlation. These results coincided with the research results of Han[6]and Kim[22]targeting nursing students. As for these results, it is thought that the higher self-control of students who use smartphones is, the better they can control temptation of smartphone addiction and remove and overcome the factors which interrupt learning. And the research results of Kim[23]targeting nursing students argued that the factors which have an effect on learning flow are self-leadership and academic self-efficacy and there is a positive interrelationship among the three factors. Therefore, it is thought that educational programs which can prevent nursing students from getting addicted to smartphones and improve their ability to control themselves are required. For this, programs which improve self-leadership to be leaders of themselves, control, and behave to improve learning flow ability, educational intervention programs which can increase academic self-efficacy need to be developed and educational environment which can support them are much needed. And the bedrock of social support including self-help groups as well as universities needs to be prepared. Therefore, development and application of manuals to prevent smartphone addition are required and various practical programs which can be evaluated and improve learning flow must be applied.

Conclusion

The research results of the study have found that smartphone addiction and learning flow show the negative correlation, self-control and learning flow do the positive correlation, and self-control and smartphone addiction do the negative correlation. Therefore, guidelines for preventing smartphone addiction and programs which can improve smartphone addiction and self-control need to be developed and various plans which can enhance learning flow must be applied. However, the study has the limit in generalizing the research results because it was intended

for nursing students in a region. In the follow-up studies, the studies which develop practical guidelines for using smartphones and preventing smartphone addiction and verify the applied effects are required.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Relationship between College Students' Perceptions of Colleague Education, Major Satisfaction and Employability

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ABSTRACT

Background/Objectives: This study aimed to investigate the relationship between college students' perceptions of colleague education, major satisfaction and employability.

Method/Statistical analysis: The survey was conducted from December1 to 20, 2017 in the subjects of the students who were informed of the study goals and contents, and agreed. First for the sociodemographic characteristics, they were set including sex, religion, entrance type, type of admission, a native high school, living environment, family economic status, study level perceived by him or her. And we surveyed the data ofperceptions of colleague education, major satisfaction and employability.

Findings: Upon the study results among 121freshman, they showed mean values of perceptions of colleague education, major satisfaction and employability with 50.73 ± 5.82 points, 35.87 ± 5.34 points and 85.10 ± 12.38 points, respectively. When looking at correlations to look at relationships between perceptions of colleague education, major satisfaction, and satisfaction employability, there is a significant amount of correlation between the three variables.

Improvements/Applications: It is intended to help develop interventions that can look at the current state of students and increase their degree satisfaction and employment potential.

Keywords: *Adolescents, Competence, Narcissism, Resilience, Youth activity.*

Introduction

Today's college education faced a variety of social needs in a rapidly changing society, and the overall problems of university education have been highlighted and it can be predicted that there are very significant structural problems behind it. The structural problem here relates to the situation in which a choice between the pursuit of knowledge and learning and the pursuit of market value is required. In such a situation, conflicts between the role of university education and social demands are inherent. In other words, university education is part of a social network, preparing for a new leap forward, as well as requiring the qualitative improvement of college education, which is specialized through university education[1]. Therefore, universities are in a situation where students and customers, or businesses or global markets are required to produce and sell knowledge in a knowledge-based society by the principle of supply and demand[2]. However, today's college education has been heard everywhere as well as the voice that it fails to foster professionals despite many self-reliance efforts and concerns about the decline in the quality of college education3. Those who believe that university education should accept social needs point out that universities today do not properly teach the practical knowledge that society requires, and that many college graduates are not getting a job[4]. While Korea, which has a high rate of higher education benefits, was expected to play a key role in fostering high-quality human resources, critics say that universities do not reflect recent social changes and do not perform sufficient human resources training functions[5]. The Korea Institute for Proficiency and Development conducted a study that found 68 percent of college graduates with four-year college education, reflecting that university education does not meet the needs of society well[6].

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If so, it is necessary to find out what college education students think and what purpose they want to receive. The expectations of college education and the quality of university life will vary depending on changes and needs of society. This capacity-based education recognizes all learning experiences in schools as preparation for the professional world and is based on two assumptions. One is that the whole purpose of education is ultimately to prepare students to participate actively in the job market and society, and the other is that the core of learning in school is training for the talent that businesses want[7]. Depending on the value, purpose, and motivation a college student has in mind, their college life will also look different, depending on the purpose or importance of their college life.

Meanwhile, the satisfaction level of a college student's major is very important because the more satisfied he or she is with his or her major, the better he or she can adapt to school life and have a positive effect on his career after graduation. College engineering satisfaction is the product of a judgment process that assesses one's current major against the standards set by an individual for career path or job[8]. In particular, it is reported that the college degree satisfaction level is lower in selecting majors based on the recommendation of others without sufficient information[9] because universities must play an important role in fostering professionals as well as well as well as well as well as well as well as a nation or society. Such a degree will have a positive impact on individual employment potential[10], which means individual belief or belief in the possibility of finding a new job or job, and generally highly available members are recognized as competent individuals. In other words, the more likely a member is to be hired, the more knowledge, skills and abilities the labor market requires [11]. In addition, the possibility of employment is high when external factors of labor market demand and economic situation policy support are well combined [12].

The final purpose of the current college education is to find a successful job. Considering that employment is not a short-term gratification but a lifelong workplace, satisfaction with a job is paramount, and that satisfaction with a major is very important. Therefore, a university's education officer should be the basis for students' choice when choosing a university and students should use it to see if it conforms to their education officer. Universities are required to make diverse efforts to achieve expectations for and high satisfaction with their majors, which could lead to employability and efficient operation of national resources. Therefore, this research is intended to help the development of interventions that can improve positive results by identifying the degree to which the relationship between the university education center, the degree satisfaction level, and the potential for employment is related.

Materials and Method

Research Subjects: A survey was conducted to investigate the relationship among college students' perceptions of colleague education, major satisfaction and employability in the freshman in the subjects with the students who go to a university in Choong chung Provinces in this study.

Research Period: The survey was conducted from December 1 to 20, 2017in the subjects of the students who were informed of the study goals and contents, and agreed.

Measurement Tools: First for the sociodemographic characteristics, they were set including sex, religion, entrance type, type of admission, a native high school, living environment, familyeconomic status, study level perceived by him or her. The tools investigated on perceptions of colleague education, major satisfaction and employability were as follows.

The "student's perception of College Education" is the value of education that university students want to gain through college education. The value of education is defined as 'the sum of the intrinsic value of being immersed and rewarding in play, and the functional value of value that it contributes to the development of the rest of the world'. Therefore, a university education center can mean an individual's thoughts, intentions, or purpose about a university education by a college education consumer, or an educational institution, which is a subjective meaning of education. In this study, it was defined as the meaning of value or purpose for a university education that college students think is subjective. The tools used in this study used a university education center tool, four questions of culture and civic awareness, three questions of interpersonal skills, and three questions of professional development[13]. It

consisted of a total of 16 questions with a four-point scale with a reliability of Cronbach'α= 0.885

Major satisfaction is a concept that is formed by individual characteristics and interactions with the environment and encompasses cognitive and defined aspects such as thoughts and attitudes that are achieved through this process. In this study, we combined the concept of a degree satisfaction with concept of career path and defined the definition of a psychological process for assessing one's department. The measure of the degree satisfaction used in this study is based Kang[14]. The questions used in this study are whether a major fits well with aptitude, whether you like your major, whether you think your major matches your career, whether your major matches your values, and whether your major is organized as a major is interesting. The question-and-answer format is a six-point scale from "not at all" to "very well" (6 points), and the higher the score, the more the major matches one's mental aptitude or career path. The overall reliability factor of the last major satisfaction scale constructed in this study is Cronbach'α = 0.901.

Employability refers to the capacity required by individuals to obtain employment while flexibly responding to changes in the working environment and to enable professional success, and is a concept that addresses cognitive dimensions of employment readiness. In this study, we intend to apply the concept of 'awareness of the possibility of obtaining new employment stability independently in the labor market' and the sub-factories include job response, job description, job description, four elements. Job response means job-related interpersonal skills, job processing ability, knowledge sharing, etc. The job description refers to the ability to adapt to changes in job environment. The measure of employability used in this study was used by Kang[14].The overall reliability factor of the employment feasibility scale that was finally configured in this study is Cronbach'α = 0.946

Results and Discussion

Sociodemographic characteristics of subjects: The sociodemographic characteristics of subjects are shown in Table 1. According to the survey, 14 percent of male and 86 percent of female students answered that there were more female students, 52.1 percent said religion was Christian, and only 42.1 percent answered that they had no religion.

Table 1: Sociodemographic characteristics of subjects

	Category	N	%
Gender	Male	17	14.0
	Female	104	86.0
Religion	Christians	63	52.1
	Buddhism	2	1.7
	Catholic	5	4.1
	No religion	51	42.1
Entrance type	New school	106	87.6
	Transfer	15	12.4
Type of admission	Non scheduled admission	68	56.2
	Regular admission	38	31.4
Native high school	General high school	96	79.3
	Special purpose high school	2	1.7
	Specialization high school	10	8.3
	Autonomous high school	5	4.1
	Qualification examination	8	6.6
Living environment	Living with one's parents	38	31.4
	Dormitory	47	38.8
	Live apart from one's own family	36	29.8
Family economic status perceived by him or her	High	5	4.1
	Medium	101	83.5
	Low	15	12.4
Study level perceived by him or her	Good	24	19.8
	Medium	70	57.9
	Poor	27	22.3

Mean value onperceptions of colleague education, major satisfaction and employability: The average score of the candidate's perceptions of colleague education, major satisfaction and employability is shown in Table 2. The perceptions of colleague educationwas 50.73 ± 5.82 points, culture and citizenship was 11.48 ± 1.94 points, interpersonal skills was 9.33 ± 1.58 points, self-reliance was 9.64 ± 1.48points, professional development was 10.45 ± 1.34 pointsand social recognition was 9.80 ± 1.59 points. The major satisfaction level was 35.87 ± 5.34 points, and employability was 85.10 ± 12.38 points. The job responsewhich was sub-region of employability was 40.18 ± 6.02 points, job skills was 19.90 ± 3.62 points, job information 12.64 ± 2.01 points, and mental health was 12.38 ± 2.63 points.

Table 2: Mean value on perceptions of colleague education, major satisfaction and employability

	M	SD	Minimum	Maximum
Perceptions of colleague education	50.73	5.82	39	72
Culture and citizenship	11.48	1.94	6	17
Interpersonal skills	9.33	1.58	6	14
Self-reliance	9.64	1.48	7	15
Professional development	10.45	1.34	7	15
Social recognition	9.80	1.59	6	12
Major satisfaction	35.87	5.34	21	45
Employability	85.10	12.38	53	120
Job response	40.18	6.02	27	54
Job skills	19.90	3.62	9	30
Job information	12.64	2.01	9	18
Mental health	12.38	2.63	6	18

Differences in perceptions of colleague educationaccording to sociodemographic characteristics: The results of differences in perceptions of colleague education according to sociodemographic characteristics are shown in Table 3. The perceptions of colleague educationare found to have no difference depending on gender, religion, entrance type, admission type, high school background, living environment, home economics, and study level.

Table 3: Differences in perceptions of colleague according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	50.52	5.86	-.157	.876
	Female	50.76	5.84		
Religion	Christians	51.41	6.57	.595	.620
	Buddhism	50.50	.70		
	Catholic	50.20	1.78		
	No religion	49.96	5.11		
Entrance type	New school	50.66	5.68	-.376	.707
	Transfer	51.26	6.89		
Type of admission	Non scheduled admission	51.22	6.03	1.362	.176
	Regular admission	49.65	4.91		
Native high school	General high school	50.55	5.37	1.239	.298
	Special purpose high school	54.00	12.72		
	Specialization high school	53.40	7.01		
	Autonomous high school	47.00	2.34		
	Qualification examination	51.12	8.65		
Living environment	Living with one's parents	50.57	5.78	.182	.834
	Dormitory	51.12	6.22		
	Live apart from one's own family	50.38	5.42		
Family economic status perceived by him or her	High	49.60	3.20	.101	.904
	Medium	50.80	5.92		
	Low	50.66	6.00		
Study level perceived by him or her	Good	51.58	6.76	.331	.719
	Medium	50.45	5.35		
	Poor	50.70	6.23		

Differences in major satisfactionaccording to sociodemographic characteristics: Table 4 shows the results of comparing major satisfaction levels according to demographic characteristics. There were no differences in gender, admission type, school of origin, living environment, home economics of one's own and study level, and there were differences in degree satisfaction level depending on religion and entrance type. In religion, Christian students were more satisfied with their majors than their unschooled counterparts, and in their admission patterns, they were more satisfied with their majors than their new students.

Table 4: Differences in major satisfaction according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	36.52	5.20	.542	.589
	Female	35.76	5.38		
Religion	Christians	37.25	4.85	3.160	.027 (a>d)
	Buddhism	34.50	2.12		
	Catholic	33.20	7.39		
	No religion	34.49	5.45		
Entrance type	New school	35.50	5.29	-2.085	0.39
	Transfer	38.53	5.12		
Type of admission	Non scheduled admission	36.25	5.19	1.978	.051
	Regular admission	34.15	5.27		
Native high school	General high school	36.05	5.04	.512	.727
	Special purpose high school	33.50	16.26		
	Specialization high school	36.70	4.29		
	Autonomous high school	35.20	5.40		
	Qualification examination	33.75	7.59		
Living environment	Living with one's parents	36.68	4.47	1.019	.364
	Dormitory	35.95	5.20		
	Live apart from one's own family	34.91	6.29		
Family economic status perceived by him or her	High	33.20	3.63	.733	.483
	Medium	36.06	5.48		
	Low	35.46	4.80		
Study level perceived by him or her	Good	37.54	5.41	1.491	.229
	Medium	35.38	5.38		
	Poor	35.66	5.08		

Differences in employ ability according to sociodemographic characteristics: The results of comparing employment possibilities according to demographic characteristics are shown in Table 5. According to the survey, gender, religion, admission type, high school of origin, living environment, family economic strength of one's own, and study level, the possibility of employment of new students is higher.

Table 5: Differences in employ ability according to sociodemographic characteristics

	Category	M	SD	t/F	p
Gender	Male	88.11	11.61	1.082	.282
	Female	84.61	12.49		
Religion	Christians	87.58	12.70	2.616	.054
	Buddhism	81.50	3.53		
	Catholic	90.40	5.85		
	No religion	81.66	11.90		

Conted…'

Entrance type	New school	84.22	11.89	-2.110	.037
	Transfer	91.33	14.35		
Type of admission	Non scheduled admission	84.30	12.43	.095	.925
	Regular admission	84.07	11.01		
Native high school	General high school	85.36	11.48	.301	.877
	Special purpose high school	89.00	38.18		
	Specialization high school	85.30	13.84		
	Autonomous high school	85.20	9.57		
	Qualification examination	80.75	17.46		
Living environment	Living with one's parents	85.36	12.17	.399	.672
	Dormitory	83.93	11.37		
	Live apart from one's own family	86.36	13.99		
Familyeconomic status perceived by him or her	High	82.20	17.29	.149	.862
	Medium	85.17	11.92		
	Low	85.60	14.48		
Study level perceived by him or her	Good	87.58	10.90	.596	.552
	Medium	84.44	11.77		
	Poor	84.62	15.10		

Relation between perceptions of colleague education, major satisfaction and employability: Table 6 shows the correlation between perceptions of colleague education, degree satisfaction, and employability. It was found that there was a significant positive correlation between major satisfaction and employability,perceptions of colleague education and employability, and the major satisfaction and perceptions of colleague education.

Table 6: Relation between perceptions of colleague education, major satisfaction and employability

	Perceptions of colleague education	**Major satisfaction**	**Employability**
Perceptions of colleague education	1		
Major satisfaction	.394**	1	
Employability	.478**	.540**	1

*p<0.05, **p<0.01

Conclusion

There was a difference in the degree of satisfaction with a major depending on the type of admission, but the degree of satisfaction was higher than that of new students. This is due to the fact that the student who was studying other subjects came back to the subject he wanted. In religious differences, Christianity was higher than an unsociable student because the academic characteristics of nursing make it clear that the basic qualities and personalities of nurses should be based on their attitude of serving and love for humans.

The possibility of employment was shown to vary depending on the type of admission, and the student who transferred was higher than the new student. The transfer students experienced their worries about the job ahead of their freshmen counterparts, including part-time jobs and job experience, and they prepared more with desire for employment, which makes them more adaptable and more flexible to think about themselves.

There is a significant correlation between the university education center, the satisfaction with a major and the possibility of employment. In the lower variables of the university's education centers, there was a correlation between the degree satisfaction level and the social recognition level, in order to develop aptitude and qualities and to develop professional skills, subjectivity, interpersonal skills, and civic awareness. The purpose of studying is to find out that many students study their majors with professional skills in mind related to the job

of hope and that the purpose of university selection is to find a job. Also, putting interpersonal skills, culture and citizenship for educational purposes should not be forgotten as a core value of college education to ensure that it is well-rounded and mature adult who performs well and does their part as a reserve society. Among the possibilities of employment, the company displayed correlation with the degree satisfaction level in the order of job response, job information, mental health, and job skills. In other words, job-related response strategies and a lot of information provision or customized guidance from students for employment in a major department could have a significant impact on their satisfaction. Employment possibilities showed correlation among university education centers by grade of professional development, interpersonal skills, self-reliant skills, culture and citizenship, which students want to develop in order to develop knowledge and skills. In addition, it should be included in the curriculum as it can be seen that a major education on interpersonal skills, which is required for social adaptation, is necessary. College education centers have shown a correlation among job feasibility by job responsiveness, mental health, job information, and job skills. Therefore, universities should play a pivotal role in establishing new institutions for the fourth industrial revolution in preparation for what education a consumer wants, and therefore which education he or she wants, at the time of transition to consumer-oriented education.

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Factors Affecting on Career Attitude Maturity in Korean Nursing Students

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ABSTRACT

Background/Objectives: The purpose of this study was to determine the factors related to career attitude maturity in Korean nursing students.

Method/Statistical Analysis: A purposive sample of 135 students from N university was recruited for the cross-sectional survey design. The structured questionnaires were used for major satisfaction, intrinsic/extrinsic work value, career attitude maturity and job barrier which was reported reliability in domestic studies. Data were analyzed using descriptive statistics, Pearson's correlation and stepwise multiple regression.

Findings: The mean scores of major satisfaction, intrinsic/extrinsic work value, career attitude maturity, and barrier were 3.86, 4.05/4.06, 3.43 and 2.08, respectively. Career attitude maturity was significantly positively related to intrinsic work value (r= .258, p<.05), major satisfaction (r=.177, p<.05) and also, negatively related to career barrier (r= .43, p<.001). Intrinsic work value(ß=0.284, p=.004), extrinsic work value(ß=-0.194, p=.043), and career barriers (ß=-0.535, p<.001) had significant effects on career attitude maturity (F=13.006, p<.001). Adjusted explained variance for the career attitude maturity was 36.4%.

Improvements/Applications: Based on the findings of this study, career development programs are recommended to improve career attitude maturity in nursing students.

Keywords: *Career attitude maturity, Intrinsic work value, Extrinsic work value, Major satisfaction, Job barriers*

Introduction

As for the turnover rate of domestic nurses, turnover rate of general nurses in 2015 is 94.7% of total nurses' turnover, which is the turnover rate of general nurses rather than managers [1]. In particular, the turnover of new nurses increased from 29% in 2013 to 33.5% in 2014, and annual rate of new nurses' resignation exceeded 50% of general nurses resignation, resulting in a very serious situation in terms of personnel management and patient care quality [1]. The point of view about the turnover and maladjustment problems of new nurses should be linked with the university curriculum.

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The college period is an important time for career decision, and it is an important time to decide career that meets his aptitude and interest through career development and to realize self-realization. However, Korean college students tend to enter college according to their school grades and career prospects after graduation, rather than choosing a department based on their aptitudes and interests, their values of life goals, and their values [2]. In the case of nursing students, unlike other majors, the direction of a career has already been determined at the same time as going to college. It is easy to choose a career without a deep concern and evaluation about the course of their choice with a relatively high employment rate. [3-4].

Students who choose nursing careers without careful consideration of career choice have an experience directly or indirectly to the role that nurses perform during clinical practice. This leads to a lot of stress on patients' nursing care, overload of work, and mood of the nursing organization, and they are worried again

about their aptitude[3, 5]. In the previous study, students with high satisfaction in clinical practice showed high degree of satisfaction and career identity. In other words, students who are less satisfied with clinical practice are less satisfied with their majors and become nurses without clear conviction about their job as a nurse. This will have a negative impact on future nursing experience [6]. And also, the stress on academic tasks and future careers of nursing students eventually lead to a loss of interest in the major and a deterioration of career decision-making efficacy [7].

Career attitudes are attitudes toward one's career in the process of preparing for work, and career attitude maturity is the degree of development of a planned, independent and firm attitude toward choosing and determining career paths.[8]. According to Super, career attitude maturity is the level of career development, which is the degree of attitude-cognitive preparation to cope with the process of identifying, preparing, working, and retiring from work [9].

In the prior studies, career attitude maturity was associated with career-related variables such as sex, age, social-economic level, education, job barriers, job stress, self concept [8,10-13]. Therefore, in order to have a successful career in a clinic or related field, students should be able to select their own career path after their search for various career paths [14].

One of the problems of Korean nursing staff is that the number of cases in which new nurses consider the clinical practice as a burden or do not adapt to the organizational culture increases their early retirement. Considering this, it is necessary to develop desirable work values through nursing education [15]. Also, it is necessary to improve the career attitude maturity of nursing students because they have low job satisfaction and high turnover intention when doing nursing work as a new nurse unless student has a clear career identity [16].

This study aims to identify nursing students' major satisfaction, work value, job barriers and the factors affecting career attitude maturity. In this study, to determine the factors affecting the career attitude maturity of nursing students, we checked the influence of intrinsic work value, extrinsic value, career barriers and career attitude maturity as the main variables, based on the study, this study would be able to provide a basis for preparing a program to develop attitude maturity of nursing students.

Materials and Method

Samples: The subjects of this study were students of the N university which is located in Chungnam province. The survey was conducted in September 2016, and the questionnaires available for data analysis were collected from 135 students in the nursing department.

Measurements

Career Attitude Maturity: In order to measure the degree of career maturity, we used CAMI (Career Attitude Maturity Inventory) by Lee & Han [17]. In total 47, negative items were reversed. The higher the score means the higher the maturity level of career attitude. Cronbach's alpha for career attitude maturity in Lee and Han [17] was .78, this paper was .84.

Work Value: The occupational values were measured by intrinsic values and external values. In Johnson 's study[18], 24 items of job value were presented. In this study, we used 16 items which were modified according to the characteristics of Koreans in Byun's study [19]. The intrinsic value is the value for personal development that can be gained from the job itself. It is fun and interesting, demonstrating ability and skill, demonstrating creativity, challenging and adventurous, guaranteeing autonomy, feeling of accomplishment, and recognizing opportunity for self-development. External value is the value that can be gained from outside the job, such as high income and respect, status and reputation, employment security, pleasant work environment, power, guaranteed leisure time, regular working hours, and free time use. All items were rated 5-point scales (1 = 'not important at all', 5 = 'very important need').

Career Barriers: Career barrier instrument was used 22 items which developed by An [20]. The instrument was composed of six sub-concepts such as lack of job information, external barrier, lack of self-clarity, lack of awareness of need, discrimination, indecisiveness. Career barriers has a 5-point scale (1 = not at all to 5 = very agree). The higher the score, the higher the career barrier. Cronbach's alpha for career barriers in An's study was .89, in the present study, it was .85.

Major Satisfaction: Major satisfaction was measured by 25 items used in the An's study [20]. A total of 25 questions were composed of 5 points Likert items (1 = not at all, 2 = slightly dissatisfied to 5= very satisfied). Cronbach's alpha for career barriers in An's study was .95, the present study was .85.

Data Analyses and Ethical Consideration: All data were statistically analyzed using SPSS 23.0 (PASW, Chicago, IL, USA). Frequencies and percentages were calculated for the students' general characteristics; means and standard deviations were estimated and t-tests and ANOVAs were used to determine variations in career attitude maturity by general characteristics. Pearson product-moment correlation coefficient assessed the correlation among variables. Finally, stepwise multiple regression analysis identified the factors affecting career decision efficacy.

To begin the study an informed consent was obtained from the students. The research instruments were completed by the participants and were eventually collected. All students completed the informed consent form and agreed to participate prior to administering the study. Participants also received information on this study including research aims, potential risks, and benefits of this study and the questionnaires collection procedures

Limitation: This study was constricted by convenience sampling, which limited generalization to a broad population.

Results

Participants Characteristics: The sample data consisted of 135 students. 21 males (16.3 %), and 113 females (83.7%). The mean age of the subjects was 20.7 years and theirs ages ranged from 18 to 32 years. Of the 135 students, 40 students (29.6%) were freshmen; 45 (33.3%) were sophomores, 21 (15.6%) were juniors and 28 (20.7%) were seniors. There were 40 students (29.6%) with a certificate related to the major and 92 students (68.1) without certification. 71 students (52.6%) did not participate in club activities, and 62 students (45.9%) did club activities. There was no statistical difference in career attitude maturity according to general characteristics.

Table 1: General Characteristics and Comparison of Career Attitude Maturity by General Characteristics (N = 135)

Variables	Categories	n	%	Mean	SD	t/F(p)
Age (yr)	Mean(SD)/Range	20.7(1.57) /18-32				
Gender	Male	21	16.3	3.45	.37	1.032(.304)
	Female	113	83.7	3.36	.35	
Grade	1st	40	29.6	3.42	.33	.853(.468)
	2nd	45	33.3	3.39	.41	
	3rd	21	15.6	3.55	.29	
	4th	28	20.7	3.48	.40	
Major related certificate	Don't have	92	68.1	3.42	.31	-.692(.491)
	Have	40	29.6	3.47	.47	
Club activity	Don't participate in	71	52.6	3.42	.32	.606(.546)
	participate	62	45.9	3.46	.41	

Descriptive Statistics and Correlations for Variables: Descriptive statistics for main variables are shown in Table 2. The mean scores of career attitude maturity, intrinsic/extrinsic work value, major satisfaction and career barriers were 3.43 ± 0.37 (ranging 1-5), 4.05 ± 0.51/4.06 ± 0.58 (ranging 1-5), 3.86 ± 0.60 (ranging 1-5), and 2.08 ± 0.69 point (ranging 1-5), respectively. Correlations for main variables is shown in Table 3. Career attitude maturity was significantly positively related to major satisfaction (r= .177, p<.05), intrinsic work value (r= .258, p<.05), and negatively related to career barriers (r=-.586, p<.001).

Table 2: Descriptive Statistics for Variables (N = 135)

Variables	Mean ± SD	Min	Max.	Range
Career attitude maturity	3.43 ± .37	2.55	4.23	1-5
Intrinsic work value	4.05 ± .51	2.56	5	1-5
extrinsic work value	4.06 ± .58	2.13	5	1-5
Major satisfaction	3.86 ± .60	1.53	5	1-5
Career barriers	2.08 ± .69	1	5	1-5

Factors Influencing the Career Attitude Maturity: Multiple regression analysis was conducted to examine the factors affecting career attitude maturity. Intrinsic work value (ß=0.284, p=.004), extrinsic work value (ß=-.194, p=.043), and career barriers (ß=-.535, p<.001) were found to be factors significantly associated with career attitude maturity. These variables explained 36.4% of career attitude maturity (see Table 4).

Table 3: Correlations among Variable

	Career attitude maturity	Major satisfaction	Intrinsic work value	Extrinsic work value
Career attitude maturity	1			
Major satisfaction	.177*	1		
Intrinsic work value	.258*	.365**	1	
Extrinsic work value	-.003	.295**	.615**	1
Career barriers	-.586**	-.173	-.132	.003

*p<.05, **p<.001

Table 4: Factors Affecting Career Attitude Maturity

Variables	B	SE	Beta (ß)	t	p
(constant)	3.590	.289		12.418	.000
Intrinsic work value	.213	.073	.284	2.921	.004
Extrinsic work value	-.124	.060	-.194	-2.045	.043
Career barriers	-.288	.041	-.535	-7.069	.000
F=17.893(p<.001), $R^{2=}$.386, Adj $R^{2=}$.364					

Discussion

The time of studying in college is the period when students develop basic competencies to establish their identity, choose their careers, and grow as capable professionals. This research was attempted to find out the factors that impact on career attitude maturity among nursing students.

When graduating from a nursing department in Korea, most of the students are employed in hospitals, and the curriculum of the university is operated as a clinical center. Currently, Korean nurses have high employment rates in general hospitals or university hospitals, but small hospitals are suffering from labor shortages because they can not find nurses. As a result, nursing students have been choosing jobs without worrying about their careers. This may lead to a positive perception for job after employment, but it may lead to a decrease in the career decision self-efficacy of nursing students [21].

In present research, the level of career attitude maturity was 3.43 point (range 1-5) indicating a moderate level and it was similar to those of Ahn and Kim's study [22] who studied nursing students. However, Kim and Kim [23] presented a career maturity score of 3.13 for a majoring in dance, which was lower than that for the present study. Also, in the prior study, male students had higher career maturity [22], but there was no significant difference in this study. This implies that nursing college students have a clear career path as a future nurse and therefore have a higher level of occupational maturity than students of the same age group.

Furthermore, in multiple regression, the results showed that predictors of career attitude maturity in nursing students were intrinsic work value (ß=0.284, p=.004), extrinsic work value (ß=-0.194, p=.043), and career barriers (ß=-0.535, p<.001) and explanatory power of the model was 36.4%. These results show the importance of intrinsic work value as a facilitating factor for career attitude maturity. In order to increase career maturity, it is necessary to eliminate factors related to career barriers. In this study, intrinsic work value was the strongest influential factor, but as the extrinsic work value increased, career maturity decreased. Major satisfaction was positively correlated with career attitude maturity, but it was not influential factor. Besides, it was found that extrinsic work value is an influential factor and that the increase of external value is inversely proportional to career attitude maturity. Therefore, nursing students' career attitude maturity shows that intrinsic work value is more important than extrinsic value and major satisfaction.

By the prior report, family conflicts had a indirect impact through self-esteem and depression on career attitude maturity [12], and in addition, self-esteem and depression had a direct impact on career attitude maturity [12] and more over, the higher the self-esteem, the more confidence in the choice of major, and the more critical thinking, the more career attitude maturity increased [24]. This is similar to our study because mental factors such as self-esteem, depression and confidence of major are in a context similar to intrinsic values. This implies that intrinsic value should be emphasized more for improvement of career attitude maturity. The intrinsic value is the value for individual development that caused from the work itself and extrinsic work value is derived from outside factors of work. Additionally, the current study suggests that nursing students' career attitude maturity could be increased through the strengthening of intrinsic work value and eliminating career barriers. In conclusion, low self-esteem, regret of choice of major, and family conflicts are considered to be obstacles to career development. Therefore, it is necessary to identify the barriers to career paths in career counseling, efforts should be made to resolve this issue. In other words, by making efforts to improve career decision efficacy and career attitude maturity, it will increase the satisfaction and adaptation of job as a clinical nurse after graduation from nursing college. In the follow - up research, it is necessary to study what kind of career barriers factors are.

Conclusion

This study was attempted to identify the factors that affect the career attitude maturity of nursing students. The present survey was carried out on September, 2016. The subjects of this study were the students in N university. The answer sheets from 145 respondents were gathered, and the answer sheets from 135 respondents were analyzed except for 10 incomplete ones. The main results of this study are as follows. The mean scores of career attitude maturity, intrinsic/extrinsic work value, major satisfaction and career barriers were 3.43 ± 0.37 (ranging 1-5), 4.05 ± 0.51/4.06 ± 0.58 (ranging 1-5), 3.86 ± 0.60 (ranging 1-5), and 2.08 ± 0.69 point (ranging 1-5), respectively. Career attitude maturity was significantly positively related to major satisfaction ($r= .177$, $p<.05$), intrinsic work value ($r= .258$, $p<.05$), and negatively related to career barriers ($r=-.586$, $p<.001$). Intrinsic work value (ß=0.284, p=.004), extrinsic work value (ß=-.194, p=.043), and career barriers (ß=-.535, $p<.001$) were found to be factors significantly associated with career attitude maturity. These variables explained 36.4% of career attitude maturity. The current study suggests that nursing students' career attitude maturity could be increased through the strengthening of intrinsic work value and eliminating career barriers. In the follow - up research, it is necessary to determine and to study career obstacle factors.

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A Study on the Dying Well Education Expert Training Course For Professional Instructors

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ABSTRACT

Background/Objectives: This study was conducted in order to determine the validity of developing a license system for qualified dying well education training experts by identifying the need of the dying well education and license system.

Method/Statistical Analysis: A survey was conducted from April 20 to May 20, 2018 for 54 professional lecturers who completed the education course for training dying well instructors, and the statistical program R was used for the analysis. All items in the questionnaire except the general characteristics of subjects were composed of 4-point Likert scale("Very unnecessary" was 1point, "unnecessary" was 2 points, "necessary" was 3 points, and "Very necessary" was 4 points.).

Findings: According to the result of measuring the need for dying well education expert license education contents, the average score for each subject was found to be as follows: Thanatology 3.40 points(± 0.63), care for terminally ill patients (hospice) 3.56 points(± 0.56), communication 3.38 points(± 0.59).

Improvements/Applications: In the future, it is necessary to provide systematic and integrated death education through the training of qualified education experts and the composition of subjects according to the necessities of the curriculum of the professional dying well education.

Keywords: *Dying well, Dying well Education, Expert Training Course, professional instructors, the training of experts*

Introduction

As interest in terminal cancer patients has increased in Korea in recent years, the use of hospice and palliative care has been emphasized and the need for health insurance coverage has led to debate about hospice palliative care services. As the dying well law (Act on Life-Sustaining Treatment Determination) was enacted as a result of the enforcement of Act on Life-Sustaining Treatment Determination with the purpose of allowing the patient himself/herself subject to terminal hospice to choose dignified death, the need for professional education for dying well has increased [1,2]. However, it can be said that there are only a few professional education courses, professional educators, and specialized facilities to conduct education at a national level for well-being and dying well for all citizens who can choose dignified death for patients and their families. In the current situation where the operator's expertise is not secured such as educational workforce as well as dying well educational institutions, it is difficult to meet the increasing social demand related to dying well [3,4], so there is a need for dying well education that can change the perception and attitude toward death through the understanding of death [5,6], and professional dying well education should be preceded in order to consider the quality of death and to improve the perception of death [7,8]. In addition, there is a high demand for the training of professional death education experts in order to secure the professionalism

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of dying well education, and there should be a license system to verify this. However, current death preparation education focuses on death lecture and how to overcome the bereavement by death education lecturers [9,10]. Therefore, it is urgent to educate those who are about to die by experts educated by the development of correct understanding and acceptance of death, psych therapeutic, more specialized and diverse programs. Thus, this study is to secure the validity of the development of the license system for the training of talented people with basic knowledge of dying well, humanistic, sociological and healthcare knowledge of death.

If dying well education is achieved through the training of experts with the qualification for dying well education by identifying the need for dying well education and license system, this study not only can change the perception and attitude of death but it is also an opportunity to prepare the death well and to determine the quality of life.

Method

Subject: The organization which has been conducting dying well related education courses for training dying well instructors for a month from April 20, 2018 sent e-mails, and a survey was conducted only for those who want to participate in the research for professional dying well lecturers aged 19 or older who have completed the dying well education course in dying well related organizations. A total of 54 people responded to the questionnaire, and they were selected as subjects.

Method: The study was approved by the Institutional Review Board (IRB No. KYU-2018-008-02) of Konyang University. The questionnaire consists of the following: The general characteristics were 3 items of sex, age, and education. For the need for each subject of dying well education expert license educational contents of the subjects, 9 items of thanatology, 19 items of care for terminal patients (hospice), 16 items of communication were composed of Likert 4-point scale("Very unnecessary" was 1point, "unnecessary" was 2 points, "necessary" was 3 points, and "Very necessary" was 4 points.).

Analysis Method: The statistical program R was used for the analysis. For the item of questionnaire, the frequency analysis of the general characteristics was carried out. Based on age, an independent sample t-test was performed for the need for each subject of dying well education expert license educational contents of the subjects (thanatology, care for terminal patients (hospice), communication).

Results

General Characteristics of Subjects: Table 1 shows the general characteristics of the subjects. The total number of subjects was 54, and men (55.6%) accounted for more than women (44.4%). In age, "50~59 years old" (55.6%)accounted for more than "60 or older" (44.4). In the level of education, grad school graduates were the most common (68.5%), followed by university graduates (24.1%), college graduates (5.6%) and high school graduates (1.9%).

Table 1: General Characteristics of Subjects

Category	N	(%)	Category	N	(%)
Sex			**Level of Education**		
Men	30	(55.6)	High school graduate	1	(1.9)
Women	24	(44.4)	College graduate	3	(5.6)
Age			University graduate	13	(24.1)
50~59 years old	30	(55.6)	Grad school graduate	37	(68.5)
60 or older	24	(44.4)			
Total	54	(100.0)	**Total**	54	(100.0)

The need for each subject of dying well education expert license educational contents of subjects (thanatology): Table 2 shows the results of measuring the need for each subject of dying well education expert license educational contents of the subjects (thanatology). The total average of the need for each subject in thanatology was found to be 3.40 points. In death education, the need for death education was found to be the highest, 3.65 points, followed by 3.50 points for the purpose of death education, 3.49 points for the main content and reality of death education and 3.43 points

for death education according to the subject. Those aged 59 or younger answered that the purpose of death education is necessary following the need for death education, while those aged 60 or older answered that the main contents and reality are needed following the need for death education. According to the understanding of death, the definition of death was found to be the highest, 3.51 points, followed by 3.46 points for psychological understanding of death, 3.36 points for social understanding of death, and 3.18 points for philosophical understanding of death and death and human civilization was found to be the lowest, 3.04 points.

Table 2: The need for dying well education expert license educational content details of subjects (thanatology)
Unit: Mean ± S.D

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Death Education							
Purpose of death education	3.50	± 0.57	3.50	± 0.59	3.50	± 0.58	1.000
Need for death education	3.63	± 0.56	3.67	± 0.48	3.65	± 0.52	0.817
Main contents and reality of death education	3.40	± 0.77	3.58	± 0.50	3.49	± 0.64	0.319
death education according to the subject	3.40	± 0.62	3.46	± 0.59	3.43	± 0.60	0.727
Understanding of Death							
Definition of death	3.43	± 0.63	3.58	± 0.50	3.51	± 0.56	0.345
Death and human civilization	3.17	± 0.70	2.92	± 0.78	3.04	± 0.74	0.219
Philosophical understanding of death	3.20	± 0.66	3.17	± 0.87	3.18	± 0.77	0.874
Psychological understanding of death	3.47	± 0.63	3.46	± 0.59	3.46	± 0.61	0.960
Social understanding of death	3.43	± 0.73	3.29	± 0.55	3.36	± 0.64	0.433
Total	3.40	± 0.65	3.40	± 0.61	3.40	± 0.63	
1point = lowest, 4 point=highest							

The need for each subject of dying well education expert license educational contents of subjects (care for terminal patients (hospice)): Table 3 shows the need for each subject of dying well education expert license educational contents of the subjects (care for terminal patients (hospice)). The total average of the need for each subject is 3.56 points in care for terminal patients (hospice). In physical symptoms and care, difficulty breathing (shortness of breath) was the lowest, 3.52 points, followed by delirium (3.50 points), bedsore care (3.48 points), nutrition management (3.38 points). In spiritual care, "human as a spiritual being" was found to be the highest, 3.70 and the detail which showed the lowest score was "Holistic human" (3.60 points). In age, "Holistic human" was the lowest in 59 or younger, while the score of human as a spiritual being was the lowest in 60 or older. In the part of spending remaining time together, "Traveling with family" and "The effect of time with family on mental state of patient" showed similar scores, 3.65 points and 3.66 points, respectively. Of 7 contents on understanding of symptoms and psychology of terminally ill patients, both understanding of hospice palliative care and understanding of patient psychology were the highest, 3.65 points, and "Symptoms at the moment of death of patients", "Types of hospice palliative care", "Criteria and scope for selecting subjects of hospice palliative care", "Contents of hospice palliative care" and "Status of hospice palliative care use" were found to be 3.61 points, 3.55 points, 3.50 points, 3.49 points and 3.47 points, respectively. In social care for terminal patients, the score of "Care service for patients with terminal cancer" (3.57 points) was higher than that of "In-ward therapy program" (3.40 points).

Table 3: The need for dying well education expert license educational content details of subjects (care forterminal patients (hospice))

Unit : Mean ± S.D

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Physical Symptoms and Care							
Difficulty breathing (shortness of breath)	3.53	± 0.57	3.50	± 0.66	3.52	± 0.62	0.843
Delirium	3.50	± 0.57	3.50	± 0.66	3.50	± 0.62	1.000
Bedsore care	3.53	± 0.63	3.42	± 0.72	3.48	± 0.67	0.527
Nutrition management	3.50	± 0.63	3.25	± 0.85	3.38	± 0.74	0.235
Spiritual Care							
Holistic human	3.73	± 0.45	3.50	± 0.59	3.60	± 0.52	0.117
Human as a spiritual being	3.77	± 0.43	3.46	± 0.59	3.70	± 0.46	0.038*
Spiritual suffering of terminal patients	3.77	± 0.43	3.63	± 0.49	3.68	± 0.47	0.274
Spiritual care	3.77	± 0.43	3.58	± 0.50	3.65	± 0.47	0.163
Spending remaining time together							
Traveling with family	3.67	± 0.48	3.54	± 0.51	3.65	± 0.49	0.359
The effect of time with family on mental state of patient	3.73	± 0.45	3.63	± 0.49	3.66	± 0.48	0.404
Understanding of symptoms and psychology of terminally ill patients							
Understanding of patient psychology	3.80	± 0.41	3.63	± 0.49	3.65	± 0.50	0.170
Symptoms at the moment of death of patients	3.77	± 0.43	3.58	± 0.50	3.61	± 0.51	0.163
Understanding of hospice palliative care	3.77	± 0.43	3.67	± 0.56	3.65	± 0.51	0.463
Criteria and scope for selecting subjects of hospice palliative care	3.63	± 0.49	3.50	± 0.59	3.50	± 0.53	0.368
Types of hospice palliative care	3.63	± 0.49	3.46	± 0.59	3.55	± 0.57	0.238
Contents of hospice palliative care	3.73	± 0.45	3.54	± 0.59	3.49	± 0.56	0.195
Status of hospice palliative care use	3.43	± 0.73	3.38	± 0.58	3.47	± 0.66	0.750
Social care for terminal patients							
Care service for patients with terminal cancer	3.57	± 0.63	3.46	± 0.66	3.57	± 0.63	0.539
In-ward therapy program	3.40	± 0.67	3.25	± 0.68	3.40	± 0.67	0.421
Total	3.64	± 0.52	3.50	± 0.59	3.56	± 0.56	

*p<0.05, 1point = lowest, 4 point=highest

The need for each subject of dying well education expert license educational contents of subjects (communication): Table 4 shows the need for each subject of the dying well education expert license educational contents of the subjects (communication). In the communication course, the total average of the need was found to be 3.38 points. In the understanding of communication, nonverbal communication, verbal communication, significance of communication and process of communication were found to be 3.45 points, 3.35 points, 3.28 points and 3.25 points, respectively and a similar pattern was shown even when examined by age. In listening, importance of listening and effort for listening were the highest, 3.45 points and method of listening is 3.43 points and significance of listening showed the lowest score, 3.39 points. In the effective death communication method, "Effect of hospice palliative care communication" showed the highest score, 3.51 points, followed by reaction in death communication (3.48 points), ineffective death communication (3.45 points), telling bad news (3.19 points). By age, "Effect of hospice palliative care communication" showed the highest score in 59 or younger, while "Reaction in death communication" showed the highest score in 60 or older.

In the contents of identifying family relationships and patient background, telling your death, telling the death of others, identifying the patient's family relationship and identifying the background of dying patients were found to be 3.48 points, 3.32 points, 3.31 points and 3.25 points, respectively, and it can be seen that it is necessary to inform death.

Table 4: The need for dying well education expert license educational content details of subjects (communication)

Unit : Mean ± S.D

Category	59 or younger (N = 30)		60 or older (N = 24)		Total (N = 54)		p-value
Understanding of communication							
Significance of communication	3.27	± 0.52	3.29	± 0.69	3.28	± 0.61	0.880
Process of communication	3.17	± 0.53	3.33	± 0.64	3.25	± 0.58	0.299
Verbal communication	3.20	± 0.55	3.50	± 0.51	3.35	± 0.53	0.045*
Nonverbal communication	3.37	± 0.61	3.54	± 0.51	3.45	± 0.56	0.268
Listening							
Significance of listening	3.40	± 0.56	3.38	± 0.49	3.39	± 0.53	0.865
Method of listening	3.40	± 0.56	3.46	± 0.51	3.43	± 0.54	0.695
Importance of listening	3.37	± 0.56	3.54	± 0.51	3.45	± 0.53	0.238
Effort for listening	3.37	± 0.56	3.54	± 0.51	3.45	± 0.53	0.238
Effective death communication method							
Reaction in death communication	3.47	± 0.57	3.50	± 0.51	3.48	± 0.54	0.824
Ineffective death communication	3.43	± 0.63	3.46	± 0.59	3.45	± 0.61	0.882
Effect of hospice palliative care communication	3.57	± 0.57	3.46	± 0.59	3.51	± 0.58	0.496
Telling bad news	3.30	± 0.70	3.08	± 0.88	3.19	± 0.79	0.319
Identifying family relationships and patient background							
Identifying the patient's family relationship	3.33	± 0.61	3.29	± 0.62	3.31	± 0.62	0.805
Identifying the background of dying patients	3.30	± 0.60	3.21	± 0.59	3.25	± 0.59	0.575
Telling your death	3.53	± 0.57	3.42	± 0.58	3.48	± 0.58	0.463
Telling the death of others	3.47	± 0.63	3.17	± 0.70	3.32	± 0.67	0.104
Total	3.37	± 0.58	3.39	± 0.59	3.38	± 0.59	

*p<0.05, 1point = lowest, 4 point=highest

Discussion and Conclusion

This study was attempted to secure the validity of the license system for the training of dying well education experts so that dying well education can be rooted as socially acceptable education. According to the results of the study, in the need for each subject of the dying well education expert license educational contents, care for terminal patients (hospice) was found to be the highest, and communication was found to be the lowest. The need for each subject of thanatology was the second highest following care for terminal patients (hospice), followed by communication. It can be interpreted that the need for education for care for terminal patients (hospice) was the highest because the recent increase in cancer patients and the enforcement of the Act on Life-Sustaining Treatment Determination led to the need for education of care for terminal patients.

Through the education of thanatology, we can increase the philosophical, psychological and social understanding of death, know the true meaning of death education, and identify the characteristics of death education according to the subject. Especially in death education, the need for death education was found to be the highest, followed by purpose of death education, main contents and reality of death education, death education according to the subject, which showed a difference depending on age. For those aged 59 or younger, the purpose and need for death education

are important, while those aged 60 or older said that death education and main contents and reality of death education are necessary. According to the understanding of death, the meaning of death was found to be the highest, which is believed that it will be the basis of the high demand for the professional dying well education which can change the attitude and perception of death. It is considered that it is necessary to construct a curriculum considering the need for each subject in the composition of educational contents in the future and to reflect the weight in the qualification examination to acquire a license. In addition, the qualification test should be carried out with the content that can verify the professional dying well educational contents, which is believed that it can support the adequacy and accuracy of the qualification examination. However, the most important thing is that professional education for dying well education should be preceded in order to increase the acceptance of death and the quality of death and to bring about a change in perception of death, and can be said that professional education institutions and professional education personnel are needed to support this. Based on this support, systematic and integrated death education should be carried out and the role of the dying well education experts is important in order to secure a central point that plays a leading role in making all the people accessible. In this way, if responsible dying well education is provided by professional staff, the training of dying well education experts is expected to secure sufficient validity as a national license system. This study was carried out in order to identify the need for dying well education and license system. If dying well education is achieved through the training of education experts with the qualification for dying well education, it not only can change the perception and attitude of death but it is also an opportunity to prepare the death well and to determine the quality of life through professional dying well integrated training.

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The Effect the Training Program on Dementia Has on the Knowledge and Attitude of Nursing College Students towards Dementia and Attitude towards the Caring of the Elderly

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ABSTRACT

Background/Objectives: This study aims to investigate the effects of dementia education program on the knowledge and attitude to the dementia, and caring attitude to the elderly people in the nursing university students.

Method/Statistical Analysis: 122 nursing students in Seniors of Nursing University located in M City were selected as the subjects and 12-hours dementia education program for 5 times were performed in the education group. They were analyzed by frequency, percentage, and T-test for independent sample using SPSS/WIN 22.0 program.

Findings: Upon the results, the education group showed higher knowledge on dementia with 13.25 points, but not statistically significant (p=.621). With respect to the attitude to dementia, mean score in the education group was 4.01 points which was more positive attitude to the dementia to the elderly with statistically significant difference (p=.027). Regarding caring attitude to the elderly, the education group showed 3.78 points as a mean score to be more positive with statistical significance (p=.003).

Improvements/Applications: From these results, dementia education program demonstrated the effects to change the attitude to dementia and caring the elderly positively. Therefore, it is required to seek the improvement plans of nursing quality by enhancing the knowledge and understanding on dementia in the nursing students upon development of dementia education program together with theory and practices.

Keywords: *Knowledge, Attitude, Elderly, Dementia, Nursing student.*

Introduction

Rapid increase of dementia patient due to aging is a global phenomenon. There are over 40 million dementia patients in the world, and it is expected to grow 3 times in next 35 years. Especially, Korea's aging tendency is one of the fastest in the world, and it is expected to reach super-aged society in 2026 as of 2000[1]. There are 702,436 dementia patients among 7,066,201 elderlies over age 65 as of 2017, and the prevalence rate of dementia is 9.94%[2].

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Dementia is a chronic mental disease that cause loss of memory, thinking ability, orientation, understanding, mathematical ability, learning ability, language and judgement which cause various social problems due to the burden and pain of patients' family[3]. Thus, the Ministry of Health and Welfare has announced the war against dementia, and has put dementia management act into force on February 2012 aiming to reduce the individual pain, damage and social burden from dementia and contribute to improvement of public health by implementing comprehensive dementia prevention and management policy.

However, the interest, understanding and knowledge about dementia of nurses who should play main role in implementing preventive and management policy of dementia is very insufficient[4], and even though the

negative attitude toward dementia increase burden in nursing[5], the cultivation of dementia knowledge and attitude of nursing students, the future dementia nursing manpower is insufficient[6]. Thus, there is a need to improve dementia knowledge and positive dementia attitude of nursing students through nursing curriculum, and to develop various dementia education program and confirmation on its effectiveness[7].

When examining the influence of education on knowledge and attitude toward dementia, it was confirmed that the level of student's dementia knowledge was correlated to the duration of education[8], and those who experienced dementia elderly had more positive attitude on dementia patients than those without experience[9]. Also, it was confirmed that dementia education was a significant step for doctor's dementia treatment and is helpful to patient management[10]. Thus, there is a need for nursing education to cultivate professional nursing manpower with professional dementia knowledge and positive dementia attitude required for the nursing service.

However, Alshi suggested that there is a limitation in improving dementia knowledge and attitude only with teaching-oriented theoretic education [11], and there is a need to apply various education program, volunteer work, revision on curriculum to let students obtain dementia knowledge and positive dementia attitude in school[7, 12, 13, 14].

Previous researches has reported the importance of dementia education and the improved knowledge and attitude after education[7, 14]. Thus, this study developed a dementia theory education program to cultivate build up dementia knowledge and positive dementia attitude of nursing students and applied the program. Also, the study used qualitative measuring tool to confirm the effectiveness, examined changes of dementia knowledge and attitude, confirmed the effectiveness which would be able to provide significant basic data providing ground regarding necessity of reinforcing dementia education for nursing students.

The purpose of this study is to examine the effectiveness of dementia education program on dementia knowledge and attitude and elderly care attitude of students through quantitative method.

Hypothesis 1: Knowledge score on dementia of nursing students will be higher after participating in dementia education program.

Hypothesis 2: Attitude score on dementia of nursing students will be higher after participating in dementia education program.

Hypothesis 3: Elderly care attitude score of nursing students will be higher after participating in dementia education program.

Study Method

Study Design: This study adapted one-group pretest-posttest design, a quantitative study method to examine the influence of dementia education on dementia knowledge and attitude of nursing students.

Study Subject: This study selected freshmen in nursing college located in M city. They were explained with the purpose of the study, and the study targeted 137 subjects who agreed to receive the dementia education. The final subjects were 122 excluding those with insincere responses.

Study Tool

Dementia Knowledge: The study used a dementia knowledge level survey tool developed by Seoul Metropolitan Dementia Management Center[15] and revised by Kim[16] to measure the dementia knowledge. Each questions are answered by 'yes' or 'no'. Correct and incorrect answers are each given 1 and 0 point to calculate the final score. For 18 questions, the range of score is from 0 to 18, and the higher score refers to higher dementia knowledge. The credibility of the tool in this study was Cronbach's α=.70.

Dementia Attitude: The tool Cho[17] developed is composed of 10 questions. Each question is answered by 5 point Likert scale, the higher score refers to the negative dementia attitude. The credibility of the original tool was Cronbach's α=.66 and it was Cronbach's α=.78 in this study.

Elderly Care Attitude: The study used tool developed by Kim[18] and revised by Joung[19]. 17 questions are answered by 5 point Likert scale, the higher score refers to positive attitude toward elderly. The credibility of the original tool was Cronbach's α=.66 and it was Cronbach's α=.95 in this study.

Study Procedure: The procedure of data collection and study is as follows.

Pretest: Before the main research, the study measured general characteristics, dementia knowledge, dementia attitude of study subjects before the dementia education. This study distributed written consent on research explaining the purpose and data collection of this study, and those who agreed on the form responded to the survey. The written consent introduces purpose and details of study, and explains that subjects can reject the participation at any time, the collected data is anonymous, and only subjected to the research.

Experiment: As for the dementia education program, it was conducted from October 9 to November 17, 2017 targeting 122 students. The details of experiment are as follows.

Table 1: Dementia Education Program

Session	Duration (hr)	Title	Contents
1	2	What is dementia? (1)	Lecture on the theory, using multi-media (on campus)
2	2	What is dementia? (2)	Presentation of cases on dementia (on campus)
3	2	What is dementia? (3)	A tablet-based dementia test conducted at the 'Dementia Experience Center' located in city S
4	4	Diagnosis and prevention of dementia using the cognitive rehabilitation program	Each team to visit recreational centers for the elderly in city M to conduct diagnosis of dementia, foot massages of the elderly, and art programs using paper or fallen leaves
5	2	Presentation of dementia experience	

Post Test: The post test measured dementia knowledge and attitude based on the survey responded by each of the individual subjects right after the dementia education program.

Ethical Consideration: The study subjects were explained with the purpose of study before data collection, and the researchers received written consent from subjects that the data is only subjected for the study purpose, and they could withdraw from the study any time.

Data Analysis: The study used SPSS/WIN 22.0 program for data analysis. The general characteristics of subjects were analyzed in frequency and percentage. The effectiveness of dementia education program was analyzed by independent sample T test.

Result

General Characteristics of Study Subject: General characteristics of study subjects are suggested in Table 2. 79.5% of subjects(97) are women, 32.8% of subjects(40) had religion, while 67.2% of subjects(82) didn't have religion.

Table 2: Characteristics of study participants (n = 122)

Characteristics	Categories	n (%)
Gender	Male	25(20.5)
	Female	97(79.5)
Religion	Yes	40(32.8)
	No	82(67.2)

Hypothesis Verification: The result of hypothesis verification is as Table 3.

Hypothesis 1: As the result of verifying 'Knowledge score on dementia of nursing students will be higher after participating in dementia education program', before the education, the average dementia knowledge score was 12.83(71.3%) which rose to 13.25(73.6) after education, but there was no statistically significant difference(t=.49, p=.621). Thus, hypothesis 1 is not supported.

Hypothesis 2: As the result of verifying 'Attitude score on dementia of nursing students will be higher after participating in dementia education program', before the experience, the dementia attitude was average 3.86 which rose to 4.01 after education, and there was statistically significant difference(t=-2.23, p=.027). Thus, as the educated group had higher score of dementia attitude, hypothesis 2 is supported.

Hypothesis 3: As the result of verifying 'Elderly care attitude score of nursing students will be higher after participating in dementia education program', before the education, the elderly care attitude was average 3.56 which rose to 3.78 after education, and there was statistically significant difference(t=-3.02, p=.003). Thus, as the educated group had higher score of elderly care attitude, hypothesis 3 is supported.

Table 3: Dementia Education Program Result (n = 122)

Variables	Pre-test	Post-test	t	p
	M ± SD	M ± SD		
Knowledge about dementia	12.83 ± 2.79	13.00 ± 2.63	.495	.621
Attitudes toward dementia	3.86 ± .47	4.01 ± .59	-2.23	.027
Elderly care Attitudes	3.56 ± .51	3.78 ± .60	-3.02	.003

Discussion

Considering the increase of elderly population due to rapid aging, and hence the rapid increase of dementia elderly, nurses will have to deal with growing number of dementia elderly. Among socioeconomic costs of elderly disease, dementia(25.4%) occupies the largest portion, and the significance of nursing and management on dementia elderly has become a social issue[20]. Thus, there is a need to develop a dementia education program for nursing students to conduct high quality nursing by obtaining proper knowledge and attitude.

This study has developed a dementia education program targeting nursing students and aimed to verify the effectiveness of dementia knowledge, attitude and elderly care attitude, and to discuss the results.

This study has examined the dementia knowledge after conducting dementia education program. As the result of verifying 'Knowledge score on dementia of nursing students will be higher after participating in dementia education program', before the education, the average dementia knowledge score was 12.83(71.3%) which rose to 13.25(73.6) after education. As there is no research that evaluated dementia knowledge after conducting education targeting nursing students in Korea, it is hard to conduct direct comparison, but according to the study of Park et al.[14], Kang et al.[5] which examined the knowledge about dementia elderly after conducting elderly nursing education program the dementia knowledge increased. Students dealt with difficulty when dementia elderly's behavior was unexpected and they felt lack of knowledge[17]. Lack of knowledge and stereotype about dementia is the cause of delayed treatment which ultimately leads to low quality of life of the patient and family and increase of medical expense [22]. Improving dementia knowledge is a significant measure[23] of leading positive attitude toward dementia. inKo[21]'s study targeting nurses, the higher the knowledge was, the less the nursing burden was. Considering consistently increasing nursing demand, education that can improve professional dementia knowledge is crucial.

As the result of verifying 'Attitude score on dementia of nursing students will be higher after participating in dementia education program', before the experience, the dementia attitude was average 3.86 which rose to 4.01 after education. In another study comparing the nursing student before and after the education, it confirmed positive changes after education which is corresponds to the study result[5, 14]. The more negative dementia attitude is, the higher the nursing burden is in a study targeting dementia support center nurses[21]. Positive dementia attitude provides patient-oriented nursing focusing on dementia patient, and not the symptom which enables high quality nursing[24] while negative attitude affects diagnosis, treatment, support and decision making to deter the various service quality given to dementia elderly[25]. Gathering up the results, it is clear that attitude of nursing students affect nursing quality in the field of medicine. Thus, nursing education is crucial to cultivate professional manpower with essential professional knowledge and positive attitude for dementia elderly nursing service[14].

As the result of verifying 'Elderly care attitude score of nursing students will be higher after participating in dementia education program', before the education, the elderly care attitude was average 3.56 which rose to 3.78 after education. This confirms that the program not only affects the dementia knowledge and attitude positively but also the elderly care attitude, which indicates the program will influence the better understanding toward elderly and lead to positive attitude toward elderly.

In 2015, the prevalence rate of dementia for those over age 65 was 9.8% which is expected to be as high as 15.1% in 2050(NSO), and dementia patients who are under medical service is growing 20% annually(NHIC, 2015). Thus, as a medical professionals, nursing students must work hard to improve dementia knowledge and establish positive attitude. There are elderly nursing education targeting nursing students, but it requires improvement in professional contents, Dementia

education program affects not only the dementia knowledge but also the attitude and elderly care attitude, which could contribute to preparing the service provision measures for individual characteristics due to increase of dementia patients. Furthermore, once the program is expanded to the public, it would contribute to the responsive capability of society regarding the prevention and management of dementia.

Conclusion

This study has conducted 12 hour dementia education in 5 sessions targeting freshmen in nursing college to examine the education's effectiveness to dementia knowledge, attitude and elderly care attitude. As the result, those who received education had better dementia knowledge, more positive dementia attitude and elderly care attitude.

Based on the result, the study suggests as below.

First, to improve professional knowledge and positive attitude toward dementia elderly, there is a need to apply curriculum that conducts both theoretic education and practices.

Second, this study suggests a phased and consistent dementia education program for professional nursing manpower and caretakers who conduct direct nursing on dementia elderly.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Validity of Dying Well Education Expert License System For Ordinary People

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ABSTRACT

Background/Objectives: This study was conducted in order to secure the validity of the license system development for education training experts with the multidisciplinary knowledge of dying well by identifying the need for the dying well education and license system.

Method/Statistical Analysis: A total of 128 adults aged 19 or older who visited D Station in D city from April 14 to May 14, 2018 was randomly selected and surveyed, and the statistical program R was used for the analysis.

Findings: All subjects answered that dying well education is necessary, and that educators suitable for dying well education included experts, medical professionals, and religious leaders who received dying well education. Of the educational contents, care for terminal patients (hospice) and psychological healing were the most needed. There was a correlation between experts who received dying well education, terminally ill patients and their families, and nursing and elderly hospital workers.

Improvements/Applications: In order to secure the expertise of dying well education in the future, it is necessary to form a curriculum based on the results of this study and to train death education experts with multidisciplinary knowledge through the verification of a professional national license.

Keywords: *Dying well, Education, License System, ordinary people, Necessity, Validity*

Introduction

Recently, the elderly population and chronic diseases are increasing in Korea, and in addition to well-being[1], dying well culture that means good death and decent death is spreading as the interest in human death is growing [2]. Death is the end of life, and the right to die like a human being should be guaranteed by the concept of human dignity and human rights[3]. The term 'human-like' herein means more or less active death, which includes planning for death and dignified, beautiful death, not lonely death, and preparing for death on their own such as writing a will in advance and preparing for shroud [4]. In particular, dying well is important not only to alleviate the pain of death, but also to find the meaning of life[2]. In addition, as interest in terminal cancer patients has increased, the institutionalization of hospice and palliative care has been emphasized, and the need to apply health insurance has been raised, thus raising the discussion on the need for institutionalization. Although the hospice palliative medical institutions are operated, there are only a few independent facility type medical institutions and independent wards, which are models of ideal hospice palliative medical institutions, not providing good quality services.

The application of dying well programs to solve these social problems positively changes elderly people's perception of the meaning of life, self-efficacy, and successful aging and is an opportunity to realize the meaning of death, to think seriously about death, to look back on their life[5], and systematic and continuous

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program application management can be achieved through the development of dying well education contents and programs needed for the elderly in order to find ways to live a healthy and happy life psychologically as well as physical health through preparation for death of the elderly [2].

'Hospice palliative care' is the extensive treatment that checks the meaning of the time left until a patient who is unlikely to be cured dies and allows him/her to live during the time faithfully. With the 'Act on Decisions on Life-sustaining Treatment', it is overall treatment and care which alleviate the pain of terminally ill patients and help them to die a comfortable death physically and mentally and hospice, palliative care and hospice palliative care are used in the same sense[6].Hospice and palliative health care system should be transformed into a nation-wide 'National cultural movement for decent death' in which many leaders of society such as culture art world, academic world, religious world as well as the government participates[7]. In order to do so, it is necessary to train experts for institutional and professional education. In addition, it is necessary to develop programs for experts treating dying patients mainly in hospital intensive care units or hospice wards and death preparation course education of professional death preparation field educators and dying well of hospice dying patients sharply increased in proportion to the diagnosis of medicine in recent years and expand the subjects of dying well preparation education[8].

As the Dying well Act (Act on Life-Sustaining Treatment Determination) which determines not to carry out or discontinue medical care for life prolongation for patients in the dying process was enacted[9], the need for professional education for dying well has increased, and at present, the expertise of the education operating subject has been secured, and it is difficult to meet the increasing social demand related to dying well. Therefore, there is a high demand for professional death education experts in order to secure the expertise of dying well education[10]. Dying well preparation education programs should be conducted in a continuous and long-term way as part of life, not as an educational short-term program. Also, when constructing a program, it is necessary to constantly supplement and develop programs that can meet the psychological and social needs by reflecting the desire of participants and to activate them professionally[5]. In addition, information on dying well should be exchanged by establishing cooperative systems such as funeral instructors, death preparation educators, end care nurses, program experts, family therapists, hospice nurses, and social welfare practitioners who are experts in interdisciplinary fields[5].

Thus, this study not only includes knowledge of basic dying well but is to secure the validity of the license system development for training educators with overall multidisciplinary knowledge of death.

Method

Subject: Adult men and women aged 19 or older who visited D Station located in D city were randomly selected and surveyed. For four weeks from April 14, 2018, we visited D Station on Saturdays and conducted surveys only for those who wanted to participate in the study. A total of 128 people answered the survey.

Method: The study was approved by the Institutional Review Board (IRB No. KYU-2018-007-02) of Konyang University. The questionnaire consists of the following: The general characteristics were 3 items such as sex, age, religion. The subjects' perception of the need for dying well education and qualification courses, the need for each subject of the dying well education expert license educational contents of the subjects and the subjects' perception related to dying well education expert training course were composed of 4 items, 5 items and 3 items, respectively. Referring to Cancer Registration Standard Occupational Classification System (Korean Standard Occupational Classification), we carried out the study by classifying the occupations of the subjects into experts, students, ordinary people as independent variables.

Analysis Method: The statistical program R was used for the analysis. For the item of questionnaire, the frequency analysis of the general characteristics was carried out. Based on occupations (expert, student, ordinary person), the perception of the need for dying well education and qualification course and the perception related to dying well education expert training qualification course were analyzed by performing the chi-square test and the need for each subject of the dying well education expert license educational contents by performing One-way ANOVA, and the canonical correlation analysis was carried out in order to identify the correlation between educators, educational subjects and perception related to qualification course.

Analysis Results

General characteristics of subjects: Table 1 shows the general characteristics of the subjects. The total number of subjects was 128, and men (9.4%) accounted for more than women (90.6%). In age, 29 or younger was the most common (48.4%), followed by 16.4% of 30-44 or older, 35.2% of 45 or older. In religion, no religion, Protestantism (Christianity), Catholics and Buddhism were found to be 46.1%, 29.7%, 7.8% and 16.4%, respectively.

Subjects' perception of the need for dying well education and qualification course: The Table 2 shows the subjects' perception of the need for dying well education and qualification course. All answered "Yes" to the question of "Do you think dying well education is necessary?". To the question of "If dying well education is necessary, who do you think is best for education?", the answer was found to be experts who received dying well education (82.0%) and medical personnel (14.8%) in, and both religious people (pastor, priest, monk) and others were found to be the lowest, 1.6%. Among groups of experts, students, ordinary people, experts who received dying well education were the most common, which showed a statistically significant difference ($p<0.05$). To the question of "for whom do you think dying well education is necessary?", the most answered all the people (51.6%), followed by nursing and elderly hospital workers (25.8%), terminally ill patients and their families (15.6%), medical personnel (6.3%), others (0.8%). To the question of "Which is the right institution for dying well education", the most people answered educational Institutions (Association or Society, Lifelong Education Center, Social Education Center, followed by university (25.0%), social welfare organs(General welfare center, senior welfare center, nursing facility, nursing home etc.) (19.3%), cultural Center (12.5%), Community Center(senior citizens' center, hall for senior citizens in addition to dong office) (7.0%), graduate school (3.1%), medical institutions (hospitals, public health centers, etc.) (2.3%), religious institutions (0.8%). In the expert group, university was the highest (37.8%) and Community Center(senior citizens' center, hall for senior citizens in addition to dong office) and religious groups were the lowest (no response). In the student group, educational institutions (Association or Society, Lifelong Education Center, Social Education Center) were the lowest (44.4%) and Cultural Center was the lowest (no response). In the ordinary people group, like the student group, educational institutions (Association or Society, Lifelong Education Center, Social Education Center were the highest and graduate school, religious institutions, medical institutions (hospitals, public health centers, etc.) were the lowest (no response), which showed a statistically significant difference ($p<0.01$).

Table 1: General characteristics of subjects

Category	N	(%)	Category	N	(%)
Sex			**Religion**		
Men	12	(9.4)	Christianity	38	(29.7)
Women	116	(90.6)	Catholics	10	(7.8)
Age			Buddhism	21	(16.4)
29 or younger	62	(48.4)	No religion	59	(46.1)
30~44 or older	21	(16.4)			
45 or older	45	(35.2)			
Total	128	(100.0)	Total	128	(100.0)

Table 2: Subjects' perception of the need for dying well education and qualification course

Unit :N(%)

Category	Expert		Student		Ordinary Person		Total		p-value
Do you think dying well education is necessary?									
Yes	37	(100.0)	54	(100.0)	37	(100.0)	128	(100.0)	
No		-		-		-		-	

Conted…

If dying well education is necesary, who do you think is best for education?									
Experts who received dying well education	30	(81.1)	49	(90.7)	26	(70.3)	105	(82.0)	0.047*
Religious people (pastor, priest, monk	1	(2.7)		-	1	(2.7)	2	(1.6)	
Medical personnel	4	(10.8)	5	(9.3)	10	(27.0)	19	(14.8)	
Others	2	(5.4)		-		-	2	(1.6)	
For whom do you think dying well education is necessary?									
Terminally ill patients and their families	7	(18.9)	8	(14.8)	5	(13.5)	20	(15.6)	0.082
Nursing and elderly hospital workers	11	(29.7)	7	(13.0)	15	(40.5)	33	(25.8)	
Medical personnel	1	(2.7)	5	(9.3)	2	(5.4)	8	(6.3)	
All the people	18	(48.6)	34	(63.0)	14	(37.8)	66	(51.6)	
Others		-		-	1	(2.7)	1	(0.8)	
Which is the right institution for dying well education?									
University	14	(37.8)	9	(16.7)	9	(24.3)	32	(25.0)	0.005**
Graduate school	1	(2.7)	3	(5.6)		-	4	(3.1)	
Educational Institutions (Association or Society, Lifelong Education Center, Social Education Center	10	(27.0)	24	(44.4)	12	(32.4)	46	(35.9)	
Religious institutions		-	1	(1.9)		-	1	(0.8)	
Social welfare organs(General welfare center, senior welfare center, nursing facility, nursing home etc.)	4	(10.8)	10	(18.5)	3	(8.1)	17	(13.3)	
Community Center(senior citizens' center, hall for senior citizens in addition to dong office)		-	6	(11.1)	3	(8.1)	9	(7.0)	
Medical institutions (hospitals, public health centers, etc.	2	(5.4)	1	(1.9)		-	3	(2.3)	
Cultural Center	6	(16.2)		-	10	(27.0)	16	(12.5)	
Total	37	(28.9)	54	(42.2)	37	(28.9)	128	(100.0)	
*p<0.05, **p<0.01									

The need for each subject of dying well education expert license educational contents of subjects: Table 3 shows the need for each subject of dying well education expert license educational contents of the subjects. The total average of the need for each subject was found to be 3.35 points, and psychological healing and care for terminal patients (hospice) were the highest (3.50 points), followed by communication (3.42 points), thanatology (3.35 points), funeral (2.96 points). In the expert group, care for terminal patients (hospice) was the highest and psychological healing was the highest (3.41 points) in the student group and the score is 3.62 in the ordinary people group, and psychological healing was found to be the highest like the student group.

Table 3: The need for each subject of dying well education expert license educational contents of subjects

Unit :Mean ± S.D

Category	Expert		Student		Ordinary person		Total		p-value
Thanatology	3.43	± 0.80	3.35	± 0.48	3.27	± 0.65	3.35	± 0.63	0.550
funeral	3.03	± 0.80	2.98	± 0.57	2.86	± 0.63	2.96	± 0.66	0.547
care for terminal patients (hospice)	3.57	± 0.83	3.43	± 0.50	3.54	± 0.73	3.50	± 0.68	0.566
Communication	3.41	± 0.90	3.37	± 0.56	3.51	± 0.80	3.42	± 0.74	0.657
Psychological healing	3.51	± 0.77	3.41	± 0.53	3.62	± 0.68	3.50	± 0.65	0.305
Total	3.39	± 0.82	3.31	± 0.53	3.36	± 0.70	3.35	± 0.67	
1point = lowest, 4 point=highest									

Subjects' perception related to dying well education expert training qualification course: Table 4 shows the subjects' perception related to dying well education expert training qualification course. In the effective lecture method during death education lecture, the most answered practice/experience style (37.5%), followed by use of video (35.2%), lecture style (16.4%), discussion style (10.2%). By group, the expert and student groups responded the most to the practice/experience style, while the ordinary people group responded the most to "Using video" (43.2%). In the item of appropriate education period for acquiring dying well education expert license, one semester (3 months) was found to be the highest (49.2%), followed by one month (22.7%), 6 months(17.2%), 1 year (9.4%), 1 week (0.8%), others(0.8%). In the item of appropriate educational expense for acquiring dying well education expert license, 43.0% answered 200,000 won~290,000 won followed by 300,000 won~390,000 won(25.0%), 400,000 won~490,000 won(16.4%), others(8.6%), more than 500,000 won(7.0%). Each group showed similar trends

Correlation factors between educators and subjects and qualification course related perception: According to the result of the canonical correlation analysis of educators and subjects, lecture method, education period, cost of education, six canonical functions were derived. Among them, 1 canonical function was found to be statistically significant ($p<0.05$). In the case of the top two canonical functions among them, when the chi-square value was 104.914 and the degree of freedom was 78, statistical significance was shown in the canonical function 1 ($p<0.05$). According to the standard canonical coefficients of canonical function 1, it was found that there was a correlation between experts who received dying well education as educators and terminally ill patients and their families, Nursing and elderly hospital workers as subjects. It was found that there was a correlation in all items of the lecture method and the education period, and there was a correlation between 400,000~490,000 won, 300,000~390,000 won, 200,000~290,000 won in the case of educational expense

Table 4: Subjects' perception related to dying well education expert training qualification course

Unit :N(%)

Category	Expert		Student		Ordinary person		Total		p-value
Effective lecture method during death education lecture									
Lecture style	3	(8.1)	10	(18.5)	8	(21.6)	21	(16.4)	0.176
Discussion style	7	(18.9)	5	(9.3)	1	(2.7)	13	(10.2)	
Use of video	13	(35.1)	16	(29.6)	16	(43.2)	45	(35.2)	
Practice/Experience style	13	(35.1)	23	(42.6)	12	(32.4)	48	(37.5)	
Others	1	(2.7)		-		-	1	(0.8)	
Appropriate education period for acquiring dying well education expert license									
One week		-		-	1	(2.7)	1	(0.8)	0.521
One month	10	(27.0)	12	(22.2)	7	(18.9)	29	(22.7)	
One semester (3 months)	16	(43.2)	29	(53.7)	18	(48.6)	63	(49.2)	

Conted…

6 months	5	(13.5)	10	(18.5)	7	(18.9)	22	(17.2)	
1 year	6	(16.2)	3	(5.6)	3	(8.1)	12	(9.4)	
Others		-		-	1	(2.7)	1	(0.8)	
Appropriate educational expense for acquiring dying well education expert license									
More than 500,000 won	4	(10.8)	3	(5.6)	2	(5.4)	9	(7.0)	0.620
400,000 won~490,000 won	8	(21.6)	8	(14.8)	5	(13.5)	21	(16.4)	
300,000 won~390,000 won	8	(21.6)	16	(29.6)	8	(21.6)	32	(25.0)	
200,000 won~290,000 won	13	(35.1)	25	(46.3)	17	(45.9)	55	(43.0)	
Others	4	(10.8)	2	(3.7)	5	(13.5)	11	(8.6)	
Total	37	(28.9)	54	(42.2)	37	(28.9)	128	(100.0)	

Table 5: Correlation factors between educators and subjects and qualification course related perception

Category		**Standard Canonical Coefficient**		**Canonical Loadage**		**Canonical Cross Loadage**	
		1	**2**	**1**	**2**	**1**	**2**
Educator	Experts who received dying well education	-.921†	-.323†	-.896	.204	-.445	.087
	Medical personnel	.039	-.680†	.828	-.242	.411	-.103
Subject	Terminally ill patients and their families	-.550†	-3.025†	-.351	-.679	-.174	-.290
	Nursing and elderly hospital workers	-.501†	-2.639†	-.031	.250	-.015	.107
	Medical personnel	-.172	-1.314†	.146	.230	.073	.098
	All the people	-.200	-3.290†	.206	.058	.102	.025
Lecture method	Lecture style	1.346†	1.435†	.318	-.235	.158	-.100
	Discussion style	1.116†	1.418†	.318	.100	.158	.043
	Use of video	1.363†	1.851†	.180	-.205	.089	-.088
	Practice/Experience style	.851†	2.278†	-.581	.380	-.288	.163
Education period	one week	-.900†	-.244	-.211	-.334	-.105	-.143
	one month.	-2.318†	1.305†	.134	-.112	.067	-.048
	One semester (3 months)	-2.904†	1.516†	-.047	.243	-.024	.104
	6 months	-2.280†	.969†	-.103	-.073	-.051	-.031
	1 year	-1.906†	.748†	-.047	-.002	-.023	-.001
Educational expense	More than 500,000 won	.023	.695†	.118	.444	.059	.190
	400,000~490,000 won	-.463†	.231	-.170	.067	-.084	.029
	300,000~390,000 won	-.524†	-.197	-.090	-.462	-.045	-.197
	200,000~290,000 won	-.478†	.346†	.004	.181	.002	0.77
		1		2			
Canonical Correlation		.497		.428			
Wilk's Lamda		.408		.541			
Chi-square		104.914		71.773			
df		78.000		60.000			
p-value		0.023*		0.142			
*p<0.05							

Conclusion

This study not only includes knowledge of basic dying well, but also aims to provide basic data for securing the validity of the license system development for training education experts with multidisciplinary knowledge about death. The results of this study are summarized as follows: First, all the experts, students, ordinary people answered dying well should be educated by experts who received dying well education, which was found to be significantly high($p<0.05$). Second, students and ordinary people answered that educational institutions (Association or Society, Lifelong Education Center, Social Education Center are appropriate for dying well educational institutions. In the case of experts, university was found to be significantly high ($p<0.01$). Third, the result of the canonical correlation analysis of educators and subjects, lecture method, education period, educational expense showed that there was a correlation between experts who received dying well education as educators and terminally ill patients and their families, nursing and elderly hospital workers as subjects. It was found that there was a correlation in all the items of the lecture method and education period. There was a correlation between 400,000~490,000 won, 300,000~390,000 won and 200,000~290,000 won in educational expenses ($p <0.05$). In conclusion, despite the development of medicine, it is necessary to traindeath education experts who have multidisciplinary knowledge through the verification of professional national license in order to carry out education and perception of death in order to finish the last period of life that cannot be avoided.

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Life Satisfaction and Related Factors of Denture Wearers

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ABSTRACT

Background/Objectives: The purpose of this study is to understand the factors affecting the satisfaction of life of female denture wearers and to practice proper denture management.

Method/Statistical Analysis: The subjects of this study were the elderly welfare facility residents of Seoul, 337 were selected for final analysis. Data collection was conducted by questionnaire survey method through face - to - face interview with the researchers who were fully informed about the purpose of the study after selecting the sample as the convenience sampling method. In this study, general characteristics were calculated as frequency and percentage.

Findings: The age of the patients was 75-79 years old with 210, followed by 69 patients over 80 years old and 58 patients 65-74 years old. And 74 women with family members were living together. There are 159 women with religion and 140 patients with activity limitation.The results of multiple regression analysis on the factors affecting the general characteristics of female denture wearers were as follows. Among the general characteristics, age, cohabiting family and activity limitation were significant influences. In other words, life satisfaction was high in the case of the younger age, the family with the same family, the absence of the physical activity restriction, and the explanatory power of the variables was 29.9. The results of multiple regression analysis on the factors affecting the satisfaction of life using the denture of female denture wearers are as follows. Satisfaction with chewing and Satisfaction with taste were significant.

Improvements/Applications: Using the right denture has a positive effect on not only the oral function but also the satisfaction of life, so efficient management habits are necessary for a happy life.

Keywords: *Denture management, Denture wearer, Factor, Female,Life satisfaction*

Introduction

The use of dentures is a factor that can help recovery of oral function and enhance the satisfaction of life by running a healthy life. The correct functioning of dentures leads to improved quality of life and satisfaction, which ultimately has a positive impact on happiness. In order to achieve a happy life for female denture wearers, it is necessary to investigate the current status of dental use satisfaction and behavior, and to provide a basis for their comfortable denture prosthesis use and to prove their validity.In the World Health Organization, periodontal diseases, especially periodontal diseases, are closely related to systemic health such as diabetes, cardiovascular diseases, and also related to the quality of life, so it is necessary to have an oral health project for health promotion for lifelong healthy life[1].

It has been reported that the good oral condition of the elderly contributes to the improvement of the quality of life by leading to active participation in social activities due to recovery of self-confidence. Therefore, to support the elderly living alone to accept the current environment and feel satisfied with life, it is necessary to

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systematically manage the physical and oral health and improve the satisfaction of life by increasing self - esteem in terms of mental health[2-4].The reason why oral health of the elderly is important is that interpersonal relations and smooth social lifeFor pronunciation and appearance as well as affecting the whole body health maintenanceIt is closely related to nutritional intake, and oral condition is related to quality of life, depression,This is because it has a great influence on the health of the people[5-6].

In previous studies, the elderly reported that there was no tooth pain, less oral restorations and missing teeth, no oral disease, higher quality of life, and oral health status and oral health behavior affected overall satisfaction with life[7]. The satisfaction of life related to oral health was high in the group satisfied with the use of denture. The elderly feel the emotional loss by the use of dentures. It may be a matter of avoiding interpersonal relationships, feeling alienation, isolation, etc., when the first dentures are worn out during the adaptation and problems such as rancidity and bad breath are encountered. Therefore, improving the correct sterilization and denture fixation is a management method that must be taken in order to improve the quality of life of denture users as well as oral health.

When dentures are missing from natural teeth and associated tissues,Implies an artificial replacement prosthesis.A denture made entirely in the form of a tooth that is completely fixed to an adjacent tooth is called a fixed denture. A denture made in such a form as to be able to take away the teeth and the support of the gum together with the tooth is called a removable denture do. It is said to be dent in the dentures, which can be inserted and removed mainly.The denture will help the recovery function of the oral cavity as it contributes to mental efficiency, nutrient intake and psychological stability of the elderly [8].

Dentures enhance the mastication efficiency of the elderly, help nutrient intake, and help in psychological stability. The discomfort of the work has a direct impact on the satisfaction of life by depriving the satisfaction and happiness of food intake[9]. Dentures will help the elderly to improve masticatory efficiency, help nutrient intake, and contribute to psychological stability. However, oral care providers recommend that implants or dentures be installed when some or all of the teeth are lost, but it is presumed that the elderly who have low financial status will have less chance of using dentures. Therefore, it is thought that the dental prosthesis business carried out by the present government should be extended for the long - term welfare of the elderly, and the life satisfaction should be improved through restoration of oral function in old age.

The healthful oral condition of the elderly helps mastication and swallowing function and reduces the possibility of threatening the whole body health due to the difficulty of digestion. It also leads to improvement of eating pleasure from normal feeding and recovery of interpersonal relationship by maintenance of aesthetic function. It will help to increase satisfaction.

Materials and Method

Research Subject and Method: The subjects of this study were the elderly welfare facility residents of Seoul, 337 were selected for final analysis. Data collection was conducted by questionnaire survey method through face - to - face interview with the researchers who were fully informed about the purpose of the study after selecting the sample as the convenience sampling method.

Data Analysis: In this study, general characteristics were calculated as frequency and percentage. Multiple regression analysis was performed to investigate the factors affecting general satisfaction and durability using general characteristics and denture. The explanatory power of the model was determined through multiple decision factors (R2). The collected data were analyzed using SPSS 19.0 statistical program. The general independent variables used in the study were age, living with the family, religion, activity limitation, denture type. Among the detailed items, the ages were classified as “65-74 years, 75-79 years, 80 years old or older”, and the question about family members living together was answered as “Yes” or “No”. The question about religion was surveyed as “Yes” or “No” as “Do you currently conduct religious activities regularly?” In addition, the question on whether activities are restricted in daily life was surveyed as “Yes” or “No” as “Do you have any difficulty in doing usual activities at home or outdoors?” The types of dentures were ‘1 Jaw Partial denture, 1 Jaw Full denture, 2 Jaw Partial denture, 2 Jaw Full denture and 2 Jaw Partial + Full denture’. The independent variables related to the use of dentures for female dentures were ‘Wear dentures all day, Daily denture

cleaning, Use a denture cleanser, Keep dentures in water, Number of brushes per day'. The independent variables related to denture satisfaction were 'Satisfaction with appearance, Satisfaction with chewing, Satisfaction with taste, Satisfaction with pronunciation, Satisfaction with denture fixation and Number of dentures made'. The above items were surveyed on 4 points scale of 'very satisfied' (4 points), 'satisfaction' (3 points), 'dissatisfied' (2 points) and 'very dissatisfied' (1 point) 'And' dissatisfied ', respectively.

The dependent variable, Life Satisfaction, was assessed as perceived subjective satisfaction, and the most satisfied life status was classified as 5 points and the least satisfied as 1 point. Cronbach's alpha 0.821 for denture use related items of the female denture user, Cronbach's alpha 0.742 for the denture satisfaction related item, and the item has a lower reliability value than the overall reliability.

Results and Discussion

General characteristics of the subjects: The demographic characteristics of the subjects are shown in Table 1. The age of the patients was 75-79 years old with 210 (62.3%), followed by 69 patients (20.5%) over 80 years old and 58 patients (17.2%) 65-74 years old and 74 (22.0%) women with family members living together. There are 159 (47.2%) women with religion and 140 patients (41.5%) with activity limitation.

The most common type of denture was 1 jaw partial denture (31.8%). The next order was 2 jaw partial dentures in 85 patients (25.2%) and 2 jaw full dentures in 82 patients (24.3%).

Table 1: General characteristics of the subjects

Variables		N	%
Age (years)	65-74	58	17.2
	75-79	210	62.3
	≥80	69	20.5
Living with the family	Yes	74	22.0
	No	263	78.0
Religion	Yes	159	47.2
	No	178	52.8
Activity limitation	Yes	140	41.5
	No	197	58.5
Denture type	1 Jaw Partial denture	107	31.8
	1 Jaw Full denture	56	16.8
	2 Jaw Partial denture	85	25.2
	2 Jaw Full denture	82	24.3
	2 Jaw Partial + Full denture	7	2.1
Total		337	100.0

Factors affecting the satisfaction of life in general characteristics: The results of multiple regression analysis on the factors affecting the general characteristics of female denture wearers were as follows. Among the general characteristics, age (β = -0.166, p = 0.006), cohabiting family (β = 0.536, p = 0.000) and activity limitation (β = -0.039, p = 0.019) were significant influences. In other words, life satisfaction was high in the case of the younger age, the family with the same family, the absence of the physical activity restriction, and the explanatory power of the variables was 29.9. <Table 2>.

Table 2: Factors affecting the satisfaction of life in general characteristics

Variables	B	β	P
Constant	0.199		0.595
1. Age(years)	-0.351	-0.166	0.006
2. Cohabiting family	1.676	0.536	0.000
3. Religion	-0.158	-0.061	0.346
4. Activity limitation	-0.103	-0.039	0.019
5. Denture type	0.001	0.001	0.981
R^2=0.309; AdR^2=0.299; F=9.620			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at α=0.05.

Satisfaction of life according to habit of using dentures: The factors affecting the satisfaction of the dentist use habit of female denture wearers are as follows as shown in table 3. When denture was not worn all day (β = -0.132, p = 0.045), daily denture cleaning (β = 0.201, p = 0.031) and use a denture cleanser (β = 0.057, p = 0.035). There was a significant difference according to the number of brushes (β = 0.104, p = 0.033).

The 'keep dentures in water' variable was not statistically significant. This means that when dentures are not worn all day, when dentures are cleaned daily, when denture cleansers are used, and when the number of brushes per day is high, life satisfaction is high.The explanatory power of the variables was 84.4.

Table 3: Satisfaction of life according to habit of using dentures

Variables	B	β	P
Constant			
1. Wear dentures all day	-0.152	-0.132	0.045
2. Daily denture cleaning	0.232	0.201	0.031
3. Use a denture cleanser	0.062	0.057	0.035
4. Keep dentures in water	0.094	0.087	0.512
5. Number of brushes per day	0.126	0.104	0.033
R^2=0.854; AdR^2=0.844; F=26.351			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at α=0.05.

Factors affecting the satisfaction of life using dentures: The results of multiple regression analysis on the factors affecting the satisfaction of life using the denture of female denture wearers are as follows as shown in table 4. Satisfaction with chewing (β = 0.140, p = 0.006) and Satisfaction with taste (β = 0.468, p = 0.000) were significant. The greater the satisfaction of chewing, the greater the sense of taste, the higher the satisfaction of life, and the explanatory power of the variables was 30.2.

Table 4: Factors affecting the satisfaction of life using dentures

Variables	B	β	P
Constant	5.299		0.000
1. Satisfaction with appearance	0.009	0.003	0.947
2. Satisfaction with chewing	0.409	0.140	0.006
3. Satisfaction with taste	1.464	0.468	0.000
4. Satisfaction with pronunciation	0.100	0.032	0.484
5. Satisfaction with denture fixation	0.108	0.042	0.409
6. Number of dentures made	0.111	0.030	0.568
R^2= 0.315; AdR^2 =0.302; F=5.239			

B: Unstandardized Coefficients, β : Standardized Coefficients.

Statistically significant differences by multiple regression analysis at α=0.05.

Conclusion

The purpose of this study was to examine the general characteristics of the subjects and to determine the determinants of overall life satisfaction. The results of the analysis are summarized as follows.

Life satisfaction was high when there was no activity limit. The physical changes due to the aging of the elderly are related to the satisfaction of life, so physical activity can be an important variable for determining the degree of life satisfaction. Female denture wearers were more satisfied with life when they were living together. The elderly living alone have a majority of three or more chronic diseases and the rate of restricting physical function is higher than that of non - living elderly people. Along with this trend of social change, we should consider various ways to lead the happy life of old age. The existence of a family living together is very important because it directly affects the satisfaction of life and reduces depressed mental state and helps to improve happiness. It is thought that concrete practical plan is necessary for the elderly living alone to ensure the elderly living guarantee for elderly people living alone and efficient co-living home.

The degree of physical activity is the minimum ability for the elderly to maintain their independence as a social member, and is the most important factor for the elderly living alone. Therefore, it is required that the health care activities of the elderly living alone should be steadily prevented from deteriorating and the health care education and publicity to practice it will be needed.The most significant factor affecting the happiness of female denture wearers was family members living together. In the previous study, the quality of life was high when living with family members, and the quality of life was low in elderly women.When using dentures, satisfaction with writing and taste was high. The discomfort of the work can directly affect the quality of life by depriving the satisfaction of food intake. Therefore, the use of correct dentures by female denture wearers has a positive effect on the oral function as well as on the satisfaction of life, so it is an oral health care habit that must be followed for a happy life.

In the case of using the denture, the satisfaction of all the items was high. The satisfaction of life was high when the dentist was satisfied with the use of denture. The denture contributes to the mental efficiency of the elderly, helps nutrient intake, and contributes to psychological stability.

It can be said that one of the requirements for living happily is 'eating pleasure', so that the decrease of chewing ability can lower the satisfaction of life. It can be a major cause. Furthermore, the dental wearer 's work satisfaction is a little more significant than that of the prehistoric. Their chewing abilities were the most important reason for the use of dentures after tooth loss, which is the most important factor affecting not only the health of the teeth but also the whole body health. It also has a positive effect on the digestion ability of food The pleasure of ingesting food will also increase the satisfaction of life.

Periodic oral examination of denture users has two main meanings. First, there are many opportunities to get proper denture management knowledge from oral health professionals by visiting regular oral care institutions, and systematic education opportunities for denture management are gained. In other words, the person can directly clean the denture himself or herself through regular oral examination, and can expect basic denture management knowledge, attitude, and behavior change that can be kept in clean water during sleep. Second, it is possible to reduce the inconvenience of dentures due to the inspection, repair and repair of removable dentures. It is possible to use the correct denture to help the function of the oral cavity by eliminating the low fixation force of the denture and the irritation of the oral soft tissue. Oral care of denture wearers The main contents of dentures for oral health are dentures, which are stored in lukewarm water for sleeping. To prevent bad breath, dentures are separated from natural teeth and managed with denture cleanser. Lastly, if the denture is not fixed properly, food enters the gap between the gums and dentures, causing pain, bad breath, and gingival inflammation.

In the present study, it was found that the denture management of the elderly people is not proper, and the elderly people perceive themselves as needing denture management education. Denture management and oral health education should be done. Denture wearers are more likely to avoid interpersonal relationships due to authoring activities and cosmetics. Use of correct dentures will increase their confidence. If you use oral dentifrices and denture adhesives to improve oral health, you will feel confident when you meet people. The implication of this study is that the denture wearers' duties and denture use satisfaction variables are generalized in order for the elderly living alone to live happily and satisfactorily. In order to protect the dental health of female denture wearers, it is necessary to support various policies. In particular, the role of healthcare institutions should be expanded when oral health problems arise. What is important is that women's dentists should improve their life satisfaction by helping them to maintain their self. The limitations of this study were that the study was designed as a cross - sectional study and it was somewhat lacking in identifying the causal relationship between the factors affecting the satisfaction of life of female denture wearers. Therefore, in future researches, we would like to carry out a systematic investigation that can realize the satisfaction of life of denture wearer by developing items and scales that set up more diversity and influence factors related to life satisfaction.

In this study, we observed various factors affecting the health of female denture wearers by their life satisfaction, which is considered to be valuable as a basic data for oral health related programs for denture wearers. However, it is considered to be a limitation of the systematic subdivision of the measurement tools of denture and oral health related variables. Therefore, the use of correct dentures by denture wearers positively affects not only the oral function but also the satisfaction of life, which is an essential requirement for a happy life.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Hamate Bone Learning Effect Using DICOM Images and 3D Printing

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ABSTRACT

Background/Objectives: This study compared the characteristics and the anatomical learning effects of a hamate bone model printed from DICOM images on a 3D printer.

Method/Statistical Analysis: After printing a hamate bone model from DICOM images obtained from a wrist joint examination using a 3D printer, this study examined the anatomical understanding of 102 university students in public health departments.

Findings: The intuitive awareness and the morphological awareness of the students on the protrusion, front and back of the hamate bone, and 5-way joint contact surfaces which were difficult to identify in conventional 2D and 3D medical images were improved by 60.7% and 58%, respectively.

Improvements/Applications: The experiment showed that instrumenting of shape through 3D printing as a knowledge transfer method for students learning anatomy can improve the learning effect.

Keywords: *DICOM, 3D Printer, hamate bone, learning effect, anatomy*

Introduction

Recently, 3D (Dimension, D) printing technology is developing as it has been applied to various fields such as industry, education, and medical care. In particular, the synergy is increasing as 3D printing is integrated with medical images used for diagnosing the human body for surgical simulation and in the production of implants in the bio-industry[1]. This is an integrated technology of methods for planning the location and extent of the tumor using 3D printing, after 3D CT(Computed Tomography) and MRI(Magnetic Resonance Image) examinations of the patient's surgical site[2-4]. This is based on the study results that 3D structure of a human body can be formed by 3D printing based on DICOM(Digital Imaging and Communications in Medicine)[5]. In addition, the recent social structure has increased a human-centered lifestyle, increasing individual sports activities for promoting health, while golf, tennis, and baseball lovers experience many hamate bone fractures in the wrist joint due to the stress of repeated impact[6]. This is a risk that reflects the protruding characteristics of the hamate bone, which increases the frequency of injuries. This requires the necessity of learning for students majoring in human anatomy. Therefore, this study used DICOM wrist joint images to extract the hamate bone into a 3D image, and performed STL(STereoLithography) modeling to print the shape on a 3D printer for conducting a survey on the students' understanding. The intention is to examine the learning effect of the students' intuitive and morphological understanding by 3D printing the actual hamate bone rather than using 2D or 3D medical images. The purpose of this study is to compare the anatomical understanding of 102 university students in public health departments majoring in human anatomy.

Materials and Method

Study Direction: This study extracted only the hamate bone from the acquired wrist joint DICOM images and created the same shape through 3D printing to evaluate the anatomical understanding of the characteristics by conducting a survey[Figure 1].

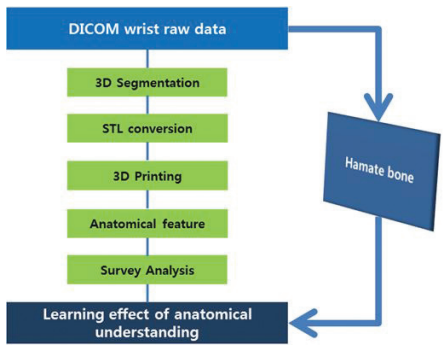
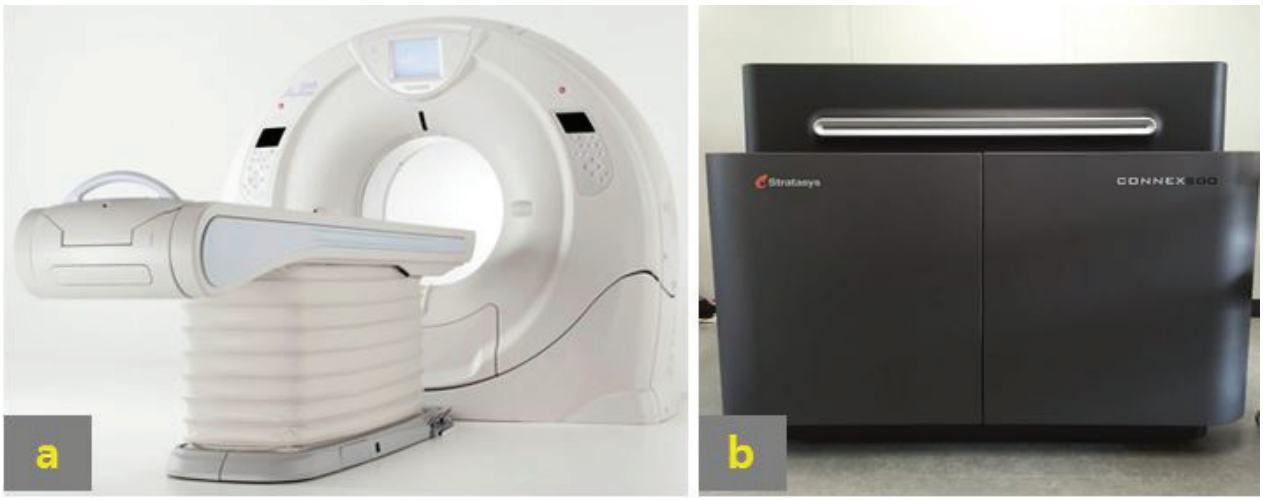


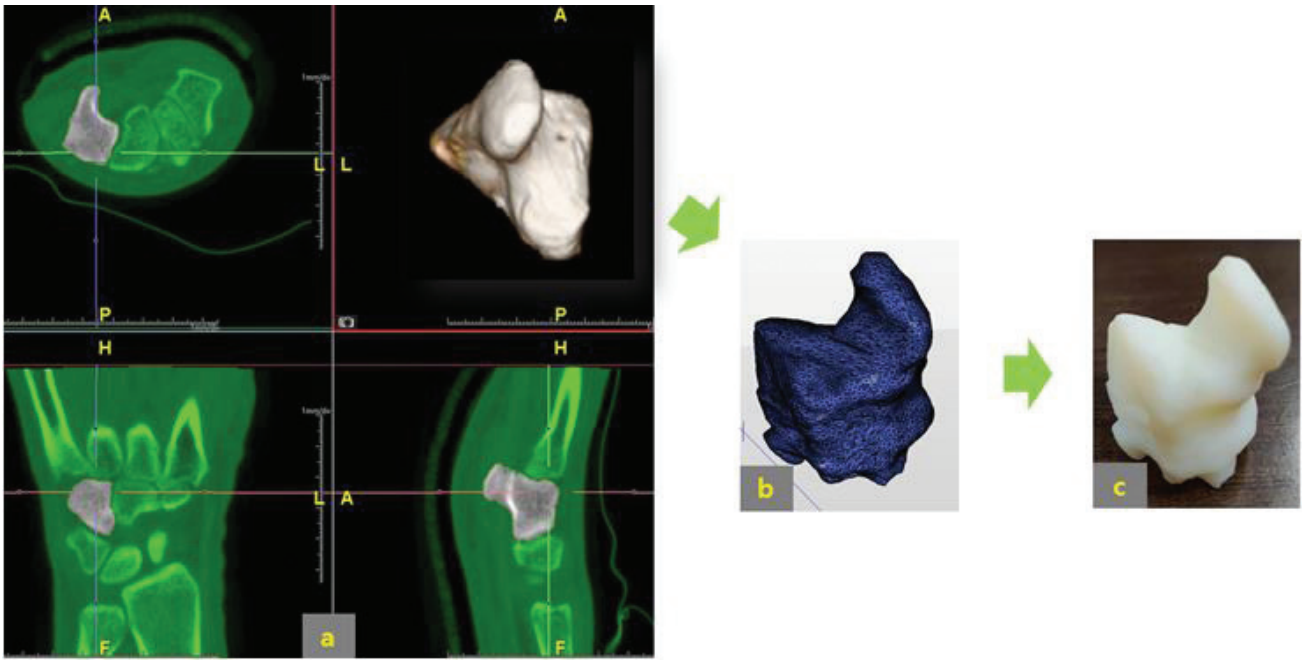
Figure 1: Overall schematic diagram of the experiment

Experimental Equipment and Materials: The wrist joint DICOM image used in the experiment was acquired as a 0.5mm volume image of 640 MSCT (multi-slice computed tomography, Aquilion ONE, TOSHIBA, JAPAN)[Figure 2. a]. This study used a 3D printer(Objet CONNEX 500, Stratasys, USA) to print the shape of the hamate bone by irradiating the liquid resin to solidify the form, and Endur RGD 450 from Stratasys was used as the material[Figure 2. b].



The computed tomography(a) and 3D Printing (b) device
Figure 2: Hamate bone image acquisition device and 3D Printer

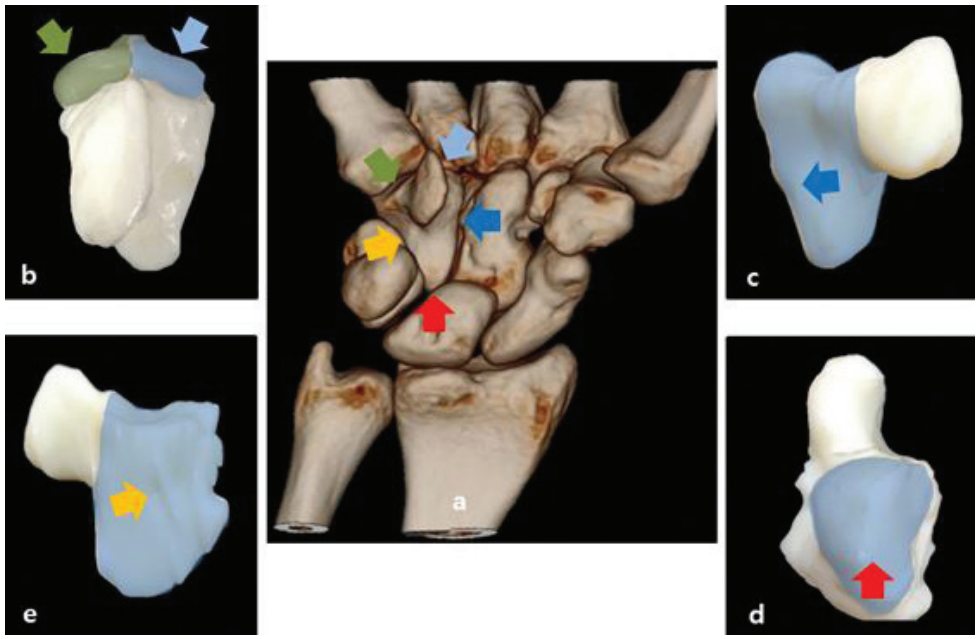
Experimental Method: The wrist joint images acquired by DICOM imaging was segmented using the dynamic region growing tool and free ROI tool of the Aquarius NET (TERARECON, USA) 3D program. Then, after converting to a stereolithography file, 3D printing was performed using the basic G-code of the hamate bone confirmed in STL View [7] [Figure 2. a, b, c]. The survey was performed by a preliminary survey showing only the DICOM image followed by a post-survey showing the image and 3D printed shape using a 5-point Likert scale for 102 university students in public health departments who completed human anatomy classes and compared the results[8].



The segmentation process of the acquired image (a), converted STL shape (b), and3D Printing shape(c).
Figure 3: The process of creating a shape of the hamate bone

Results

Morphological characteristics of the hamate bone



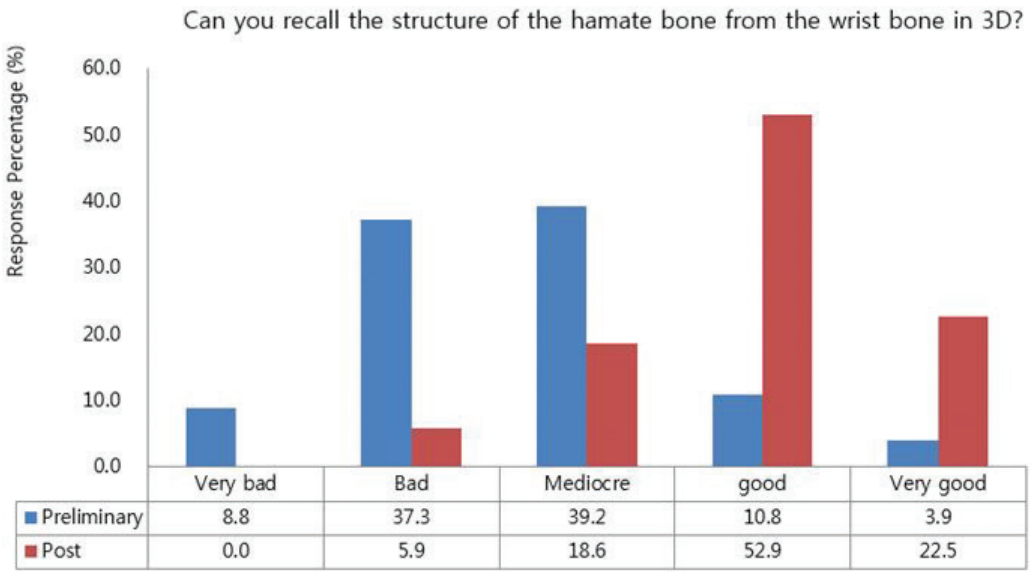
Wrist volume rendering image (a)and various articular surfaces of the hamate bone(b-e).
Figure 4: The joint correlation of the hamate bone within the carpal bone

The front, back, and side of the hamate bone, which is difficult to distinguish visually with 2D and 3D images, were confirmed in 3D printed shape. This shows the 5 characteristic joint surfaces of the hamate bone that are in contact with the 5th metacarpal, 4th metacarpal, Capitate, Lunate, and Triquetrum. As shown in Fig. 4, (a) is the DICOM volume rendering image, and (b) to (e) show the contact surfaces of the hamate bone in the clockwise direction of image (a). Anatomically, (b) is the distant part of the wrist joint, and the hamate bone is divided into the form of a seagull(green and sky-blue arrows), forming a joint in the metacarpal bone. (c) is the articular surface parallel to the long axis of the body, forming the longest articular surface in the hamate bone and a flat boundary with the capitate bone. (d) is the part forming a joint with the lunate, showing a pointed shape in front of the abdomen. (e) is the part forming a joint with the triquetrum and pisiform bone, showing a hollow shape in the center of the articular surface. As such, the overall shape of the hamate bone shows the characteristics of forming an inverted triangle, protruding hook, and 5 joints in an anatomic position[Figure 4].

Evaluation on the hamate bone learning effect: After preparing a questionnaire for 102 university students in public health departments to examine the learning effect of recognizing the hamate bone shape, this study examined and analyzed the preliminary evaluation in which the survey was performed with only the images and the post-evaluation showing 3D printed shape as well [Table 1].

Table 1: Survey questions and evaluation results

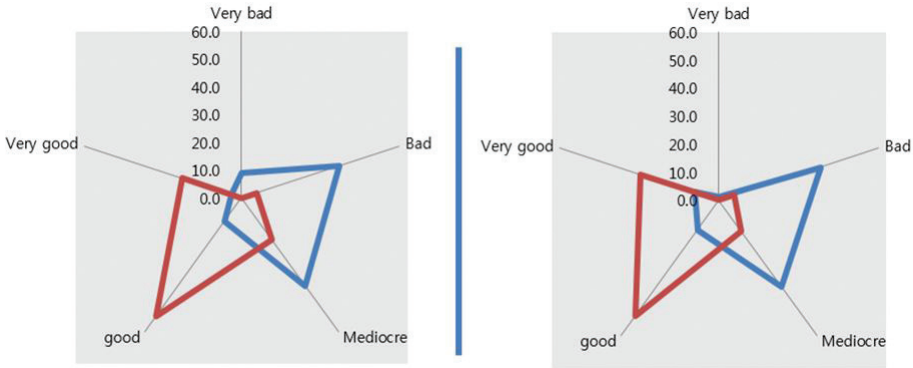
Item	Survey analysis N(%) N = 76, 102						
	Score	Very bad	Bad	Mediocre	Good	Very good	Total
Can you recall the structure of the hamate bone from the wrist bone in 3D?	Preliminary	9(8.8)	38(37.3)	40(39.2)	11(10.8)	4(3.9)	102(100)
	Post	0(0)	6(5.9)	19(18.6)	54(52.9)	23(22.5)	102(100)
Can you distinguish the front and back of the hamate bone in an anatomical position?	Preliminary	1(1.3)	29(38.2)	29(38.2)	10(13.2)	7(9.2)	76(100)
	Post	0(0)	6(5.9)	14(13.7)	52(51)	30(29.4)	102(100)



	Very bad	Bad	Mediocre	good	Very good
Preliminary	8.8	37.3	39.2	10.8	3.9
Post	0.0	5.9	18.6	52.9	22.5

Figure 5: Hamate bone pre- and post-survey learning effect analysis graph

The students who answered "Good" and "Very good" to the question "Can you recall the structure of the hamate bone from the wrist bone in 3D?" increased from 14.7%(preliminary survey) to 75.4%(post-survey), and the students who answered "Good" and "Very good" to the question "Can you distinguish the front and back of the hamate bone in an anatomical position?" increased from 22.4%(preliminary survey) to 80.4%(post-survey). Fig. 5 is a bar graph comparing the 5-point Likert scale survey questions, and Fig. 6 is a radial graph that compares the results of the survey, which shows the preliminary negative opinion(blue) in contrast with the post-positive opinion(red) [Figure 5] [Figure 6].



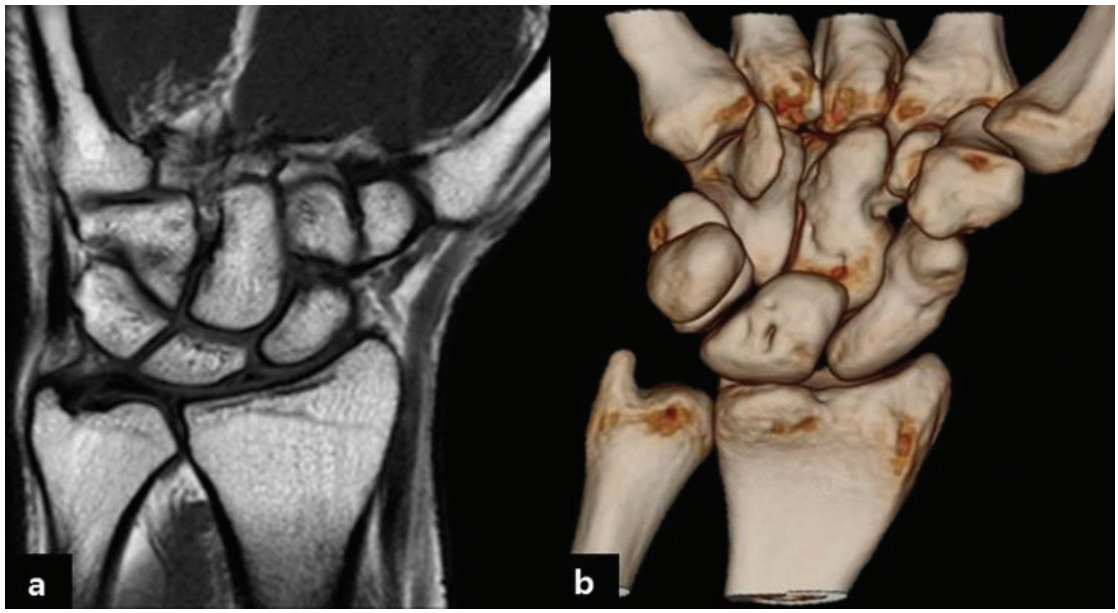
Evaluation on the ability to recognize 3D shape of the hamate bone(left) and the ability to distinguish the front and back of the hamate bone(right).

Figure 6: Comparison of hamate bone pre- and post-survey learning effect

Discussion

This study used DICOM images and 3D printing technology to fabricate the hamate bone of the wrist joint in the human anatomy structure[9-11].With the hamate bone model printed by 3D printing technology, the 5-joint surfaces and the front and back of the protruding hook were examined, which are difficult to identify in 2D and 3D images. This hamate bone is one of the 8 wrist bones and has a distinctive hook of hamate in the front in the shape of a wedge. It also forms a joint with the 4th and 5th metacarpal bone, triquetrum, capitate, and lunate [12]. The various shapes of bones in the human body result from the ligaments and muscles attached to function the human body, and the hamate bone was applied to this study because an important ligament that holds the wrist tunnel is attached to this bone, and recently many injuries have occurred in this area due to the increase of sports activities. This study aimed to explore the understanding of anatomy students by modeling the characteristics of

the hamate bone with 3D printing. With the application of 3D printing, 2D medical images can be instrumented and visualized, which can draw curiosity and interest of the students in future. Designing human anatomical structural models for learning and printing them on a 3D printer will provide a variety of applications for learning [13].Recently, DICOM imaging has the technology to acquire a thin section of less than 0.5mm. Through this technology, the synergies will increase by visualizing the reconfiguration of multiple sections and integrating with 3D printers. As shown in the wrist joint image of this study, it is possible to distinguish several bone shapes and boundaries to some extent, but to understand the 5 articular surfaces of the hamate bone, a lot of time along with 3D reconstruction technology and environment must be accompanied to continuously view and understand many cross-sectional images[Figure 7].As shown in Fig. 8, there are many limitations in enhancing the academic understanding of the various shapes of the hamate bone with DICOM images only [Figure 8].Furthermore, it is more difficult to understand for students with a low level of human anatomical knowledge.



2D coronal section(a) and 3D volume rendering(b) images.
Figure 7: Carpal bone coronal images

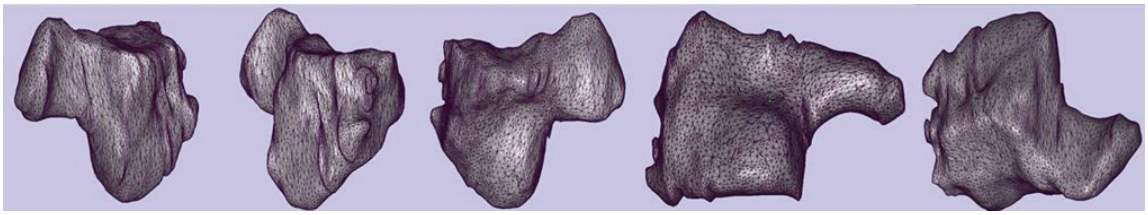


Figure 8: Various shapes of the hamate bone

In the questionnaire survey of this study, only 76 students responded to the question "Can you distinguish the front and back of the hamate bone?", which is considered to be the result of students in lower grades were unable to answer the question. These students are familiar with the term 'hamate bone' but have a low human anatomical understanding of the front and back of the bone. As a result, although this study was limited to 102 university students, the learning effect of showing the actual shape of the hamate bone was high. Therefore, if DICOM technology that is capable of describing the human body and 3D printing technology that can copy the same shape are integrated, the educational effect for students learning human anatomy will increase significantly[14].

Conclusions

A hamate bone printed with 3D printing technology has increased the students' understanding of the 5 articular surfaces and the front and back of the protruding hook that are difficult to identify in 2D or 3D medical

images. This was the result of comparing visual medical images with an actual shape printed on a 3D printer, which resulted in a 60.7% improvement in the intuitive awareness and a 58% improvement in the morphological awareness through a hamate bone shape. This is a result that shows modeling through 3D printing is effective for students learning human anatomy.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Science and Technology on Quality of Life Perceived by College Student

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ABSTRACT

Background/Objectives: We examined the perceptions of how science technology can change quality of life. We wanted to analyze what kind of images students have about science technology and quality of life.

Method/Statistical Analysis: A total of 144 students attending liberal arts classes were asked to describe the impact of science and technology on quality of life. All students were divided into small groups and activities were conducted among the groups. Two experiments were conducted to investigate whether the science technology have a positive or negative impact on quality of life. In addition, we analyzed the factors that lead to positive or negative views.

Findings: We could classify students' images about science and technology and quality of life as mental factors, Socio-economic factors, technical factors and environmental factors. Socio-economic factors accounted for 63% of the total image frequency. The second most common factor was technical factors, accounting for 27% of the total. From the technical point of view, there are many positive factors that can improve the quality of life. Third, mental factors accounted for about 6%. Students thought that science and technology would negatively affect human mental factors. Finally, the image of the environmental factor was 3.7%, indicating that science technology would cause environmental problems such as air pollution and water pollution. The results of the chi-squared analysis showed that the four factors were discriminative factors that showed differences in opinion about how science technology affects quality of life in the future.

Improvements/Applications: In order to improve the quality of life through the development of science and technology, socio-economic, mental factors and environmental factors derived from this study can be reflected in the policy.

Keywords: *Science and technology, future society, quality of life, Perception of university students, chi square analysis*

Introduction

People think differently about how science and technology will affect the quality of human life. To address these problems, some researches have been conducted on how science and technology can affect the quality of life of humans [1-5]. Some people are worried that the development of science and technology led by global corporations can not improve the quality of life of individuals and lead to a dystopian future due to indiscreet development. Some people worry that the development of robotic technology will lose human jobs. But some people think that science and technology in various fields are improving the quality of our lives. It is hoped that science and technology will help the lives of the underprivileged and be very useful for health and welfare, thus improving the quality of human life. They believe that the development of technology to predict and

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respond to natural disasters such as floods and typhoons has ensured a safer life for mankind. Especially, science and technology are directly connects with the economy of the country and have a great impact on the lives of the people.

Quality of life generally refers to the level of mental life, and we tend to regard subjective happiness as the quality of life [6-7]. Quality of life is known not only to economic conditions but also to non-economic factors such as social relations, social psychological factors, institutional factors, environmental factors, and physical factors. The economic condition and the quality of life are known to be less correlated if the economic level exceeds a certain level. If annual GDP is more than $ 10,000 the rate of increase in subjective well-being with income increases tends to decrease [8]. The impact of income on life satisfaction is maximized in a set of annual income less than $ 15,000. When income is above a certain level, non-economic variables determine the quality of life [9].The WHO Quality of Life Groups defines the quality of life as a personal perception of one's own situation in the context of his or her own cultural and value system and his/her goals, expectations, norms and interests [10].UN defined the quality of life from a subjective perspective by defining quality of life as the concept of human welfare measured by social indicators rather than quantitative measures such as income or production [11].

Cho et al. investigated how science and technology affect the quality of lives of the socially underprivileged, and they reported that science and technology have a very positive effect on the quality of life of people with disabilities and the elderly [1]. Through hearing aids, hearing impaired people perceive sounds, perceive their surroundings, communicate with people, and express their opinions. Therefore, hearing aids are very closely related to emotional well-being and satisfaction, interpersonal relations, self-determination and choice, and rights. They said that the quality of life for people with mobility impairments due to electric wheelchairs is greatly improved. Science and technology can contribute to meet social demand and increase social value. When the quality of life and the promotion of welfare are linked with technological innovation, the related industrial base is formed and the development of the industry can create employment and added value. Therefore, they said that it is necessary to promote the technological innovation, the technology acquisition, and the policy and the linkage between them in order to increase the quality of life in the public area [1].

Kang said that quality of life includes value judgment, but science technology itself can be assumed to be value-neutral [2]. Therefore, it is easy to understand how to connect with each other through variables of science and technology utilization rather than directly associating quality of life with science and technology. No matter how wonderful science and technology are, if the use of science and technology plays a negative role in the quality of life, science and technology will greatly deteriorate the quality of life. On the other hand, even if science technology is a little lacking, the quality of life is improved if utilization of science technology plays a positive role in quality of life. A rich life due to the driving force of economic development, a healthy life due to advanced medical equipment, a safe life due to weather forecasts, a convenient life to utilize rehabilitation aids, and so on. However, environmental destruction could lead to global warming, the depletion of energy resources and excessive waste, which could reduce quality of life. He argued that the current use of science and technology should seriously analyze and predict the impact on future quality of life.

Kim claimed that the functions of science and technology should be changed in terms of the quality of life and the role of science and technology [3]. Science and technology should be able to provide meaning for sustainability and concrete measures for achieving it. In order to do this, it is necessary to make efforts for continuous research and information acquisition under global cooperation, and to provide national support for this. Kim suggested that the quality of life can be divided into objective dimension and subjective dimension in the improvement of future life quality and the development of science and technology [4]. The objective dimension is something that can be identified as an objective indicator of physical components such as clothing, health, income and working environment. And the subjective dimension is the cognitive state in which subjective evaluation such as satisfaction, independence, sense of achievement, cultural affluence, safety, and stress works. It is argued that science and technology that promote communication and relationship together will be needed when considering the Korean people's strong desire for competition and expectation.

Cho et al. focused on the impact of science and technology development on quality of life in that science and technology development is aimed at improving the quality of human life [5]. He studied to identify perceptions of quality of life in specific areas. He examined how science and technology affected human economic life quality, healthy life quality, safe life quality, convenient life quality, pleasant life quality, socio-cultural life quality. In addition, research on the sustainability and quality of life of science and technology has confirmed that both agree that science and technology will help improve the quality of life. The results that science and technology can improve the quality of life showed a very positive response overall, and it was confirmed that future generations perceived more positively than current generations. The impact of science and technology on the quality of economic life and the quality of life is more positive for future generations than for generations. The question on safety, education, environment, and society was that the average response of the current generation was higher.

We investigated the perception of college students about the impact of science and technology on the quality of life in the future. Our research team saw a science fiction film about a future society that could come from science and technology. We looked at movies with students over three weeks and looked at college students' perceptions through small-group discussions and mini-essay tests. Students enrolled in liberal arts classes vary from grade 1 to grade 4, with majors in science and arts, and men and women. We analyzed students 'opinions and responses to the effects of science and technology on future students' lives after class. We look at how similar the views of college students are with previous studies. And we want to see if college students have a positive or negative view of science and technology and why they had such a view.

Materials and Method

After the liberal arts class using movies, we conducted mini-essay tests asking students about their personal opinion on the impact of science and technology on quality of life in the future. We asked our students a personal opinion on whether they think science and technology will improve the quality of life in the future or that they will decrease the quality of life. We had asked them to describe three or more freely why they think so. We wanted to know the views on the relationship between science and technology and quality of life. In addition, we wanted to see what images they have about future science and technology.

Test Subjects: The subjects participating in this study are 144 people as shown in Table 1.There are 40 students in science and engineering major and 104 students with major in humanities. The genders participated in the experiment were similar, and 87% of the lower grades were more than two grades. In the first week, students watched the film and in the second week, they lectured on modern genetic engineering techniques that became the background of the movie "Gattaca". In the third week, small groups were discussed about how science and technology would affect future society. In order to analyze their perception and image of science and technology in detail, a mini essay test was conducted.

Table 1: Test subjects

Kinds		Number	Ratio
Grade	Freshman	84	0.583
	Sophomore	43	0.299
	Junior	11	0.0764
	Senior	6	0.0417
Gender	Female	71	0.493
	Male	73	0.507
Major	Science and engineering	40	0.278
	humanities	104	0.722

Research Method: Movie "Gattaca" was released in 1997 and is a science fiction film about how future science and technology can change human life. The film deals with the destruction of human life by science and technology in the future. Those who are born with genetic engineering to remove the recessive factors form the upper echelons of society. However, people born with traditional marital relationships are born with inferior factors. So they are treated as inferior humans and pushed to the bottom of society. The film deals deeply with the negative views that may arise from the development of science and technology. We thought that because of this movie theme, students could have more negative thoughts about science and technology, and that this prejudice could affect the mini essay test.

The subjects of the mini-essay test conducted for the recognition survey of college students were

as follows." Some people dream of a future where all people live happily with the development of brilliant science and technology. However, there are people who pessimistically anticipate the future in which individuals can not enjoy human life because of the side effects of science and technology. Movie "Gattaca" we saw belongs to the latter. Predict whether one thinks science and technology development will improve the quality of life for the future or whether it will decrease it. Explain three or more concrete examples that you can predict and prove your argument in detail.

We categorized the words that students expressed freely about science technology and future quality of life. We could classify all of the students' words into mental factors, social boundary factors, technical factors, and environmental factors. The perception of the students we classify is based on the existing studies that the quality of life is influenced not only by economic conditions but also by non-economic factors such as social, psychosocial, institutional, environmental, and physical factors. However, students' perceptions differed from those of previous studies that showed positive views on existing science and technology. We conducted a chi-square analysis to see if the four factors that were categorized had an effect on students' views and perceptions.

Results and Discussion

Table 2 shows the words related to the image of the science technology described by the students on the quality of life. There were 23 images described by students. We divided them into themes and classified them into mental factors, socio-economic factors, technical factors, and environmental factors. As shown in Table 2, the areas described by the majority of students with the most factors are socio-economic factors. This showed that science and technology have the greatest impact on human socio-economic factors in the students' perception.

Table 2: Students' image on the impact of science and technology on quality of life

Territory	Contents (Frequency/Ratio)
Mental factors	Life satisfaction (1/0.32), Loss of humanity (1/0.32), Depression (2/0.64), Loss of dream (1/0.32), Loss of emotion (1/0.32), Loss of will (6/1.93), Machine dependence (6/1.93).
Socio-economic factor	War(4/1.29), political participation(1.0.32), lack of interpersonal relationship(7/2.26),aging(2/0.64), telecommuting(1/0.32), abundant life(16/5.16), convenient life(13/4.19), welfare system(1/0.32), social unrest(2/0.64), polarization of wealth(32/10.3), job problem(29/9.35), social control(5/1.61), leisure life(17/5.48), alienation(1/0.32), suicide rate(1/0.32), misuse of the technique(14/4.52), monopoly of the technique(25/8.06), ignore life(16/5.16)
Technical factors	treatment of incurable diseases(15/4.84), transportation(7/2.26), robot(7/2.26), artificial intelligence(2/0.64), genetic engineering(4/1.29), space travel(3/0.96), virtual reality(2/0.64), life extension(4/1.29), personal information leak(3/0.96)
Environmental factors	overcoming environmental pollution(2/0.64), environmental pollution(7/2.26), depletion of resources(2/0.64)

Socio-economic factors accounted for 63% of the total image frequency, with 18 factors. The majority of socioeconomic factors were wealth polarization, job problems, monopoly of science and technology, abundant life and leisure life. Positive and negative views were found to be compatible, with a slightly less negative view. The word most often mentioned by students was the polarization of the rich. Students thought that science and technology would encourage the polarization of the poor in the future. Next, students considered their job problems to be serious and human jobs were threatened by high-level robotic engineering. In addition, they believed that the monopoly of science and technology and the abuse of science and technology of a global company or a specific country had a negative impact on humanity. In a positive view, students expected that the development of science and technology would enable them to enjoy leisure life, abundant life and convenient life, and increase human life span. Unusual among negative views, they thought that life-shortening phenomena would appear. This was close to 5%, which seems to be the influence of the film "Gattaca". There was also a lack of interpersonal relationships. We have not found anything different from previous studies in socio-economic factors.

The second most common factor was technical factors with 9 factors, accounting for 27% of the total. In the technical factor, there were many positive views that science and technology can improve the quality of life. The development of artificial intelligence, transportation and robotic technology was expected to make human life more convenient. In addition, medical technology due to genetic engineering was developed, and it was expected that it would be possible to treat incurable disease and give them a healthier life. He also thought that the development of robots would replace dangerous and difficult things that humans should do. On the other hand, a small number of students worried that the information would be collected and leaked by science and technology, which would affect the individual's life negatively.

Third, the mental factor had seven images and was about 6%. They thought that science and technology would negatively affect human mental factors. They thought that when science was highly developed, the dependence on machines increased and humans might fall into a loss of motivation, loss of dream and loss of emotion. They also recognized that human alienation could occur in the future. Finally, the overall image of environmental factors was 3.7%. In environmental factors, very few students thought that environmental pollution would be overcome, but most students thought that science and technology would cause environmental pollution problems such as air pollution or water pollution and depletion of resources, which would reduce the quality of life. There was no significant difference between the factors in the existing studies that have studied the impact of science and technology on quality of life and the image of students' science and technology.

Table 3 shows the chi-square analysis of the students' answers to their positive or negative opinions for four categories of the science and technology. In order to investigate the difference of image perception between positive and negative viewpoints of college students on the impact of science and technology on quality of life, we classified the cognitive contents into mental, socio-economic, technical and environmental factors and then conducted a Kai test. As a result of the analysis, there were statistically significant differences in the image recognition of positive and negative opinions ($\chi 2$ = 28.02, p <.001).

Table 3: Difference between positive and negative views (N = 297)

Item Contents	University students					χ^2
	MF	SEF	TF	EF	Total	
Utopia	1 (1.0)	49 (51.0)	44 (45.8)	2 (2.1)	96 (100.0)	28.02***, df=3
dystopia	17 (8.5)	138 (68.7)	37 (18.4)	9 (4.5)	201 (100.0)	
Total	18 (6.1)	187 (63.0)	81 (27.3)	11 (3.7)	297 (100.0)	
***p < .001., MF: Mental factors, SEF: Socio-economic factors, TF: Technical factors, EF: Environmental factors						

Conclusion

We examined perceptions of the science and technology of college students on the quality of human life through liberal arts classes using movies. We have classified students' images of science and technology into mental, socio-economic, technological, and environmental factors. Students thought that the development of science and technology had the greatest impact on socioeconomic factors among the categories of quality of life. And the number of students who perceived that they would improve their quality of life and the number of students who perceived that they could degrade were similar. On the other hand, students had the perception that technical factors would improve the quality of life. For mental factors, they perceived that science and technology would reduce the quality of life. We conducted a Kai test to see if the four factors have a significant effect on predicting whether to improve or deteriorate the quality of future life. The result showed that there was statistically significant difference in image recognition for the two opposing views of the four factors.

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Conflict of Interest: Nil

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Development of Korean Herbal Medicine Cosmetics Containing Polygonum Multiflorum Extracts

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ABSTRACT

Background/Objectives: The purpose of this study is to develop raw materials of Korean herbal medicine cosmetics that can improve aging skin of middle-aged women through the analysis of anti-oxidation and anti-aging using domestic PolygonumMultiflorum.

Method: Extraction, anti-aging and antioxidant experiments were designed and performed by synthesizing previous studies based on scientific evidence and a prescription in Donguibogam (Treasured Paragon of Eastern Medicine) that utilized PolygonumMultiflorum for regaining vigor and rejuvenating at an old age.

Findings: The result of this study showed that PolygonumMultiflorum presented high anti-oxidation effect from the analysis of Polyphenol, Flavonoid, and DPPH and it also has an excellent inhibiting ability, showing great possibility to be used as a material for functional cosmetics. Moreover, it showed a significant synergy effect in composites mixed with other raw materials at a small mixing quantity.

Improvements/Applications: it has a great potential to be developed as a natural material for complex cosmetics in future.

Keywords: *PolygonumMultiflorum, natural material, complex cosmetics, skin aging, middle-aged women, Korean herbal*

Introduction

Aging population is increasing due to the recent increase in average life span. According to the announcement of Statistics Korea, the proportion of people aged 65 and older in 2018 is 14.3% of total population, indicating that Korea has become an aged society and it is expected to become a super-aged society by 2025 that the proportion of people aged 65 and older will reach 20.0%[1]. Due to such social phenomenon, a lot of interest in elderly life and various efforts to prepare for old age and maintain youth and beauty are being made. Aging is a general and universal phenomenon that everyone experiences in life but it is recognized as a negative matter from various aspects including body, soul, society, and culture in modern society[2]. Therefore, many people are fearful and anxious about aging[3].

Especially, middle-aged woman complain of psychological depression and emptiness from aging that happens suddenly before and after menopause along with physical abnormality. In addition, aging in the middle age impairs the function of the ovaries and reduces hormones such as estrone, estradiol, and estrogen, resulting in a collapse of collagen formation that causes a loss of elasticity and wrinkles. In other words, the vitality is lost in terms of functionality as well as beauty. The desire to prevent or improve such skin aging is growing further in proportion to the improvement of general living standard and trend of studies on anti-aging and development of raw materials is switching from a passive concept as “prevention of aging” to an active concept as “treatment”[4]. The cosmetics industry is equipped with anti-aging system that can remove and prevent excessive oxygen free radicals from the skin and studies regarding natural antioxidants that can delay the aging of skin are being carried out actively[5].

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Polygonum Multiflorum is a tuberous root of Polygonummultiflorum Thunberg which is a perennial herb and it belongs to Polygonaceae. Polygonum Multiflorum is classified into red Polygonum Multiflorum and white Polygonum Multiflorum, and red Polygonum Multiflorum is a polygonaceae plant which is distributed and inhabits in Henan, Guangxi, Guangdong, Sichuan, and Guizhou in China[6,7]. In addition, white Polygonum Multiflorum is an asclepiadaceae plant which is distributed and inhabits in Korea, China, and Japan and its cultivation method has been developed recently, so it is cultivated and produced in various areas[8]. The composition of Polygonum Multiflorum includes starch 45%, crude face 3.1%, anthraquinoneemodin, lecithin, and shrysophanol and among these components, emodin shows the highest content and it is reported that it has antibacterial, antioxidant, anti-inflammatory, and anti-tumor activities[9,10].

Therefore, the purpose of this study is to confirm the antioxidant effect and skin-aging improvement effect of PolygonumMultiflorum which is a natural herbal raw material and present direction of raw material development for multi-functional cosmetics.

Materials and Method

Materials for Experiments and Production of Extracts: Pleuropterusmultiflorus, used as the experimental specimen, was purchased from a farm in Jangsu-gun, Jeollabuk-do Province in May 2017, and it was used after the process of washing and drying. 100 mL of three types of solvents (DW, 70% EtOH, 99% EtOH) were applied to 10 g of dried Pleuropterusmultiflorus, respectively. The extract was obtained using reflux condenser (Labpia, LP, Korea) at 40°C~80°C for 24 hours. After filtering the extract (No.2, Advantec, Japan), a vacuum evaporation was carried out using the rotary evaporator (Rotary Evaporator N-1000SW, Eyela, Japan). The final specimen powder was obtained from the vacuum evaporated Pleuropterusmultiflorus extract using the lyophilizer (Lyophilizer FD5508, Ilshin Lab co., Korea).

MTT Assay: For the RAW 264.7 cells used in the cell experiment for toxicity assessment, the cells obtained after culturing for 3 days using the DMEM culture medium were divided into 24 well plates by 1.5×10^5 and cultured at 37°C, 5% CO2 culture medium for 24 hours. When the cells were grown by more than 90%, 10, 50, 100 μg/mL were set as the final concentration of three different extracts, and the cells were divided into each well by 100 μL and cultured again for 24 hours. After reaction, 900 μL of culture medium and 100 μL of 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) were added and reacted for 2 hours. The culture medium was removed after 2 hours, and 100% DMSO 1mL was added to resolve MTT fomazan absorbed into the cells, and the cells were separated into 96-well plates by 50 μL and the absorbance was measured at 570 nm using the microplate reader (Synergy MX BioTek instrument, Winooski, VT).

Measurement of Total Polyphenol Content and Total Flavonoid Content: For total polyphenol compound content of the extract, experiment was conducted using the modified Folin-Denis method showing a change in color through the reaction with a certain reagent (phosphomolybdic acid). 100 μL of extracted specimen and 1 mL of 2% Na2Co3 were mixed and reacted for 2 minutes, and then 100 μL of 50% Folin-ciocalteu's phenol regent concentration was added and reacted for 30 minutes. Total flavonoid content per gram was measured using the Diethylene glycol method. 100 μL of extracted specimen, 100 μL of 1N NaOH and 1 mL of diethylene glycol were added and reacted at 30°C for 1 hour. The discoloration was measured using the UV/VIS spectrophotometer (OPTIZEN 2120UV, Mecasys co. Korea) at 750 nm for total polyphenol and 420 nm for total flavonoid.

Dpph Radical Scavenging Activity: The antioxidant activity was measured using the modified 1,1-diphenyl-2-picrylhydrazyl (DPPH) radical scavenging activity Blois which was one of most general methods. Triz buffer and Methanol 500 mM DPPH with a pH of 7.4 were produced. 100 μL of extracted specimen, 400 μL of 0.1M Triz buffer and 500 μL of 500 mM DPPH were mixed and reacted for 30 minutes and the absorbance wad measured at 517 nm.

Measurement of Elastase Inhibitory Activity: The extracted specimen was diluted by 0.1%, 1%, 10% and 100%, respectively and elastase and N-succinyl-(L-Ala)3-pnitrianilide were dissolved in 50 mMTris-HCl buffer (pH 8.6). 40 μL of 2.5 U/mL elastase concentration was added to 40 μL of the specimen, and then 80 μL of 0.5 mg/mL N-succinyl-(L-Ala)3-p-nitroanilide concentration was added and reacted at 37 °C for 30 minutes, and then the absorbance was measured at 445 nm wavelength.

Measurement of Collagenase Inhibitory Activity: The extracted specimen was diluted by 0.1%, 1%, 10% and 100%, respectively and 4-phenylazobenzyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg was dissolved in 0.1M Tris-HCl buffer (pH 7.5) added with 4 mM CaCl2. 250 µL of 0.3 mg/mL 4-phenylazobenzyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg concentration was applied to 100 µL of the specimen, and 150 µL of 0.2 mg/mL collagenase concentration was added and reacted for 20 minutes, and then, 500 µL of 6% citric acid and 1.5 mL of ethyl acetate were applied and the absorbance was measured at 320nm wavelength.

Sub-title: All results were measured and analyzed repeatedly for three times. For the verification, the significance at $p<0.05$ was investigated with Duncan' multiple range test during the oneway analysis of variance (ANOVA) using the SPSS 20 (SPSS Inc., Chicago IL, USA).

Results and Discussion

MTT Assay: The cytotoxicity result of Pleuropterusmultiflorus extract was shown in Figure 1. The cell survival rate in all extracts was over 80%, indicating that Pleuropterusmultiflorus extract had no cytotoxicity.

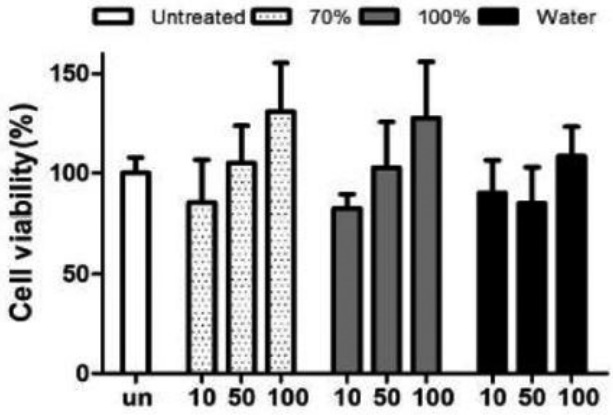

Figure 1: Cell viability of RPME

Analysis of total polyphenol content and total flavonoid content: Polyphenol and flavonoid are typical antioxidants in plants that have various effects. Especially, such substances affect the skin, preventing natural aging due to oxygen free radical. These substances are very effective for rapid skin aging of middle-aged women who entered menopause [11]. In addition, antioxidants are essential for preventing or making skin pigments such as freckles and blemishes caused by the irregularity of melanin in the skin due to reduced estrogen lighter[12]. Total polyphenol content and total flavonoid content in Pleuropterusmultiflorus extract were shown in Table 1. Both of these substances showed excellent antioxidant effects, indicating that these substances are suitable for antioxidants.

Table 1: According to solvents contents of total polyphenol and total flavonoid

Solvent	D.W	70%EtOH	100% EtOH
T. P.	12.53 ± 0.02 mg/g	26.22 ± 0.06 mg/g	39.38 ± 0.08 mg/g
T. F.	0.10 ± 0.01 mg/g	0.13 ± 0.01 mg/g	0.13 ± 00.01 mg/g

Analysis of DPPH radical scavenging ability: The DPPH radical scavenging activity comparison result of Pleuropterusmultiflorus extract according to solvents was shown in Table 2. The extract showed concentration dependent antioxidant effect and the antioxidant effect was shown in order of "70% EtOH> 100% EtOH> distilled water" according to the comparison result by solvent. The result at 10000 ppm was similar to that of Ascobic acid which was the control group, indicating that the antioxidant effect of Pleuropterusmultiflorus extract was highly superior.

Table 2: According to solvents DPPH radical scavenging ability

Solvent	D.W.	70% EtOH	100% EtOH
10 ppm	12.00 ± 0.35, %	11.93 ± 0.25 %	9.06 ± 0.20 %
100 ppm	21.04 ± 0.06 %	20.04 ± 0.11 %	22.80 ± 0.04 %
1000 ppm	53.97 ± 0.18 %	78.77 ± 0.05 %	72.72 ± 0.40 %
1000 ppm	64.59 ± 0.36 %	82.39 ± 0.04 %	75.03 ± 0.05 %

Analysis of elastase inhibitory activity: According to the research paper of Jin (2015) [13], anti-aging materials of representative domestic cosmetics companies included retinol from Amore Pacific, culture medium of a stem cell from plant cambium jointed developed by LG Household & Health Care Ltd. and the Sederma research institute in France, and peptide from ISA KNOX. Such anti-aging cosmetics materials display excellent ability to inhibit Elastase or Collagenase activities that cause

a loss of elasticity and wrinkles [14]. Therefore, the test substance formula containing DCCM4 which was the culture medium of a stem cell supplied from SMEDIA was used as the control group in the analysis of Elastase inhibitory activity and Collagenase inhibitory activity for anti-aging analysis. In addition, the specimen extracted with 70% EtOH solvent which showed the highest effect in the antioxidant activity test was used for Pleuropterusmultiflorus extract. The measurement result of elastase inhibitory activity from three specimen types was shown in Figure 2. All specimens were concentration dependent and DCCM4 showed higher inhibitory activity by concentration than Pleuropterusmultiflorus extract, but composites containing 10% Pleuropterusmultiflorus extract showed higher activity than DCCM4, indicating that the mixing with low concentration natural substance shows a higher effect.

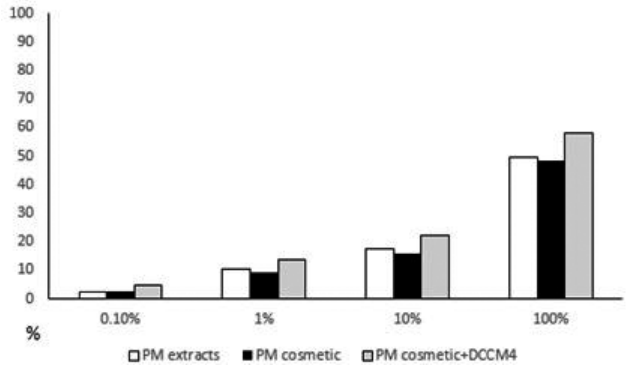

Figure 2: Elastase inhibitory activity of Samples were incubated at 0.1,1, 10 and 100% with elastase, N-succinyl-(L-Ala)3-p-nitroanilide for 30 mins. Activities were etermined by measurement of absorbance at 445 nm. The results were express asmean ± S.D from three independent experiments

Analysis of collagenase inhibitory activity: The measurement result of collagenase inhibitory activity from three specimen types was shown in Figure 3. These specimens were concentration dependent similarly to the elastase inhibitory activity result, but the result of composites and single DCCM4 was similar, so there was no significant difference. Various factors cause skin aging in the middle age, and one of most significant factors is the activation of enzymes that break down connective tissues such as collagen [15]. Therefore, it is considered that Pleuropterusmultiflorus extract which effectively inhibits the activation of enzymes is highly suitable as a raw material for anti-aging cosmetics, and Pleuropterusmultiflorus extract is also natural herbal substance that can solve various problems from synthetic materials that may occur in the middle age.

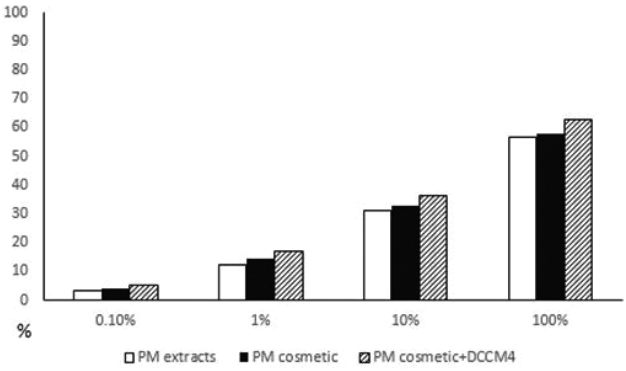

Figure 3: Collagenase inhibitory activity of Samples were incubated at 0.1,1, 10 and 100% with Collagenase, 4-phenylazobenzyloxycarbonyl-Pro-Leu-Gly-Pro-D-Arg for 20 mins. Activities were determined by measurement of absorbance at 320 nm. The results were express as mean ± S.D from three independent experiments

Conclusion

In this study, it was intended to develop raw materials of Korean herbal medicine cosmetics for middle-aged women using PolygonumMultiflorum that only grew naturally in Korea. The result of the study showed that PolygonumMultiflorum contained high content of polyphenol and flavonoid that were typical antioxidants of plants and DPPH activity similar to that of ascobic acid which was the control group at 10,000 ppm, proving that it was an excellent antioxidant. It also showed a high Elastase and Collagenase inhibitory activity, and especially, composites containing 10% extract showed very high Elastase inhibitory activity, so it is considered that PolygonumMultiflorum extract is suitable as a natural and herbal functional raw material.

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Moderating Effects of Wage Satisfaction and Social-organizational Support on the Relationship between Emotional Dissonance and Turnover Intention among Korean Dental Hygienists

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ABSTRACT

Background/Objectives: Emotional dissonance is a risk factor for job dissatisfaction among healthcare workers. This study investigated the moderator variables influencing the relationship between emotional dissonance and turnover intention.

Method/Statistical Analysis: This cross-sectional study surveyed 270 Korean dental hygienists working full-time at dental care facilities using a structured questionnaire. Socio-demographic characteristics, emotional dissonance, turnover intention, and individual and organizational factors were collected. The individual and organizational factors were considered moderator variables. The t-test, one-way ANOVA, and moderated multiple regression were used.

Findings: Dental hygienists experiencing more emotional dissonance had higher turnover intention ($p<0.001$). The relationship between emotional dissonance and turnover intention was moderated by wage satisfaction and social-organizational support ($p<0.05$), but not by individual factors. These findings suggest that intervention strategies to buffer, effectively, turnover intention due to emotional dissonance should be developed and implemented at an organizational level.

Improvements: Further studies must examine a greater variety of moderator variables that may effectively mitigate turnover intention.

Keywords: *Dental hygienists, Emotional dissonance, Social-organizational support, Turnover intention, Wage satisfaction*

Introduction

Dental care facilities are facing competitive pressure and unprecedented challenges[1]. Patients expect high-quality dental care, increasing the potential for patient complaints[2]. As patient satisfaction can have an impact on the business performance of a health care facility, particularly on the patients' cooperation with treatment[3], health professionals must make efforts to provide high-quality health care. Furthermore, the patient's perspective is becoming more and more important in evaluating the quality of health care[4], exposing more health professionals to situations where they must behave or express their feelings in accordance with rules and regulations defined by the organization[5]. In such a patient-driven work environment, emotional labor—the process of managing one's true feelings and expressions—is increasingly important for health professionals, including dental hygienists[6]. Unfortunately, emotional dissonance i.e., the conflict due to the discrepancy between emotions experienced by the employee and those required by the organization, is

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prevalent among health professionals, resulting in severe side effects[7,8]. Generally, when health professionals experience emotional dissonance, they choose a harmful coping strategy such as surface acting, which leads to increased work strain, to fulfill their responsibilities to the patients[9]. As a result, substantial literature has highlighted that emotional dissonance is a risk factor for emotional exhaustion[10], medically certified absence due to illness[11], and depression[12]. In addition, emotional dissonance causes job dissatisfaction and burnout, and thus may be a reason for changing jobs[8,13]. Therefore, emotional dissonance should be considered not just as a personal matter, but also as a social issue.

Effective management of health care staff is important to achieve business targets, while at the same time aiming to improve of the patients, and is particularly relevant in the highly labor-intensive industry of dental care[14]. Dental hygienists providing oral hygiene services while also interacting verbally and face-to-face with patients. Therefore, as caregivers dental hygienists are required to conform to emotional regulations with respect to expressing appropriate emotions to patients[15,16]. While emotional dissonance has received much attention among caregivers in the medical sector, we know little about how this impacts dental hygienists[5].

The purpose of this study was to identify the relationship between emotional dissonance and turnover intention among dental hygienists, and to analyze the moderator variables influencing the relationship between emotional dissonance and turnover intention.

Materials and Method

Participants: This study was approved by the Institutional Review Board (IRB) of Gachon University, Korea (IRB NO. 1044396–201411- HR-028-01), and conducted in accordance with the tenets of the World Medical Association Declaration of Helsinki. Participants were recruited from 30 dental care facilities in Seoul and Incheon, Korea. The study's purpose and methods were sufficiently explained to the full-time dental hygienists. They signed a consent form, and completed a self-administered questionnaire during the period from December 15, 2014 through January 17, 2015. The minimum sample size required for multiple linear regression was calculated using G*power 3.1 software with the following parameters; 95% power, 5% significance level, and 0.15 medium effect size[17]. The minimum sample size was determined to be 214. Considering the possibility of attrition, the survey was distributed to 300 participants; ultimately, 275 questionnaires were returned. Five of the questionnaires had missing data and were excluded, therefore a total of 270 questionnaires were used in the statistical analysis.

Study Design: This study used a cross-sectional design. The design of the study, based on the stressor-strain-outcome model[18], is shown in Figure 1.

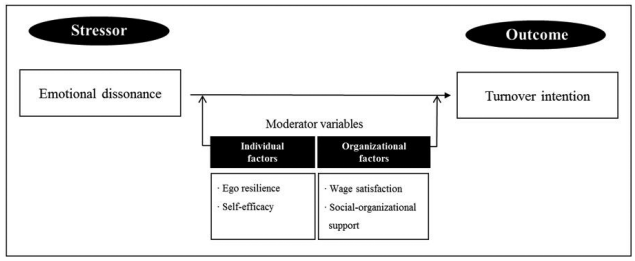

Figure 1: The Conceptual Model

Measurements: Five types of data were collected: socio-demographic characteristics (age, educational level, main professional duty, clinical experience), emotional dissonance, turnover intention, and individual factors (ego resilience and self-efficacy) and organizational factors (wage satisfaction and social-organizational support), treated as moderator variables. Emotional dissonance was assessed via the 14-items scale[19]. The scoring options ranged from 0 (not at all) to 4 (almost always), with high scores indicating greater emotional dissonance. Turnover intention is defined as an employee's intention to voluntarily leave a job or company[20]. Five items were used to assess turnover intention[21]. The scoring options ranged from (not at all) to 4 (very much), and higher scores were considered indicative of greater turnover intention. Ego resilience is defined as the personality trait of not becoming frustrated, but rather adapting to stress and incessant environmental changes[22]. The 14-item scale was used to assess ego resilience[23]. The scoring options ranged from 0 (not at all) to 3 (very much), and higher scores were interpreted to show higher ego resilience. Self-efficacy is defined as a personal judgment of an individual that he/she can successfully accomplish a task necessary to achieve his/her desired result[24]. The ten items were used to assess self-efficacy and rated on a 5-point scale[25]. Higher scores were considered indicative of greater self-efficacy. The five items were used to assess wage satisfaction[26]. The scores ranged from 0 (not at all) to 4 (very much), with higher scores indicating greater wage satisfaction. Social support refers to the helpfulness

of social interactions with both supervisors and peers in regard to work performance[27]. A scale consisting of 8 items was used to assess social support[28]. Organization support is the extent to which an employee believes that his/her organization cares about his/her well-being and endeavors to fulfill his/her socioemotional needs[29]. The 13-item scale was used to assess organization support herein[29]. Both measures were scored via 5-point Likert scales ranging from 0 (strongly disagree) to 4 (strongly agree). To quantify the overall support level within the dental care facility, scores on the two scales, social support and organization support, were combined. A higher score indicates greater social-organizational support.

Statistical Analysis

The collected data were analyzed using SPSS for Windows software (ver. 18.0; IBM Corp., Armonk, NY, USA), with statistical significance set at $p<0.05$. The t-test and one-way ANOVA were conducted to analyze differences in emotional dissonance and turnover intention according to socio-demographic characteristics. Moderated multiple regression (MMR) was conducted to measure the moderating effect of individual factors and organizational factors on the relationship between emotional dissonance and turnover intention[30]. To reduce the multicollinearity problems, mean centering was performed on independent variables and moderator variables. In the MMR analysis, the dependent variable was turnover intention and the independent variables were input in the following order: Step 1: emotional dissonance, Step 2: emotional dissonance and moderator variable, Step 3: emotional dissonance, moderator variable, and interaction term (emotional dissonance × moderator variable). To demonstrate a moderating effect, two conditions must be met: First, the adj. R^2 value must gradually increase across steps; and second, the p-value of the F change must be less than 0.05[31].

Results

Turnover intention according to socio-demographic characteristics: Dental hygienists who reported their main duty was clinically focused and limited to scaling/preventive care showed higher turnover intention than their peers in charge of consulting/management support ($p<0.01$) [Table 1].

Table 1: Turnover Intention according to Socio-demographic Characteristics

Variables	Participants	Emotional dissonance		Turnover intention	
		Mean ± SD	t or F (P value)	Mean ± SD	t or F (P value)
Age					
≤25	111	31.87 ± 7.18	2.070 (0.128)	11.58 ± 4.43	1.441 (0.238)
26-30	104	32.66 ± 6.45		10.90 ± 4.20	
≥31	55	30.27 ± 7.85		10.40 ± 4.72	
Educational Level					
College diploma	158	31.44 ± 6.98	-1.145 (0.253)	11.49 ± 4.33	1.846 (0.066)
University	112	32.44 ± 7.21		10.49 ± 4.48	
Main Duty					
Consultation, management support	149	31.49 ± 7.63	-0.932 (0.352)	10.42 ± 4.51	-2.737 (0.007)
Scaling, preventive care	121	32.30 ± 6.34		11.88 ± 4.17	
Clinical Experience (yrs.)*					
≤6	166	31.95 ± 7.23	0.293 (0.770)	11.29 ± 4.53	0.994 (0.321)
≥7	104	31.69 ± 6.86		10.74 ± 4.21	

*Divided by participants' medium score.

Moderating effect of individual factors on the relationship between emotional dissonance and turnover intention

Moderating effect of self-efficacy: In multiple regression analysis, adj. R^2 decreased from Step 1 to Step 2 and the significance of F change was 0.450, demonstrating no significant moderating effect of self-efficacy on the relationship between emotional dissonance and turnover intention [Table 2].

Moderating effect of ego resilience: Adj. R^2 decreased from Step 1 to Step 2, and the significance of F change was 0.862, demonstrating no significant moderating effect of ego resilience [Table 2].

Table 2: Moderating Effect of Individual Factors on the Relationship between Emotional Dissonance and Turnover Intention

Moderator	Step	R	R^2	Adj. R^2	Std. error of the estimate	Change statistics		
						R^2 change	F change	Sig. F change
Self-efficacy	1	0.279[a]	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.283[b]	0.080	0.073	4.251	0.002	0.573	0.450
	3	0.292[c]	0.085	0.075	4.247	0.005	1.496	0.222
Ego resilience	1	0.279[d]	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.280[e]	0.078	0.071	4.256	0.000	0.030	0.862
	3	0.282[f]	0.079	0.069	4.261	0.001	0.306	0.580

[a]predictors: emotional dissonance

[b]predictors: emotional dissonance, self-efficacy

[c]predictors: emotional dissonance, self-efficacy, interaction term (emotional dissonance × self-efficacy)

[d]predictors: emotional dissonance

[e]predictors: emotional dissonance, ego resilience

[f]predictors: emotional dissonance, ego resilience, interaction term (emotional dissonance × ego resilience)

Moderating effect of organizational factors on the relationship between emotional dissonance and turnover intention

Moderating effect of wage satisfaction: The value of adj. R^2 increased from 7.5% to 30.7% between Step 1 and Step 2, and then again to 31.6% between Step 2 and Step 3 ($p<0.05$) [Table 3]. Thus, the relationship between emotional dissonance and turnover intention was moderated by wage satisfaction.

Moderating effect of social-organizational support: The value of adj. R^2 increased gradually, from 7.5% (Step 1) to 23.8% (Step 2) and to 25.1% (Step 3) ($p<0.05$) [Table 3]. Thus, the relationship between emotional dissonance and turnover intention was moderated by social-organizational support.

Table 3: Moderating Effect of Organizational Factors on the Relationship between Emotional Dissonance and Turnover Intention

Moderator	Step	R	R^2	Adj. R^2	Std. error of the estimate	Change statistics		
						R^2 change	F change	Sig. F change
Wage satisfaction	1	0.279[a]	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.559[b]	0.312	0.307	3.676	0.234	90.891	<0.001
	3	0.569[c]	0.323	0.316	3.653	0.011	4.328	0.038
Social-organizational support	1	0.279[d]	0.078	0.075	4.248	0.078	22.697	<0.001
	2	0.494[e]	0.244	0.238	3.855	0.166	58.466	<0.001
	3	0.509[f]	0.259	0.251	3.822	0.015	5.523	0.019

[a]predictors: emotional dissonance

[b]predictors: emotional dissonance, wage satisfaction

[c]predictors: emotional dissonance, wage satisfaction, interaction term (emotional dissonance × wage satisfaction)

[d]predictors: emotional dissonance

[e]predictors: emotional dissonance, social-organizational support

[f]predictors: emotional dissonance, social-organizational support, interaction term (emotional dissonance × social-organization support)

Discussion

This study showed that higher emotional dissonance leads to higher turnover intention among dental hygienists. This result supports the result of a previous study that the more emotional regulation and suppression that is demanded by a work environment, the higher the level of turnover intention that its employees have[32]. As regulating and suppressing one's feelings requires effort and energy[33], excessive emotional dissonance increases the rate of burnout among dental hygienists[15], which may have strengthened their intention to change vocation. Therefore, understanding the emotional dissonance of dental hygienists is important to increase their job satisfaction and reduce turnover intention.

In exploring the moderator variables of the relationship between emotional dissonance and turnover intention, the moderating effects of wage satisfaction and social-organizational support were demonstrated, but the effects of individual factors were not. These findings indicate that intervention strategies provided by organizations and supervisors are more effective than individual factors in buffering the negative effect of emotional dissonance. First, the results confirmed that turnover intention due to emotional dissonance decreased as wage satisfaction increased [Table 3]. This is in line with a previous study that reported that wages influence the rate of burnout, and that wage dissatisfaction can lead to job dissatisfaction and turnover[34]. Wage dissatisfaction is one of the primary reasons cited as to why Korean dental hygienists leave their jobs[35]. Therefore, adoption of a wage system that sufficiently acknowledges the energy-consuming nature of the emotional labor and duties of dental hygienists is expected to buffer, to some extent, the negative effects of emotional dissonance. Second, in accordance with a previous study of health professionals[36], the current study of dental hygienists concluded the subjects had low turnover intention when their perceived level of social-organization support was high; that is, social-organizational support was confirmed as a significant predictor of turnover intention in the context of the relationship between emotional dissonance and turnover intention. As proposed by some researchers, support from colleagues is one of the most acceptable ways to address chronic and cumulative stress among dental hygienists and reduce their turnover intention[37,38]. Research has shown that support from colleagues increases the level of knowledge of social support beneficiaries and helps improve their mental health[39], which, in turn, reduces the negative consequences of emotional dissonance[5]. Therefore, a preceptor system to facilitate communication and information-sharing among colleagues can be an effective way to promote social support among dental hygienists. Additionally, as an organizational measure to reduce turnover intention due to emotional dissonance, customized mentoring programs can be developed and implemented to facilitate understanding of stress and improve interpersonal interaction skills.

This study had several limitations. First, there may be a geographical bias in the findings because the participants were dental hygienists working at dental care facilities in only two large-sized cities in Korea. In addition, as there are a variety of reasons for turnover intention, reductions in turnover intention may be limited by using interventions addressing only the moderator variables identified in this study. Therefore, further studies must examine a greater variety of moderator variables that may effectively mitigate turnover intention. Longitudinal studies should also be conducted that cover wider regions and include larger samples. Nonetheless, this study is significant in that it demonstrates the importance of organizational factors, such as wage satisfaction and social-organizational support as moderator variables that can reduce turnover intention due to emotional dissonance among dental hygienists. The findings are expected to be useful in improving the occupational well-being of dental hygienists and managing human resources more effectively.

Conclusion

Dental hygienists experiencing greater levels of emotional dissonance had higher turnover intention. Organizational factors were confirmed to have moderating effects on the relationship between emotional dissonance and turnover intention, but individual factors were not. Therefore, intervention strategies to effectively buffer turnover intention due to emotional dissonance should be developed and implemented by dental care facilities at an organizational level.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Study on the Relationship between Social Support and Life Satisfaction of College Students

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ABSTRACT

Background/Objectives: The aim of this study was to investigate the relationship between social support according to gender, grade, and residential type and between social support and life satisfaction of college student.

Method/Statistical Analysis: A survey was conducted among 444 college students in Gangwon area, South Korea. Questionnaire was composed of 32 items which consist of 27 items of social support and 5 items of life satisfaction.

Findings: Analysis showed that male in the relationship between social supports according to gender showed a significant difference in the teaching support. The relationship between social supports according to grade showed significant differences in parents, teaching support. The boarding house receives more friend support than other residential type. Social support and life satisfaction showed a correlation, teaching support and life satisfaction was the highest coefficient of correlation.

Improvements/Applications: There was a significant difference in teaching support among males than female's students, and there was a significant difference in teaching support among the lower grades than in the upper grades.

Keywords: *Life satisfaction, Social support, Parents support, Friend support, Teaching support, College students*

Introduction

After entering college, students experience many confusions and conflicts in their academic lives due to the different environments of the high school [1]. In fact, college is a time to prepare for life outside adolescence. As the grade increases, it gradually becomes recognized as an important process for expanding social awareness and forming a close relationship with others. Therefore, the high satisfaction of life obtained during the university life plays an important role in designing the future positively[2]. The main factors influencing the satisfaction of life during college are social support composed of various social relations related to parents, friends and university professors [3]. This is closely related to emotional support that affects self-concept in individuals [4]. Specifically, social support can be classified as parent, friend, or faculty support. First, parent support is a sub-concept of social support, which means the help provided by parents, but it is an important factor that greatly influences career choice and value formation in social support [5]. Second, friend support is an important social factor that occurs throughout the entire human life cycle. Therefore, it plays an important role in solving various problems and forming a good social relationship through appropriate human relations with friends [6]. Lastly, teaching support is a factor that influences the level of school adaptation of students. If teaching support is high, life satisfaction can be easily

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increased through high adaptation at college [4]. In fact, in the case of male students, the lower the sociality than the female students, the more difficult it is in friendship [7]. In addition, the lower the grade, the higher the reliance on social support through parent supports [3]. Therefore, it is important to analyze the relationship between social support and life satisfaction of students in understanding the stress of university students' adaptation to school life and their worries about career after graduation. In addition, college students experience a variety of residential spaces, such as dormitories, boarding houses, and self-help, away from their own homes, which can also affect life satisfaction [8]. The purpose of this study is to investigate the correlation between college students' gender, grade, and type of residence, parent support, friend support, and teaching support.

Materials and Method

Subjects: This study was conducted on 444 male and female students in a university located in Gangwon-do. There were 252 male students (56.8%) and 192 female students (43.2%), 122 students (27.5%) in the first grade, 131 students (29.5%) in the second grade, 138 students in the third grade (31.1%) and 53 students in the fourth grade (11.9%).In addition, the residence type of the subjects was the highest with 263 dormitories (59.2%), followed by 150 (33.8%), 23 (5.2%), 4 (0.9% [Table 1].

Materials: In this study, we used the social support scale (SSS) and the Korean version of the Life Satisfaction Scale (SWLS-K) support scale, SSS) was composed of 27 items, each with 9 items for each of three parents, friends, and faculty members. The higher the score for each item, the more social support means high.In addition, the Korean version of the satisfaction with the life scale (K-SWLS) was composed of 5 items. Each question was a simple scale that responded to the 7-point scale. The higher the score, the higher the satisfaction of life[9].In this study, the items were revised and supplemented as the test items based on college students[Figure. 1].

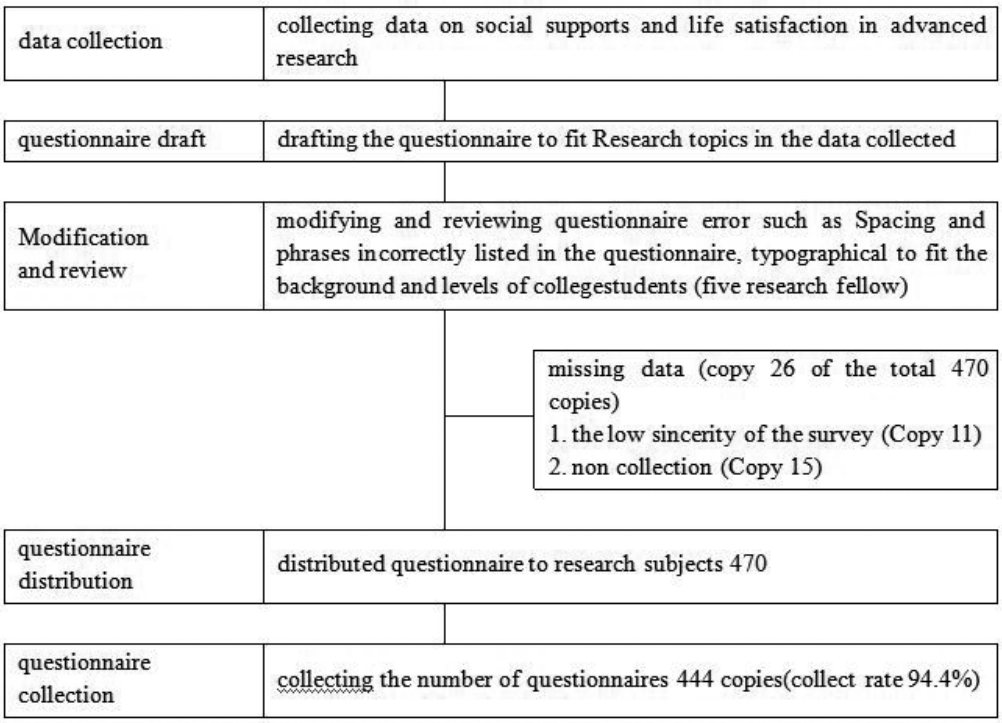

Figure 1: The design and progress summary of this study

Method

In this study, a total of 470 questionnaires were distributed and used in this study, with 15 unreturned copies and 444 copies excluding 11 copies with low integrity [Figure. 1]. Data analysis was done using the SPSS 19.0 statistical program. The frequency of gender, grade, and residence type of college students was analyzed by frequency analysis. An independent t-test was conducted to examine the characteristics of gender

and social support. One-way ANOVA was conducted to examine the relationship between grade and social support for residence type. Statistical significance was $\alpha = 0.05$.

Results and Discussion

General characteristics of subjects: Table 1 shows the general characteristics of the study subjects. There were 252 (56.8%) male students and 192 (43.2%) female students. There were 60 students (13.6%) in male students, 122 students (27.5%) in first grade students and 131 students (29.5%) in second grade students. In the third grade, 138 (31.1%) showed the highest rate, and in the fourth grade, 53 (11.9%) were the lowest. The residence type was the highest with 263 dormitories (59.2%), followed by 150 (33.8%), 23 (5.2%), 4 (0.9%) and 4 others (0.9%) [Table1].

Table 1: General characteristics of the subjects (N = 444)

Characteristics		N (%)
Gender	Male	252 (56.8)
	Female	192 (43.2)
Grade	Freshman	122 (27.5)
	Sophomore	131 (29.5)
	Junior	138 (31.1)
	Senior	53 (11.9)
Residential type	Dormitory	263 (59.2)
	Live apart from house	150 (33.8)
	House	23 (5.2)
	Boarding house	4 (0.9)
	Etc.	4 (0.9)

Analysis of results of parent support, friendship support, and faculty teaching support on college students: Table 2 shows the differences in perception of social support among the subjects. First item, 65.3% of AS, 0.9% of NS, and AS of 67.6% were the second item in parents support, and the lowest value was 0.2% in NS. The third item was the highest with AS (65.3%) and the lowest one, NA (0.7%). The 4th question was the lowest at 57.9% for AS and 0.7% for NS. The 5 items were the lowest at 49.5% for AS and 0.5% for NS. In the 6 items, the lowest score was AS (51.6%) and NS (0.2%). In the 7 items, 57.7% of AS and 0.7% of NS were the lowest. In the 8 items, the lowest score was 55.6% for AS and 0.9% for NS. In the 9 items, AS were the lowest (61.0%) and NS was the lowest (1.1%) [Table 2].In the case of friendship support, the 10 items were lowest at 64.6% for AS and 2.5% for NS. In the 11 items, the lowest score was AS (60.6%) and NS (1.6%). In the 12 questions, the lowest score was 58.6% for AS and 2.5% for NS. In the 13 items, the lowest score was 57.2% for AS and 1.1% for NS. In the 14 items, the lowest score was 63.3% for AS and 1.1% for NS. In the 15 items, the lowest score was 57.4% for AS and 0.7% for NS. In 16 items, the lowest score was 55.9% for AS and 2.0% for NS. In the 17 items, the lowest score was 55.6% for AS and 2.0% for NS. In the 18 items, the lowest score was 55.6% for AS and 2.5% for NS[Table 2].Among the 19 items, 61.5% of the respondents supported the teaching and 4% of the professor supported the teaching. In the 20 items, the lowest score was 39.9% for AS and 9.5% for NS. The lowest score was 52.0% for AS and 5.0% for NS in 21 items. In the 22 items, the lowest score was 52.0% for AS and 5.6% for NS. In the 23 items, the lowest score was 52.0% for the AS and 5.9% for NS. In the 24 items, the lowest score was 52.7% for AS and 5.4% for the NS. In the 26 items, AS were the lowest at 49.3% and NS was the lowest at 4.7%. Finally, the lowest score was 53.4% for AS and 3.2% for NS in 27 items [Table 2].

Table 2: Responses rate per questionnaire item of social support (N = 444)

Characteristics		N (%)			
		NS(1)	LS(2)	OS(3)	AS(4)
Parent supports	1. Parents are interested in children.	4(0.9)	25(5.6)	125(28.2)	290(65.3)
	2. Parents recognize their children as valuable.	1(0.2)	10(2.3)	133 (30.0)	300(67.6)
	3. Parents feel that their children are receiving love and care.	3(0.7)	21(4.7)	130 (29.3)	290(65.3)
	4. Parents give praise for what their child did well.	3(0.7)	33(7.4)	151 (34.0)	257(57.9)
	5. Parents encourage your child when he is hesitant to make a decision.	2(0.5)	37(8.3)	185 (41.7)	220(49.5)

Conted…

	6. Parents advise your child to make a reasonable decision	1(0.2)	31(7.0)	183 (41.2)	229(51.6)
	7. Parents help their children solve problems when they are in a difficult situation.	3(0.7)	24(5.4)	161 (36.3)	256(57.7)
	8. Parents can help their children do what they want.	4(0.9)	35(7.9)	158 (35.6)	247(55.6)
	9. Parents provide financial support to their children.	5(1.1)	26(5.9)	142 (32.0)	271(61.0)
Friend supports	10. My friend is worried about my work.	11(2.5)	51(11.5)	287 (64.6)	95(21.4)
	11. My colleague friend helps me when I need help.	7(1.6)	36(8.1)	269 (60.6)	132(29.7)
	12. My colleague friend is doing my job when I'm sick.	11(2.5)	68(15.3)	260 (58.6)	105(23.6)
	13. When others turn me off, my department friend is with me.	5(1.1)	57(12.8)	254 (57.2)	128(28.8)
	14. Friends of my department respect my opinion and accept it positively.	5(1.1)	38(8.6)	281 (63.3)	120(27.0)
	15. My friend turns me on when I'm in a bad mood.	3(0.7)	53(11.9)	255 (57.4)	133(30.0)
	16. My colleague praises me when I work well.	9(2.0)	55(12.4)	248 (55.9)	132(29.7)
	17. My colleague friend kindly explains what I am confused about.	9(2.0)	57(12.8)	247 (55.6)	131(29.5)
	18. My colleague friend and I use things together.	11 (2.5)	41(9.2)	247 (55.6)	145(32.7)
Teaching supports	19. The faculty professor respects my personality.	13 (2.9)	71(16.0)	273 (61.5)	87(19.6)
	20. The department professor is interested in me.	42 (9.5)	162 (36.5)	177 (39.9)	63(14.2)
	21. The department professor encourages my college life.	22 (5.0)	115 (25.9)	231 (52.0)	76(17.1)
	22. The department professor tells me how to do the study.	25 (5.6)	116 (26.1)	231 (52.0)	72(16.2)
	23. The department professor will discuss my goals and interests.	26 (5.9)	110 (24.8)	231 (52.0)	77(17.3)
	24. Department professors provide information to help solve academic problems.	24 (5.4)	111 (25.0)	234 (52.7)	75(16.9)
	25. The department professor does my best to help me without paying the price	16 (3.6)	115 (25.9)	227 (51.1)	86(19.4)
	26. A professor advises me about my behavior	21 (4.7)	131 (29.5)	219 (49.3)	73(16.4)
	27. The department professor praises me when I have worked hard or have done well.	14 (3.2)	110 (24.8)	237 (53.4)	83(18.7)
NS(1): no support; LS(2): a little support; OS(3): often support; AS(4): always support					

Results of Life Satisfaction of Study Subjects: Korean version of life satisfaction Questionnaire in each item, 1 item had the lowest score of 28.2% for 4 point and 4.5% for 1 point. The highest score was 29.1% from 3 points in 2 items, and the lowest was 0.2% in 1 point. In the 3 items, 4 points were the highest with 27.5% and 1 point was the lowest with 2.9%. In the 4 items, 30.4% of the 3 point were the highest, and 1point was the lowest at 5.0%. In the 5 items, 4 points were the highest (21.8%) and 1 point was the lowest (7.2%) [Table 3].

Table 3: Responses rate per questionnaire item of life satisfaction on college students (N = 444)

Characteristics		N (%)						
		7	**6**	**5**	**4**	**3**	**2**	**1**
Life Satisfaction	1. My college life is similar to my goal at the time of admission.	46(10.4)	67(15.1)	87(19.6)	125(28.2)	51(11.5)	48(10.8)	20(4.5)
	2. In my college life, social support (parent, friend, teaching support) is good.	11(2.5)	32(7.2)	123(27.7)	88(19.8)	129(29.1)	60(13.5)	1(0.2)
	3. I am satisfied with my college life.	13(2.9)	38(8.6)	71(16.0)	122(27.5)	75(16.9)	93(20.9)	42(7.2)
	4. I have done what I want in college life.	33(7.4)	67(15.1)	86(19.4)	135(30.4)	60(13.5)	41(9.2)	22(5.0)
	5. Even if I go to college again, will do the same school life as now.	75(16.9)	76(17.1)	69(15.5)	97(21.8)	38(8.6)	57(12.8)	32(7.2)
7: strongly disagree, 6: disagree, 5: silghtly disagree, 4: neither agree nor disagree, 3: slightly agree, 2: agree, 1: strongly agree								

Relationship between parental support, friendship support, and faculty teaching support according to gender differences on college students: There was no statistically significant difference in the satisfaction of males and females in parent support and friendship support according to gender difference of participants in the study (p> 0.05). However, there was a statistically significant difference in teaching support (p <0.01) [Table 4].

Table 4: Difference of gender in social supports on college students

Variables	Male	Female	t	p
	M ± SD	M ± SD		
PS	31.77 ± 5.40	31.87 ± 5.23	- 0.19	0.85
FS	28.38 ± 4.92	27.85 ± 4.38	1.19	0.23
TS	26.26 ± 5.93	24.01 ± 5.31	4.13	0.00***
M ± SD: means ± standard deviation, ***p < 0.00, PAS: parent support; FS: friend support; TS: teaching support.				

Differences in the support of parents' friends and professors by grade of college students: There was a statistically significant difference between the four groups in parent support and teaching support (p<0.05)(p<0.01). There was no statistically significant difference between the four groups in friend support (p> 0.05)[Table 5].

Table 5: Difference of grade in social supports on college students (N = 444)

Variables	Freshman	Sophomore	Junior	Senior	F	p
	M ± SD	M ± SD	M ± SD	M ± SD		
PS	32.49 ± 5.60	32.35 ± 3.84	30.82 ± 6.39	31.68 ± 4.35	2.76	0.04*
FS	28.72 ± 4.82	28.44 ± 4.72	27.77 ± 4.70	27.34 ± 4.27	1.60	0.19
TS	25.79 ± 5.74	26.34 ± 5.13	24.40 ± 6.01	23.92 ± 6.10	3.95	0.01**
*p < 0.05 **p < 0.01, M ± SD: means ± standard deviation, PS: parent support, FS: friend support; TS: teaching support.						

Relationship between parental support, friendship support, and teaching support and life satisfaction depending on the type of residence on college students: There was a statistically significant difference between friendship support and life satisfaction according to residence type of students (p<0.05). There was no statistically significant difference between parents support, teaching supportand type of residence on college students (p> 0.05) [(Table 6].

Table 6: Difference of residential type in social supports on college students (N = 444)

Variables	Dormitory	LH	House	BH	etc.	F	p
	M ± SD	M ± SD	M ± SD	M ± SD	M ± SD		
PS	31.93 ± 5.96	31.82 ± 4.18	30.39 ± 4.49	34.75 ± 2.50	31.25 ± 4.50	0.76	0.55
FS	28.39 ± 4.62	28.03 ± 4.82	25.78 ± 4.34	33.75 ± 2.87	27.75 ± 2.98	3.14	0.02*
TS	25.19 ± 5.67	25.73 ± 5.96	22.95 ± 4.45	29.00 ± 8.75	25.75 ± 5.18	1.61	0.17
*p < 0.05, M ± SD: means ± standard deviation, PS: parent support, FS: friend support, TS: teaching support, LH: live apart from house, BH: boarding house.							

Discussion

The purpose of this study was to examine the perception of university students' gender, grade, residence style and social support, and to examine the relationship between social support and life satisfaction of students in college. First, male students were more satisfied with teaching support than female students and satisfaction was higher than male students in relation to social support of male students and female students. This is because there are many male professors in the

professorship at the university, so that male students have an environment where they can easily interact with female students. Therefore, it is necessary to propose environment improvement programs for female students and support programs for female students. In this study, we looked at the relationship of social support by grade, and it was confirmed that lower grades were more supported by department professors than upper grades. This means that the interactions among the professor and the student are relatively increased because the teaching support programs are concentrated in the lower grades, which means that the higher grade students have an environment with less discussion than the class. In addition to the class, it was found that visiting the professor by counseling about the career or academic plan was linked to the psychological burden and the teaching support decreased. Therefore, it is necessary to reduce the program and psychological burden according to the characteristics of each grade. In this study, we analyzed residence type and social support, and it was found that students who are living in boarding houses are more supportive than students who live in other residential areas. This is similar to the previous study in which dormitory or trainee students had relatively little social support [10].In addition, university students reported that they received social support in the order of friend support, family support, and teaching support [11], because active exchange with friends, neighbors, and groups positively influenced the satisfaction of life for young people [12]. Therefore, it is considered that the students who choose the boarding house because of their geographical distance are far from the house where they live, the quality of life is affected by the friend support rather than the parent and teaching support. And for the students of the provincial universities, it is necessary to improve the living environment and improve the life satisfaction by supporting the appropriate choice.

Conclusion

There was a significant difference in teaching support among male students than female students, and there was a significant difference in teaching support among the lower grades than in the upper grades. College students who chose to live in a boarding house showed a significant difference in friendship support compared to students living in another residence.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Task Application after Hand Intrinsic Muscle Treatment on Decreasing Unilateral Spatial Neglect in Stroke Patients

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ABSTRACT

Background/Objectives: In this study, we assessed the effects of task application after hand intrinsic muscle treatment on decreasing unilateral spatial neglect in stroke patients.

Method/Statistical Analysis: 20 subjects with stroke patients participated. Subjects were randomly divided into task application after hand intrinsic muscle treatment group (n=10) and common upper extremity task group (n=10) both therapy was applied for 30mins in a day and 5 times in a week for 2 weeks. The Albert's test, Line bisection test was used to evaluate unilateral spatial neglect by paretic side(left) in stroke patients. To compare the treatments, we used paired t-test and independent sample t-test.

Findings: The task application after hand intrinsic muscle treatment group and common upper extremity task group showed statically significant differences before and after unilateral spatial neglect. The experimental group showed a more significant difference compared with the control group when Albert's test, Line bisection test.

Improvements/Applications: The task application after hand intrinsic muscle treatment was more effective in unilateral spatial neglect of stroke patients than in reaching treatment.

Keywords: *stroke, task application, hand intrinsic muscle treatment, Unilateral spatial neglect, left hemiplegia*

Introduction

A Stroke is a cerebral ischemic or hemorrhagic cause of the vascular loss of cerebral function with various accompanying symptoms [1].Even after survival through appropriate first aid and early treatment after cerebrovascular disease, exercise, sensory, cognitive, perceptual, psychological, social, and physical functioning impairments remain [2].Cognitive and perceptual impairment due to stroke is a major cause of difficulty in complete recovery, even if motor skills are restored [3], especially when unilateral neglect lead to difficulties with sensory or motor function It does not recognize or respond to stimuli on the opposite side of the damaged brain [4].

Unilateral neglect is more severe than a left cerebral hemispherical lesion in the right cerebral hemisphere, and patients with unilateral neglect have a problem with inadequately perceiving the shape of the left part [5].If these symptoms persist, they continuously fail to recognize things in the left space, and functional recovery is highly difficult, resulting in greater difficulty in activities of daily living(ADL)[6, 7]. Recent studies have suggested a treatment that improves motor function by altering the cortical motor area by activating paralyzed movements. It is reported that this treatment focus on spatial representation attention and it has positive effects, improving unilateral neglect and ADL[8].

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Dobler et al. (2001) also describe the relationship between familiar tools and body cognition, suggesting that hand use and activities can be applied to reduce neglect [9].

In this study, it is thought that treatment of the intrinsic muscles of the hand has the effect of transferring hand sensation, such as the proprioceptive and tactile senses, through hand contact. In previous study, it was reported body sensory information of the hand through the treatment acted as a powerful aid for the spatial recognition of the body's position in the space in the postural control element [10].

Stable postures of these hands were made by internal work [11].The purpose of this study was to investigate whether the post treatment of the hand had positive effects on stroke patients with unilateral neglect.

Materials and Method

Experimental Subjects: The experiment was conducted in S hospital of Gyeonggi-do, South Korea. Twenty patients diagnosed with stroke for at least 6 months were randomly allocated between 2 groups. The study was conducted from July to April 2017, with the following inclusion criteria:

1. Diagnosed with cerebral hemorrhage or cerebral infarction for more than 6 months
2. Left hemiplegic patients who were diagnosed with stroke by a specialist through computed tomography
3. Those suspected of having unilateral negligence in a Motor-Free Visual Perception Test (MVPT) evaluation
4. There are no visual disturbances or visual field defects, and the elderly do not have visual impairment due to eye diseases, such as cataracts and glaucoma.
5. Score of at least 24 on the MMSE-K(Korean mini-mental state examination), with no difficulty comprehend instructions or communicating.
6. Without joint deformity, musculoskeletal pain, fractures, or hemianopsia.
7. Patient (or guardian) fully comprehends the object of this study and agrees to participate.

Evaluation Tools

Albert Test: Albert's test is an assessment tool to check the degree of unilateral neglect. The evaluation paper consists of 6 lines X 4 lines, totaling 40 lines at 2.5cm in length, 26cm in width, and 20cm in length [Figure 1].The evaluator should demonstrate by plotting one line in the middle column before evaluation and instruct participants to mark all lines. The evaluation method confirms the number of lines marked, and the test-retest reliability is .99 [12].

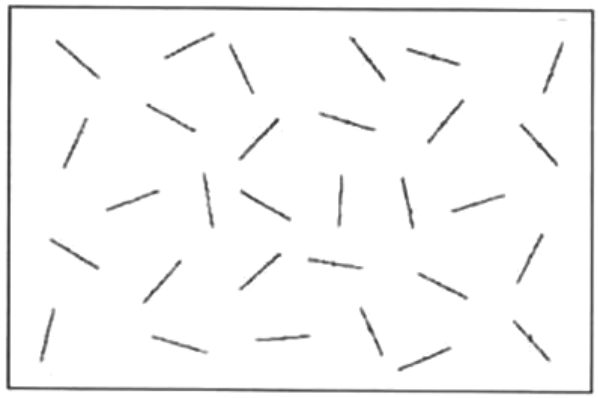

Figure 1: Albert Test

Line-bisection Test: The line-bisection test consists of lines arranged randomly in the center, left, and right on a 21.5cm X 29cm white paper. The top and bottom lines are used for practice. The six lines on the left are 100mm, 120mm, 140mm, 160mm, and 180mm, respectively, and the six lines on the right are 200mm [Figure 2].The test involves positioning the paper at the center of the subject and marking the center of each line using a pen. The score is calculated by measuring the distance between the actual center point of each line and the displayed center point, dividing the values for each line by the total number of lines. On the other hand, the mean distance from the center is less than 6.33 mm, and the mean is greater than 6.33 mm [13]. The inter-later reliability was .82.

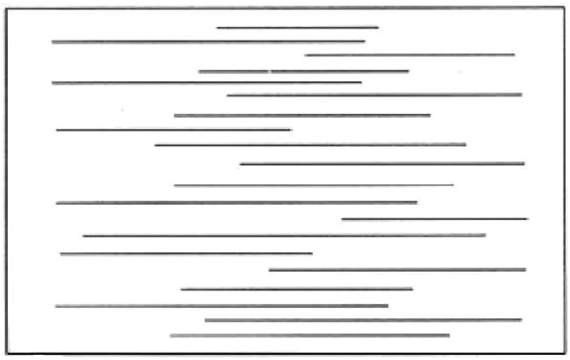

Figure 2: Line-bisection Test

Intervention Program: The subjects were allocated into control and experimental groups (10/group); Both groups were followed-up at the end of the day, and were equally mediated five times a week for two weeks, 30 minutes per session.

The experimental group was given of task application after hand intrinsic muscle treatment, and the control group a common upper extremity task.

Task Application After Hand Intrinsic Muscle Treatment (Experimental Group): In this study, the task application after intrinsic muscle treatment of the hand was revised and supplemented with reference to Sue Raine's (2013) proposal [11].The treatment program for the intrinsic muscles of the hand was characterized by specific activation of the lumbricals and, specific activation of the abductor digiti minimi after the intervention, the mediator applied the flu the cup and drink, press a computer keyboard, and the small ball and put in basket [Table 1].

Table 1: Task Application After Hand Intrinsic Muscle Treatment and Common Upper Extremity Task

	Task Application After Hand Intrinsic Muscle Treatment		Common Upper Extremity Task
Intervention	Hand intrinsic muscle treatment	sSpecific activation of lumbriclas	1. Grip the cup 2. Press a button 3. Grip the small ball 4. Move the stocking cone 5. ROM arc exercise
		Specific activation of abductor digiti minimi	
		Specific activation of thenar eminence	
	Task application	Grip the cup and drink	
		Press a computer keyboard	
		Grip the small ball and put in basket	

Common Upper Extremity Task (Control Group): The control group mediates the training of five common upper extremity tasks, such as grip the cup, press a computer keyboard, grip the small ball, move the stocking cone, ROM arc exercise, applied in the control group[Table 1].

Statistical Processing: The data were statistically processed using SPSS 18.0 for Windows. Descriptive statistics and a frequency analysis were performed to determine the general characteristics of the subjects. Data analysis showed a normal distribution for all variables. Two weeks after the intervention, a paired t-test was performed to compare the Albert test and Line-bisection test, and independent t-test was performed to compare the difference between the experimental and control groups. For statistical significance, α was set to 0.05.

Results and Discussion

General Characteristics of Experimental Subjects: The general characteristics of the experimental, control subjects are shown in table 2.

Table 2: General Characteristics of Subjects

	Division	Task application after hand intrinsic muscle treatment group (n = 10)	Common upper extremity task group (n = 10)
Gender (Persons)	Man	6(60.0%)	5(50.0%)
	Women	4(40.0%)	5(50.0%)
Brain Injury Type	Hemorrhage	5(50.0)	6(60.0)
	Infarction	5(33.3)	4(40.0)
Paretic Side	Left	10(100.0)	10(100.0)
Average Age		48.00 ± 7.43	49.70 ± 3.71
Average Disease Period (Month)		23.20 ± 8.69	25.90 ± 4.45

Comparison of Results before and after the Intervention

Comparison of Results before and after the Intervention in Experimental Group: In the Albert test, there was a statistically significant improvement from 29.00line before the intervention to 33.50line after the intervention($p<0.001$).

In the Line-bisection test showed the statistically significant decrease from 23.80mm before the intervention to 19.70mm after the intervention ($p<0.001$). See table 3.

Table 3: Comparison of Results before and after the Intervention in Experimental Group

	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t
Albert test (line)	29.00 ± 2.70	33.50 ± 2.12	-10.510***
Line-bisection test (mm)	23.80 ± 2.30	19.70 ± 1.25	8.947***

*p<0.05, **p<0.01, ***p<0.001 by paired t-test

Comparison of Results before and after the Intervention in Control Group: In the Albert test, there was a statistically significant improvement from 29.70 line before the intervention to 32.70 line after the intervention($p<0.001$).

In the Line-bisection test showed the statistically significant decrease from 22.30mm before the intervention to 20.10mm after the intervention($p<0.001$). See table 4.

Table 4: Comparison of Results before and after the Intervention in Control Group

	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	t
Albert test (line)	29.70 ± 3.19	32.70 ± 3.23	-7.115***
Line-bisection test (mm)	22.30 ± 1.94	20.10 ± 1.37	5.284***

*p<0.05, **p<0.01, ***p<0.001 by paired t-test

Comparison of Results between the Two Groups: A comparison of experimental and control groups showed statistically significant differences for Albert test; the experimental group increased by 4.50 ± 1.35line and the control group by 3.00 ± 1.33line and a statistically significant improvement over the control groups($p<0.05$).

In the Line-bisection test, experimental group decreased by -4.10 ± 1.44mm and the control group by -2.20 ± 1.31mm and a statistically significant improvement over the control groups($p<0.01$). See table 5.

Table 5: Comparison of Results between the Two Groups

	Task application after hand intrinsic muscle treatment group (n = 10)	Common upper extremity task group (n =1 0)	t
	(Mean ± SD)	(Mean ± SD)	
Albert test (line)	4.50 ± 1.35	3.00 ± 1.33	2.496*
Line-bisection test (mm)	-4.10 ± 1.44	-2.20 ± 1.31	3.069**

*p<0.05, **p<0.01, ***p<0.001 by independent t-test

Discussion

Patients with unilateral disregard may often have difficulty in ADL, such as failing to eat food on the left side of the dish, being unable to shave the left side of the face, and avoiding obstacles on the left when or moving in a wheelchair [6]. To alleviate these symptoms, we applied the task after intrauterine treatment to reduce unilateral neglect in patients with left hemiplegia due to stroke. In this study, 20 patients with left hemiparesis were divided into two groups. Subjects were randomly divided into task application after hand intrinsic muscle treatment group(experimental group, n=10) and common upper extremity task group(control group, n=10) both therapy was applied for 30mins in a day and 5 times in a week for 2 weeks. The Albert's test, Line bisection test was used to evaluate unilateral spatial neglect by paretic side(left) in stroke patients. To compare the treatments, we used paired t-test and independent sample t-test.

In the Albert's test and line bisection test, there was a statistically significant difference between the task application after intrinsic muscle treatment group and the common upper extremity task group. Therefore, task application after intrinsic muscle treatment and common upper extremity tasks were found to be effective in reducing unilateral spatial neglect.

However, in the comparison between the two groups after the intervention, the task application after intrinsic muscle treatment group showed significant improvement compared to the common upper extremity task group. The results of this study suggest that task application after intrinsic muscle treatment is more effective in reducing unilateral neglect than common upper extremity tasks. According to previous studies, Halligan et al. (1991) reported that the ability to recognize left stimuli could be increased by providing a proprioceptive sensation through upper limb movements in the external space [14]. In a single case study by Robertson and North (1993), manual and active exercises on the hands and feet showed significant effects only in the active movement of the hands and feet in the left space [15]. In this study, it was confirmed that the application of the task after the in-hand workout was more effective in reducing unilateral neglect than the general simple task in the control group.

Carr and Shepherd (2003) argued that the task-oriented approach could provide a higher level of improvement than repeated learning of the normal pattern of movement as a way to improve cognitive function and daily living behavior in stroke patients [16]. In this study, we also applied real daily life tasks after in-hand treatment and led the active participation of patients. All tasks used the left upper limb, which is the injured side. Therefore, the paralyzed upper limb has meaningful and functional tasks to allow the left space to be recognized and the left body to be used through active participation. These points are confirmed as positive in reducing unilateral neglect.

Although there have been reports that exercise methods that have been applied many times in a clinical setting can reduce unilateral neglect, the application of the task after the in-hand workout, as applied in this study has been shown to reduce participant disregard the injured side. It is thought to have therapeutic significance. However, the difference in ignorance response in the application of the task after the in-hand work in this study may be vary according to the individual function of the patient after the stroke, and the specific method of the daily life activity to which the task is applied. It is necessary to confirm the experimental effect.

In addition, because the number of subjects is limited, it is difficult to generalize the results of this study to all stroke patients. The selection of tasks that can be motivated by the patient and the selection of tools for objectively evaluating upper limb function are considered necessary. By supplementing these points, I think it will have a positive effect on reducing unilateral neglect by following a stroke, and it will improve independence executing ADL.

Conclusion

The purpose of this study was to investigate the effect of treatment on the unilateral neglect in patients with left hemiparesis due to stroke.

First, in the pre- and post-interventional comparisons, the task application after intrinsic muscle treatment group and the common upper extremity task group showed statistically significant differences in the Albert's test and the line bisection test.

Second, in the comparison between the two groups, the Albert's test showed that the task application after hand intrinsic muscle treatment group showed a significant improvement over the common upper extremity task group.

In the third, second, and two groups, the line bisection test showed significant improvement in task application after hand intrinsic muscle treatment group compared to the common upper extremity task group.

In this study, it was found that the application of the task after the in- hand treatment was effective in reducing the unilateral neglect due to stroke.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Dating Violence Perceived by University Nursing Students

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ABSTRACT

Background/Objectives: This study was designed to identify how nursing students recognized dating violence currently.

Method/Statistical Analysis: This study applied to the Q methodology to grasp dating violence perceived by university nursing students in order to identify future educational programs for dating violence. This study was conducted from May 8 to May 17, 2018, and 30 university nursing students in Gangwon and Gyongmam provinces, applied by convenience sampling method, scored 28 Q statements selecting forced normal distribution. Collecting data was analyzed by the QUANL PC program such as eigenvalues, variance,z-score and so on.

Findings: There are two different factors with two types showing eigenvalue more than 1. Factor 1 with twenty four participants showed that they understood giving the feeling of thrust, well behaved and a worthwhile job positively, the eigenvalue 7.1458. Factor II with twelve participants showed that they positively agreed with a comfortable person, a value and worthwhile job as well as playing a role as a mother, the eigenvalue 2.5628. Factor III with eight participants showed that they positively agreed with a doctor's assistance, well behaved and a comfortable person, the eigenvalue 2.5366. The correlation among three types was not relatively similar. However three types showed some consensus items. They recognized positively a value and worthwhile job, earnest and honest as a nurse, while negatively scientific knowledge, leadership and authority.

Improvements/Applications: The result of this study can provide basic data for preparing a nursing educational strategy with personalized the image of nurses for future generation who will become a nurse.

Keywords: *Dating violence, Nursing students, Perception, Subjectivity,Q methodology*

Introduction

There is no doubt that we are too easily exposed to horrible and threatening articles about dating violence recently compared to the past. It seems to be due to active involvement of society in order to recognize such violence as a social problem and deal with it while in the past, these violent forces were addressed to the personal domain of the individual [1]. According to the Korean Times, one of the most widely read newspapers in South Korea, nine out of ten in Seoul among 2,000 women interviewed have experienced dating violence and it was the first official figure of dating violence conducted by the local government [2]. In addition, the National Maritime Police agency announced that there was more than 10 million of dating violence abusers in 2017 which increased by 17 percent compared with the last year[3]. This result can simply assume that more violence occurs in loving relationships than we think, and the intensity of violence is significantly increasing between themas a serious social problem for all Koreans [4].

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The American National Center for Victims of Crime defined dating violence as "controlling, abusive, and aggressive behavior in a romantic relationship [5]."A lot of researches showed that mild level of violence that is not physically injured also has a very negative psychological impact such as depressed mood, anger, fear, low self-esteem and so on, on the dating violence victims. Throughthese studies, we would think about the adverse impact on both victims and attacker with the negative social effect [4,6,7 and 8].Therefore, this research will study how nursing students understand dating violence in order to provide one of wide database for individual thoughts.

Materials and Method

This research adopted Q methodology which focuses on the subjectivity or first person perspective of the participants to understand how nursing students discerned dating violence nowadays. This methodology research method is to show the subjectivity of the participants by modeling the results of individuals by compiling the Q statements, compulsorily ranking the subjects [9]. This study was conducted from May 8 to May 17, 2018, and 30 university nursing students in Gangwon and Gyongmam provinces, applied by convenience sampling method, scored 28 Q statements selecting forced normal distribution analyzing eigenvalues, variance, and z-score. The survey results were analyzed through using the QUANL PC program.

Results and Discussion

In terms of participants' general characteristics, the average age of participants was 23 years old and the ratio of male to female was the same. The third graders (juniors) in the college consisted of about 90%. Two-third of participants did not have any religion, but religious beliefs were surveyed in the order of Christianity, Buddhism and Roman Catholic. Currently, only one-third of participants have a dating partner. There were fewer students who experienced any types of violence such as bullying, dating and domestic violence than those who did not suffer from them. However, 6.6% of participants were both victims and abusers of dating violence in table 1.

Table 1: The General Characteristics (n = 30)

Items		Numbers	%
Genders	Male	15	50.0%
	Female	15	50.0%
Grades	3rd	27	90.0%
	4th	3	10.0%
Religion	Christian	5	16.7%
	Roman Catholic	2	6.7%
	Buddhism	4	13.3%
	No religion	19	63.3%
	Others	0	0.0%
Dating Partner	Yes	10	33.3%
	No	20	66.7%
Experience of school violence (bullying)	Yes	4	13.3%
	No	26	86.7%
Experience of dating violence (as a victim)	Yes	2	6.7%
	No	28	93.3%
Experience of dating violence (as an attacker)	Yes	4	13.3%
	No	26	86.7%
Experience of domestic violence	Yes	0	0.0%
	No	30	100%

There were two types of factors of dating violence which nursing students recognized. In addition, table 2 showed each factor's eigenvalue, factor I-16.9963 and factor II-1.4174. The variance has 61% of explanation power to this study clearly.

Table 2: Eigenvalues and Variance Percentage

	Factor I	Factor II
Eigenvalues	16.9963	1.4173
Variance Percentage	.5665	.0472
Cumulative Frequency	.5665	.6138

Table 3 shows correlation of two factors. It means that factor I and factor II have a strong positive correlation in this study.

Table 3: Correlation

	Factor I	Factor II
Factor I	1.000	.680
Factor II	.680	1.000

In terms of Factor I, there were twenty four participants out of the total number. The most agreed statements and disagreed ones are shown in table 4. There were the top four agreements of high scored Z-score. The first one was physical beating causing a dating partner to be hospitalized. The second one was coercive intercourse without a dating partner's agreement. The third one was using physical forces such as throwing objects to a dating partner rather than having verbal communication in the conflict situation. The last one was is the use of physical force to their dating partner as often as kissing and caressing. On the other hand, there were the bottom five disagreements. The first one was giving a dating partner gifts unilaterally without respecting. The second one was forcing a dating partner to cut off relation with others. The third one was controlling their partner's behavior, hair, and clothes. The fourth one was informing a dating partner what they would do in advance. The last one was keeping an eye on dating partner's text messages and telephone. This group seems that they were more concerned with physical damage rather than other harms.

Table 4: Descending Array of Z-Scores of Factor I (Greater than ± 1) (n = 24)

	Statement	Z-score
Positive	Q16. Dating violence is beating a dating partner so badly that she/he is hospitalized.	2.04
	Q20. Dating violence is he/she forcefully had sex without theirdating partner's agreement.	1.99
	Q17. Dating violence is to deal with conflict situation by a force rather than communication.	1.45
	Q22. Dating violence is the use of physical force to their dating partner as often as kissing and caressing.	1.18
Negative	Q15. Dating violence is giving a dating partner gifts unilaterally without respecting their own partner.	-2.18
	Q25. Dating violence isnot to allow male friends/female friends to their dating partner.	-1.90
	Q26.Dating violence is the dating partner control their partner's behavior, hair, and clothes.	-1.31
	Q24. Dating violence is a coercion to tell the dating partner when, where, who and what to do before it.	-1.20
	Q4. Dating violence is keeping an eye on dating partner's text messagesand telephone.	-1.18

In terms of Factor II, there were six participants out of the total number and there were more male nursing students than women compared with Factor I. The most agreed statements and disagreed ones are shown in table 5. There were the top six agreements of high scored Z-score. The first one was coercive intercourse without a dating partner's agreement. The second one was using physical forces such as throwing objects to a dating partner rather than having verbal communication in the conflict situation. The third one was physical beating causing a dating partner to be hospitalized. The fourth one was the forgiveness of their violent behaviors to their dating partner. The fifth one was to ignore their dating partner and to force their own opinion or thought to their dating partner. The last one was glorifying everything including harmful actions for their dating partner. On the other hand, there were the bottom six disagreements. The first one was giving a dating partner gifts unilaterally without respecting. The second one was being afraid of his/her partner. The third one was keeping an eye on his/her partner's text messages and telephones. The fourth one was a fear of making one's partner angry so he/she cannot oppose his/her opinion. The fifth one was yelling or screaming enough to feel tremendous fear from their dating partner. The last one was all kinds of harm done by a dating partner in the name of love. Unlike the group of Factor I, this group recognizes various causes as dating violence.

Table 5: Descending Array of Z-Scores of Factor II (Greater than ± 1) (n = 6)

	Statement	Z-score
Positive	Q20.Dating violence is he/she forcefully had sex without theirdating partner's agreement.	2.04
	Q17. Dating violence is to deal with conflict situation by a force rather than communication.	1.67
	Q16.Dating violence is beating a dating partner so badly that she/he is hospitalized.	1.63
	Q18.Dating violence is he/she can think of being forgiven their violent behaviors such as hitting or kicking their dating partner's cheek.	1.54

Conted…

	Q14.Dating violence is to ignore the intention of their dating partner and to force their own opinion to their dating partner.	1.09
	Q28.Dating violence is glorifying everything including harmful actions for their dating partner.	1.02
Negative	Q15.Dating violence is giving a dating partner gifts unilaterally without respectingtheir own partner.	-1.78
	Q6.Dating violence is afraid of his/her dating partner.	-1.36
	Q4.Dating violence is keeping an eye on dating partner's text messages and telephone.	-1.36
	Q7.Dating violence is a fear of making one's partner angry sohe/she cannot oppose his/her opinion.	-1.28
	Q2.Dating violence is yelling or screaming enough to feel tremendous fear from their dating partner.	-1.22
	Q11.Dating violence is all kinds of harm done by a dating partner in the name of love.	-1.10

Among two groups, there were some consensus items. Two Factors strongly recognized dating violence as a physical and sexual threat while they weakly perceived their actions as a dating violence such as giving a dating partner gifts without respecting their owe partner and closely watching his/her partner could be accepted in table 6.

Table 6: Consensus Item

	Statement	**Z-score**
Positive	Q20.Dating violence is he/she forcefully had sex without their dating partner's agreement.	2.01
	Q16.Dating violence is beating a dating partner so badly that she/he is hospitalized.	1.83
	Q17.Dating violence is to deal with conflict situation by a force rather than communication.	1.56
	Q18.Dating violence is he/she can think of being forgiven their violent behaviors such as hitting or kicking their dating partner's cheek.	1.24
Negative	Q15..Dating violence is giving a dating partner gifts unilaterally without respecting their own partner.	-1.98
	Q4.Dating violence is keeping an eye on dating partner's text messages and telephone.	-1.27
	Q24.Dating violence is a coercion to tell the dating partner when, where, who and what to do before it.	-1.04

The physical damage of violence by the dating partner is more serious than strange other's one. As a result, the adverse effect of mental harm between dating relationships would be greater than physical one [10]. Accordingly, our whole society should change the concept of dating violence. It means that the predisposition of violence happened in intimate relationships is believed to be learned from the society following their growth, and preventative intervention would be required for young children in order to educate them what the violence is. It also is the responsibility of society all so that we should all abuse and violence, regardless of the object, is criminal, and it is necessary to spread social awareness that it will never tolerate it socially. For this, it is necessary to strictly punish perpetrators of the act. It needs to be recognized as a social problem[4]."Safe Date Program" implemented in American schools has already proved effective. In order to prevent dating violence, it is necessary to educate people to control some factors that can promote dating violence [11]. Accordingly, our society will need an extensive research on how the general population perceives dating violence in order to provide educational materials and develop prevention program in advance.

In addition, our society should widely discuss the punishment of dating violence because punishment of dating violence has been still insufficient and inadequate [8].Because of traditional Korean society custom, it is true that violence in intimate relationships such as dating violence and domestic violence has been treated as an individual problem and is reluctant to actively engage in society as usual.

Conclusion

In conclusion, thirty nursing university students perceived dating violence as serious violence both physically and sexually, but they were not aware of the seriousness of the mental side in this study. After rating Q cards from 1 to 9, many participants in their interviews said that they sometimes did some activities on the

Q cards and at the same time they did not recognize their behaviors were violent actions to their partners. This study shows two different factors. In Factors I with twenty four participants, there were the top four agreements of high scored Z-score and the bottom five disagreements. They thought physical damages more significantly. In Factor II with six participants, there were the top six agreements of high scored Z-score and the bottom six disagreements. They did not weigh on one factor as dating violence and they perceived various factors. Through this research, we understood how nursing university students perceived dating violence individually. Therefore,this study consequently will be a stepping stone for offering meaningful data.

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Analysis of LUCAS™ 2 and Standard Cardiopulmonary resuscitation results in VR-based Simulation Ambulance

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ABSTRACT

Background/Objectives: When chest compression is performed with two hands in a situation where the movement of the vehicle cannot be predicted, the hands-off time increased resulting in inadequate chest recoil.

Method/Statistical Method: VR-based ambulance simulation experiments were conducted from February 19 to 28, 2018 in the National Fire Service Academy. The mean and standard deviation of chest compression and artificial respiration were analyzed by descriptive statistics and t-test. The results were analyzed using SPSS software 12.0 (SPSS Ins., Chicago, IL, USA).

Findings: The results of Lucas (LUCASTM) and manual cardiopulmonary resuscitation of VR-based state showed better chest compression and less incomplete chest relaxation rate than the standard CPR of Lucas™ 2. In the VR-based condition, the respiration rate was better when the bag-valve mask was applied at a ratio of 30: 2 than in the case of continuous chest compression under the condition of special airway intubation. Therefore, chest compression using machine was more effective than cardiopulmonary resuscitation in transferring cardiac arrest patients, and it was more efficient to use bag-valve mask at 30: 2 in volume delivery.

Improvements/Applications: This study suggests to use automatic external defibrillator as an alternative to chest compression in transit ambulances.

Keywords: *Virtual Reality, Mechanical CPR, Manual CPR, Chest Compression, Ventilation.*

Introduction

It is known that the quality of cardiopulmonary resuscitation (CPR) performed during the transfer the patient to the ambulance at the site of the cardiac arrest has a great effect on the survival of the cardiac arrest patients[1,2]. Paramedics are making efforts to implement good quality CPR with regular education and training, but it is difficult to perform CPR in the narrow and shaken ambulance, and the accumulation of fatigue by paramedics due to long transit time makes it difficult to provide high quality CPR[3,4].

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It is very difficult to transfer the patient to the hospital while conducting CRP in the ambulance. Although accurate chest compressions and relaxation are essential to increase cerebral blood flow and coronary artery perfusion pressure, if the transfer distance is long and the paramedic performing CPR is alone, effective chest compression and artificial respiration are not expected. Even if the chest compression is properly performed, the chest compression and relaxation have a significant effect on the prognosis of the cardiac arrest, although it is only 20 to 30% of the normal cardiac output. In order to provide professional treatment for cardiac arrest patients, transfer time to the hospital is important. Transfer time from site to hospital is 26.3% for less than 5 minutes, 31.5% for 6 minutes to 10 minutes, 25.5% for 11 minutes to 20 minutes, 10.7% for more than 21 minutes ~ 30 minutes and 6.0% for more than 31 minutes respectively[5]. Cardiopulmonary resuscitation shall be performed every two minutes when there are

more than two paramedics because of increased physical strength and increased fatigue over time. However, in a shaken ambulance, the location, depth, velocity and incomplete relaxation of chest compression may affect chest compression and artificial respiration quality.

Mechanical chest compression device was developed to overcome various problems of standard CPR and includes various models such as X-CPR, LUCAS and load-distributing band CPR. These mechanical chest compression devices can continue providing good quality chest compression and can be expected to deliver good results when used in-vehicle during movement or transfer between departments. According to previous studies, when CPR was performed using LUCAS or a load-distributing band, no advantages or disadvantages were found compared with the standard CPR [6, 7], and there was no difference in neurological outcome in the study[7]. On the other hand, some studies have shown that CPR using mechanical chest compression device has higher survival rate than standard CPR[8, 9]. In another study, it is not able to explain more clearly whether cardiopulmonary resuscitation using an mechanical chest compression device (LUCAS) affects survival, spontaneous circulation recovery and neurological outcomes than standard CPR[10-12] does.

This study assessed the chest compression and artificial respiration quality when using a mechanical chest compression device ("Lucas") two-person standard cardiopulmonary resuscitation (CPR) to propose a more effective CPR method during transfer.

Materials and Method

Study Design and Data Collection: This study compared the results of chest compression and artificial respiration in the mechanical chest compression device and the two-person standard CPR conditions within the VR-based simulation ambulance. For this purpose, VR-based simulation ambulance in the National Fire Service Academy was used and "Urban outskirts road scenario" was applied among the developed scenarios. The running time was maintained at 60-80 km/h for 6 minutes, and the chest compression and artificial respiration rates were analyzed for 15 cycles with 30:2 between chest compression and artificial respiration. VR-based simulation ambulance driving was conducted by one of the National Fire Service Academy's faculty of education and training department and used the same scenario.

Comparisons of chest compression and artificial respiration were made using a bag-valve mask applied to Lucas and 2-person standard CPR with bag-valve mask applied. When Lucas was used for chest compression, Lucas' compression pad was placed in the same place after prescribing the compression area under the half of the mannequin dressing bone. The standard CPR was performed by a professor of emergency department of the National Fire Service Academy, and performed CPR. Before the experiment, chest compression and artificial respiration were repeated 15 times at a ratio of 30: 2, which was repeated 10 time [Figure 1, Figure 2]. In both groups, only one-third of the bag-valve mask was squeezed.

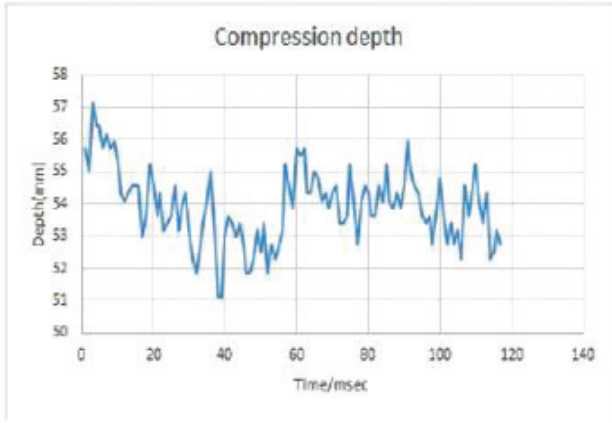

Figure 1: Pre-evaluation of Chest Compression Depth

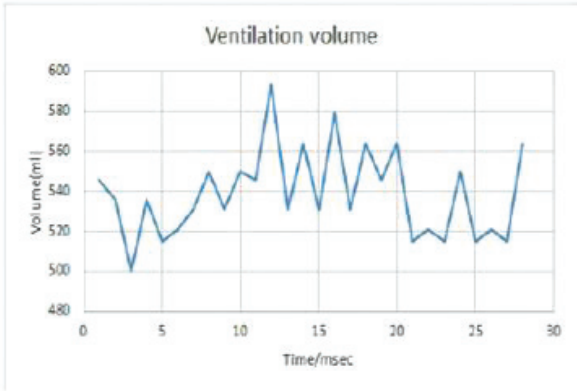

Figure 2: Pre-Evaluation of Ventilation Volume

Experimental Tools

VR Simulation Ambulance: VR simulation ambulance, developed to enable emergency service education and training in various road environments, was developed as a fire research and development (R&D) project. VR based simulation ambulance implemented VR by applying Ambulance Driving Simulation S/W to computer - controlled moving platform design[Figure 3]. Six

scenarios have been developed to suit the surrounding environment, such as rural, urban and suburban areas, and the driving is designed to be able to operate while monitoring scenarios set outside the ambulance.

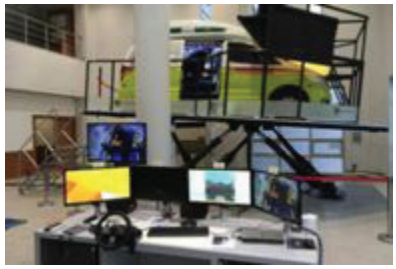

Figure 3: VR based Simulation Ambulance

Figure 4: LUCAS™ 2

Mechanical Chest Compression Device (LUCAS™ 2): Mechanical chest compression device was used with LUCAS™2 (Physio-control Inc, Reymond, USA) [Figure 4]. With a compression rate of 102 (± 2) per minute and a compression depth of 53 (± 2) mm, the ratio of chest compression to artificial respiration can be set to 30: 2, Lucas was fully secured to the manikin using shoulder straps and wrist straps, and pads were applied to both lateral chest areas of the manikin to minimize movement. Lucas is easy to use with a combination of back plate and body which is placed behind the patient's back and consists of the power button (1 time) on the top of the main unit, the button to pause the pressure (2 times), continuous chest compression and a button (3 times) that can select the chest compression and 30: 2.

Cardiopulmonary Resuscitation (CPR) Manikin: The manikin used for CPR is Resusci Anne QCPR® (Laerdal, Stavanger, Norway). The chest compression and specialized tracheal intubation are possible, and the depth, velocity, incomplete relaxation and artificial respiration rate of chest compression can be evaluated. Manikin and Sim Pad were connected to collect data.

Bag-valve Mask: Bag-valve mask (BVM) was attached to a Laerdal® Silicone Resuscitator with a storage bag and the bag volume was 1,600 mL.

Data Collection and Analysis

All experiments were conducted at the National Fire Service Academy from February 19 to 28, 2018 in VR based simulation ambulance. Data were collected using Vital Sim® during 15 cycles of 30: 2 ratio of chest compression to artificial respiration and data collected were analyzed using SPSS software 12.0 (SPSS Inc., Chicago, IL, USA). The mean and standard deviation of chest compression and artificial respiration were measured by descriptive statistics and t-test.

Results and Discussion

With VR based Lucas, the rate of chest compression was 110, min 97, and 101.87 (± .566) per minute, respectively. The depth of the chest compression was 55.24 mm at the maximum and 47.86 mm at the minimum. The average depth of the chest compression was 53.80 (± .98). In the case of the standard 2-Person CPR, the speed of chest compression increased to a maximum of 138 times per minute, a minimum of 93 times, and an average of 123 times (± 4.325) per minute. The depth of the chest compression was 61.59 mm at the maximum and 15.75 mm at the maximum, and the average was 48.30 (± 6.11)[Table 1].

Unstable posture in the ambulance can cause physical damage to paramedics, and there is no device to ensure safety. Especially, when chest compression is performed with two hands in a situation where the motion of the vehicle cannot be predicted, it can be exposed to the vehicle movement in a defenseless manner. As a result, the chest compression speed increased to 138, 93, and 123 (± 4.325) in the standard CPR state, as if compensating for the chest compression. In addition, the depth of chest compression was 61.59 mm at the maximum, 15.75 mm at the minimum, and 48.30 (± 6.11) in average, which indicates that inappropriate chest compression was maintained. Another problem with standard CPR status was incomplete chest relaxation in 33.4%.

The rate of proper chest compression, the exact compression location, the depth of sufficient chest compression, and complete relaxation are important techniques for increasing cerebral blood flow and coronary perfusion. According to the American Heart Association guidelines for 2015[13], the rate of chest compression should be maintained at least 100 times per minute, not exceeding 120 times, maintaining a chest compression depth of at least 5 cm and chest

compression is recommended to minimize interruptions with complete compression and complete relaxation. Minimization of chest compression downtime affects cerebral blood flow, coronary perfusion pressure, spontaneous circulation recovery rate, survival rate, and good neurological outcome (CPC 1-2). A study of the efficiency of CPR in moving ambulances was readily available[14,15]. The depth of chest compression performed within the ambulance was deeper and faster in compression and relaxation than in the plain[14], indicating that the chest compression in ambulance is much harder than that in the flat place[16,17].

Table 1: Chest Compression Results in VR-based Lucas and Standard CPR States (N = 1800)

Variables	Mean	Minimum	Maximum	Standard Deviation	t	p
Chest Compression Depth (mm)						
LUCAS	53.80	47.86	55.24	0.98	37.660	.000
Standard CPR	48.30	15.75	61.59	6.11		
Chest Compression Velocity (minute)						
LUCAS	101.87	97.00	110.00	0.566	-211.891	.000
Standard CPR	123.66	93.00	4.325			

It is very difficult to conduct the standard CPR within a shaken ambulance. When the CPR was performed by the researcher, it was necessary to open the legs wide to maintain the center of the weight, and then the chest compression was performed with the knee leaning on the side of the cart where the patient was lying. In the case of rotation, chest compression was performed using only hands.

On the other hand, when Lucas was used, chest compression speed was 110 times, 97 times, 101.87 times (± .566). The depth of the chest compression was 55.24 mm, the minimum was 47.86 mm, and the average was 53.80 (± .98). In 1.4%, the incomplete chest relaxation was observed. Simulation studies using elevators in elevated buildings to deliver cardiac arrest patients indicated that the application of mechanical device may be effective during the transfer of cardiac arrest patients to ambulances[18]. According to the results of a randomized controlled trial[6-12], the use of mechanical device for adult CPR is not recommended as a standard CPR method in relation to whether it alters good neurological and functional outcomes in patients who survive after 30 days, 60 days, 180 days, or 1 year after discharge, or only contributes to a change in survival rate or spontaneous recovery rate, the CPR International Liaison Committee (ILCOR) proposed that an mechanical device could be considered as an alternative to high-quality chest compression. However, when three trained paramedics applied the load distribution band, an average of 39 seconds of chest compression discontinuity occurred, and this chest compression discontinuation time tended to decrease as the case repeated [19].

This study has the following limitations. First, this study is a VR based manikin study with CPR for 6 minutes. Second, whether the VR based urban road scenario fully reflects on-site road conditions, and whether the VR based computer - controlled moving platform design sufficiently reflects the suspension of the ambulance that actually drives.

Conclusion

Although CPR can restore spontaneous circulation in patients with cardiac arrest, CPR can be performed while transferring patients who have difficulty in resuscitation in the field. However, high quality CPR is difficult with standard CPR. The results of chest compression depth, velocity, and volume were better than the standard 2-person CPR using Lucas in the VR based state. Especially, since the incomplete relaxation rate is low after chest compression, using mechanical chest compression device (LUCAS) rather than standard CPR affects the result of CPR in positive way, so it is suggested to use mechanical chest compression device as an alternative of high quality chest compression. In addition, there should be regular training programs so that mechanical chest compression device can be used efficiently.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Types of Subjectivity for Images of Nurses in Small and Medium-Sized Hospitals

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ABSTRACT

Background/Objectives: The purpose of this study was to provide basic data for improving the desirable nursing image by identifying subjectivity of the nursing image of Korean small and medium-sized hospitals.

Method: Final 57 Q-sample constructed of 267 Q-populations. P-sample collected by convenience sampling of 36 nurse in Korean hospitals. P-sample collection was from August 25, to 2017 September 15. Data analysis of the principal component factor analysis method based on PC-QUANL use

Findings: Results of this study among the small-medium sized hospital's nurses, three types of attitudes toward nursing images were identified: Type 1 (Caring provider with a mission); Type 2 (Professional health manager); and Type 3 (Responsible medical profession).

Improvements/Applications: The results of this study can be helpful in understanding the nursing image and this can be used as basic data for the establishment of desirable nursing image.

Keywords: *Q-methodological, Nursing-image, small and medium-sized hospital, Subjectivity, Type*

Introduction

In Korea, starting from 2018, the demand for medical care is expected to surge due to the introduction of an elderly society. and the demand of nurses is increasing in health care area[1].

According to health care environment, the ratio of nurses which play a key role in patient care, accounts for more than 30-40%. In 2015, the government introduced a comprehensive nursing service system in order to solve the social problems caused by family care for private employment[2].

The 21st century is to nurture competent nurses, provide to high quality nursing care. It is important for nurse practitioners to the image of a medical institution, the nurse's own image are perceived to have an ambiguity[3].

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The image of nursing is divided into social, traditional, professional, and personal images [4]. In the meantime, if it has responded to many social roles required by traditionally devoted person image [5], who are intelligent, logical, progressive, and sophisticated in their understanding of the other's feelings [6].

According to the Gallup Survey of the United States in 2010, nursing jobs ranked first among the most honest and ethical professionals in the profession, excluding 2001, during the period from 1999 to 2010. According to the survey results of the nurses perceived by the public conducted by the Korean Nursing Association, 9 out of 10 (91.1%) were 'socially recognized professions', 84% said' nurses have expert knowledge the patient 's problem is solved. Furthermore, 8 out of 10 people thought "a warm and kind person who can trust and believe in a nurse".

it deviates from the image which is in charge of the Today, however, nurses find it difficult to improve the image of themselves by the outside rather than the inner factor of nursing itself [7].

According to the Hospital Nursing Association Report in 2012, the turnover rate of nurses is more than

three times higher the small and medium size hospital than that of large general hospitals. The turnover rate of large general hospitals is 9.8%, while the turnover rate in small and medium size general hospitals in 200-399 hospitals is 23.2%.

Although small and medium hospitals are in an important position to meet the medical needs of the local residents by linking the large general hospitals and the primary medical institutions in the medical delivery system in Korea.

Thus, the purpose of this study is to provide basic data for establishing the image of nurses in small and medium hospitals by analyzing the types of nurses.

Research Method

Study Design: This is an exploratory study by Q-methodology to identify the subjectivity of the image of the nursing n in small and medium Korean hospitals.

Study Method

Composition of Q-sample: Concourse extraction conducted to overall through literature review and in-depth interviews. 12 nurses from were asked to participate in–depth interviews and consented, and then the interviews were conducted. The in-depth interviews were conducted in seminar rooms of for the data collection. We explained for research purposes only use. The interview was then conducted for 1 ~ 1.5 hour after obtaining consent. In this process, a total of 767 Q populations were extracted.

Among 767 Q populations extracted 62 statements were adopted by two nursing professors with experience in studying of Q methodology. The 62 statements adopted were drawn up to cards for each statement, followed by a preliminary survey of six subjects in order to identify the balance of positive, negative, and neutral statement. Then the statements verified the final 57 statements.

Selection of P-sample: The Q-methodology is a qualitative study that emphasizes the subjectivity of individuals by focusing on differences in meaning or importance within individuals, not the differences among individuals. And as a result of the small sample doctrine that when the P sample is enlarged, the characteristics of the P sample are not clearly apparent because several people are biased against one factor, so about 50 people are common [10].

The P sample of this study was collected from a convenience sample of 36 nurses working in small and medium hospitals in Korea. For the ethical protection of participants, the data collection was carried out with consent, participants were told that this study would be solely used for research purposes, that anonymity and the privacy would be guaranteed, and that their participation could be withdrawn during the course of the interview or questionnaire preparation by the participants, if desired.

Q-sorting: Q-sorting is a process of modeling the opinions or feelings of a subject on a subject and this study used the principle of Q methodology. Extracted Q sample was Sby forced distribution. The 57 samples, 2 cards that are most similar to your opinion in strongly Agree (+4), 5 in +3, 7 in +2, 9 in +1, and 11 in neutral (0), and then 22 cards that are furthest from your opinion in strongly Disagree (-4), 5 in -3, 7 in –2, 9 in –1 were distributed forcedly in the same way and the converted scores were assigned in order of 9 points. After the distribution of the Q sample, the reason why each of two cards were placed at +4 and –4 on each end of the Q distribution table was required to be recorded on the questionnaire. It applied later analysis of as a powerful and robust expression of the subject [10].

In this study, the follow-up statements were quoted directly in the type analysis, and the statements were not presented because they are not statistical data.

Data Analysis

The Principal Component Factor Analysis (PCA) method was used by the PC-QUANL program, which was produced by Norman Van Tubergen and coded in numerical order.

In order to determine the ideal number of factors and to increase the explanatory power, the number of factors was input based on Eigen value 1.0 or higher, among the calculated results, and the type that was judged to be ideal was finally selected.

Results

Composition of Q-factors: In this study, leading to three types factors to be found. In the first type, there were 17, the second type was 16, and the third type was 3.

The explanation power of each factor, the first factor was 26.1%, the second factor was 6.5%, and the third factor was 5.1%. The correlations among the three types and explanatory power of each type are shown in table 1.

Table 1: Correlation between Eigen Values and Factors by Type

	Type 1 (N = 17)	Type 2 (N = 16)	Type 3 (N = 3)
Eigen value	14.5353	1.9942	1.6585
Variance	.7992	.1096	.0912
Cumulative	.7992	.9088	1.000
Type 1	1.000		
Type 2	.733	1.000	
Type 3	.450	.489	1.000

In addition, the demographic characteristics and factor weights are show in Table.

Analysis of Characteristics by Each Type

Type 1: Caring Provider with a Mission: As shown in table 2, there were 17 subjects classified as type 1, with an average age of 37.6 years and the average clinical experience was 15.5 years, with 16 female and 1 male.

Table 2: Demographic Characteristics and Factor Weights of Each Type

Type	P No.	Factor weight	Age	Gender	Clinical experience (year)
Type I (n = 17)	17	2.0393	27	F	5
	11	1.7020	35	F	13
	36	1.6413	45	F	23
	27	1.4539	41	F	19
	32	1.3923	31	F	9
	31	1.3582	40	F	18
	28	1.2474	33	F	11
	29	1.1999	41	F	19
	5	1.1970	27	F	5
	18	1.1774	23	F	1
	33	1.1254	38	F	16
	26	1.0312	34	F	12
	24	0.9824	48	F	26
	15	0.8444	40	F	18
	2	0.8427	52	F	30
	22	0.7974	43	M	18
	19	0.5721	42	F	20
Type II (n=16)	23	1.3843	48	F	27
	30	1.2577	42	F	21
	16	1.2171	25	F	4
	3	1.1809	52	F	31
	13	1.1179	50	F	29
	34	1.1044	34	F	13
	10	1.0862	30	F	9
	4	0.9886	38	F	17
	1	0.9605	40	F	19
	6	0.6900	44	F	23
	12	0.6613	38	F	17
	14	0.6171	45	F	24
	20	0.5318	47	F	26
	21	0.4704	35	F	14
	25	0.4653	41	F	20
	8	0.4322	30	F	9
Type III (n=3)	9	0.6600	26	F	5
	7	0.4296	44	F	23
	35	0.2381	25	F	4

As show table 3, the strongest positive items is a job with a mission (Z = 1.19)', 'Nurse takes health as a top priority (Z = 1.08)', 'Nurse are the mental proponents of patient' (Z = 1.06) ', 'Nurse are people who act as intermediaries for doctors and patients (Z = 1.05)', 'Nurse are the closest person to patients (Z = 1.03)', 'Nurse give patients faith (Z=1.01), whereas items with strong negative, 'Nursing is just a job in the hospital (Z = -1.47)', 'Nurses are assistants to doctors (Z=-1.46)', "Nurses are the people who care for a patient (Z = -1.44)', and 'Nurses are people who perform the work according to the doctor's prescription (Z = -1.33)'.

Table 3: Statement of Z-score by Type ≥ |1|

Type	Q-Statement		Z-score
1	Q19	Nursing is a job with a mission	1.19
	Q43	Nurses take health as a top priority	1.08
	Q47	Nurses are the mental proponents of patient	1.06
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.05
	Q46	Nurses are the closest people to the patients	1.03
	Q08	Nurses give patients faith	1.01

Conted…

	Q45	Nurses are people who perform the work according to the doctor's prescription	-1.33
	Q42	Nurses are the people who care for a patient	-1.44
	Q25	Nurses are assistants to doctors	-1.46
	Q10	Nursing is just a job in the hospital	-1.47
2	Q24	A nurse is a professional health care provider	1.71
	Q07	Nursing is an accurate and smart profession	1.42
	Q05	A nurse is a person who cares for the patient	1.27
	Q31	A nurse is a health manager	1.27
	Q19	Nursing is a job with a mission	1.15
	Q30	A nurse is a hard worker	1.08
	Q12	Nurses are unfriendly	-1.16
	Q10	Nursing is just a job in the hospital	-1.39
	Q25	A nurse is an assistant to a doctor	-1.45
	Q42	A nurse is a person who attends to a patient	-1.67

Conted…

3	Q09	Nurses are always busy	1.85
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.61
	Q23	Nurses have a strong sense of responsibility	1.56
	Q21	Nurses are people who help	1.37
	Q44	Nurses are sincere and must complete their work without making mistakes	1.17
	Q08	Nurses give patients faith	1.13
	Q37	A nurse is a person who cares for the patient	1.08
	Q56	Nursing is a patient-care job	1.03
	Q46	Nurses are the closest people to patients	-1.07
	Q05	A nurse is a person who cares for the patient	-1.12
	Q51	A nurse is on the side of the patient	-1.36
	Q25	A nurse is an assistant to a doctor	-1.36
	Q31	A nurse is a health manager	-2.24

Score difference between type 1 and the other types were shown' <Table 4>.

As show table 4, items that show a difference in scores in type 1 when compared to other types of items were 'The image of nurses is as a nightingale, a white

Table 4: Positive and Negative Statements Compared to Other Types

Type	Q-statement		Z-score	Others' Z-score	Difference
1	Q02	The image of a nurse is that of nightingale, a white angel	.790	-.437	1.227
	Q49	Nurses should resolve the patient's discomfort	1.083	-.053	1.135
	Q25	A nurse is a doctor's assistant	-.464	-.437	-1.027
	Q41	Nurses are passive	-1.549	-.187	-1.362
	Q01	Nursing is a stressful and hard job	.003	1.563	-1.561
	Q09	Nurses are always busy	-.366	1.391	-1.757
2	Q05	A nurse is a person who cares for the patient	1.274	-.357	1.631
	Q35	Nursing is a stable job	.953	-.450	1.403
	Q38	A nurse is an educator	.919	-.384	1.303
	Q24	A nurse is a professional health care provider	1.712	.469	1.242
	Q48	A nurse is devoted to patients	-.035	1.004	-1.039
	Q50	A nurse is the patient's messenger	-1.852	-.519	-1.333

Conted…

3	Q01	Nursing is a stressful and hard job	2.246	.815	1.431
	Q21	Nurses are people who help	1.368	.007	1.361
	Q48	Nurses are devoted to patients	1.564	.241	1.323
	Q57	Nurses are people who act as intermediaries for doctors and patients	1.612	.392	1.219
	Q50	A nurse is the patient's messenger	.052	-1.154	1.206
	Q09	Nurses are always busy	1.855	.651	1.204
	Q42	A nurse is a person who attends to a patient	-.387	-1.537	1.150
	Q43	Nurses takes health as a top priority	-.287	.797	-1.084
	Q51	Nurses are on the side of the patient	-1.360	.029	-1.389
	Q05	A nurse is a person who cares for the patient	-1.117	.440	-1.557
	Q46	Nurses are the closest person to patients	-1.069	.764	-1.833
	Q31	Nurses are health managers	-2.237	1.144	-3.382

Participants in Type 1 considered the nurse to be a person with a mission that considered the patient's health as a top priority. The first type strongly denied the images that nurses are always busy, stressed, and hard job, and it has been named as a "caring provider with a mission" because it has a mission and a recognition that a nurse should exist to promote patient's health and solve problems.

Type 2: Professional Health Manager: Type 2 classified 16 subjects with an average age of 39.9 years and the average clinical experience was 18.9 years. <Table 2>.Type 2 **were** ' Nurse is a professional health care provider (Z=1.71)',Nurse is a smart in professional (Z = 1.42)', 'Nurse is a person who takes care of a patient (Z = 1.27)', 'Nurse is a health manager (Z = 1.27)' etc., while items showing strong negative were 'Nurse is a person who attends to a patient (Z = -1.67)', 'Nurse is an assistant doctor (Z = -1.45)', 'Nursing is just a job (Z = -1.39), 'Nurses are unfriendly (Z = -1.16)' <Table 3>. Score difference between type 2 and the other types were shown' <Table 4>.

Type 3: Responsible Medical Profession: There were three subjects classified as type 3, with an average age of 31.7 years, an average clinical experience was 10.6 years, and all were of the female gender.

The most positive items of type 3 were 'Nurses are always busy (Z = 1.85), 'Nurses are people who act as intermediaries for doctors and patients (Z=1.61)', 'Nurses have a strong sense of responsibility (Z=1.56)', 'Nurses are people who help (Z=1.37)', 'Nurses are sincere and must complete their work without making mistakes (Z=1.17)', 'Nurses give patients faith (Z=1.13)', 'Nurse is a person who cares for the patient (Z=1.08)', 'A nurse is a patient-care job (Z=1.03)', On the other hand, items showing strong negative are 'Nurses are health care workers (Z=-2.24)', 'A nurse is an assistant to a doctor (Z=-1.36)', 'A nurse is on the side of the patient (Z=-1.36)', 'A nurse is a person who cares for the patient (Z=1.12)', 'A nurse is the closest person to patients (Z=-1.07)'<Table 3>. Score difference between 3 type and the other types were shown' <Table 4>.

Discussion

Nurses share the most time with patients in specialized department in the hospital. As a result, nurses themselves have a negative image of nurses [11]. This study was to investigate of nurse's subjectivity image in small and medium hospitals.

Type 1, "Caring Provider with Mission", responded to 17 of 36 participants, with an average age of 37.6 years and an average clinical career of 15.5 years. This group involved in the middle manager that is expect to have a profession job and a positive thinking in comparison with other types. On the other word, it was worth the image like 'Nightingale' which is the closest to the patient and serves as a healer for the patient without any mistake.

Type 2 was the "professional health manager" type, and 16 of 36 participants responded. The average age was 39.9 years and the average clinical career was 18.9 years. This group responded 16 of 36 participants responded. The average age was 39.9 years and the average clinical career was 18.9 years. The most positive

items in this type were 'nurses' (n = 1.71),' nurses' (n = 1.71) 'and' nurses' Attitudes and values are based on the recognition that nurses are more than just physical and mental care of patients as professional occupations.

Type 3 was "Responsible medical practitioner" with 3 out of 36 participants. The average age was 31.7 years and the average clinical career was 10.6. The most positive items were 'Nurses are always busy (Z = 1.85)', followed by nurses who answered 'Nurse is a mediator between doctor and patient (Z = 1.61)', Attitudes and values. This group focus on the patient rather than on the image of mission or profession, and the nurse is a stressful, busy and difficult occupation rather than had the image of a job to manage.

The results of this study are as follows. First, the study on the nursing work environment of small and medium hospitals shows that job satisfaction is low, delegation and confusion of informal roles among medical personnel, unfair reward system between job and job type, the results of this study were as follows. Second, the nurses of the small hospitals experienced low levels of nursing care for themselves [13]. Based on this study, it is necessary to provide policy support, education and counseling to solve problems of supply and demand of insufficient nurses in Korea and to provide high quality nursing care.

Conclusion

This study on the type of subjectivity for images of nurses in small-medium sized hospital identified three types: (1) caring provider with a mission, (2) professional health manager, and (3) responsible medical profession.

This study has significance that the image of nurse's in small and medium hospital. But, the subjects of this study were limited Therefore, further research is required to understand the more diverse subjectivity of nurses, it is necessary to have a continuing interest in professional roles as well as nursing images of the nurses.

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Three-Dimensional Measurements of Pharynx Structures in Malocclusion

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ABSTRACT

Background/Objectives: The present study was conducted to examine differences between malocclusion the pharynx by reconstructing 3D images from CBCT data using the Mimics program, which allows actual measurement values to be acquired that are not affected by image distortion.

Method/Statistical Analysis: The subjects were analyzed by dividing them into malocclusion of classes I, II, and III (with each group comprising five participants) according to their facial skeletal forms. DICOM images were 3-dimensional ones manufactured by using the 3-D image program(Mimics 17, Materialise, Leuven, Gelgium). Upper airways in subjects of class I,II and III were divided into rhinopharynx, oropharynx and laryngopharynx.

Findings: The volume of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III; the corresponding values for the oropharynx were 10946.0500, 8547.6125, and 12126.3125, respectively, indicating no significant differences. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III; the corresponding values for the oropharynx were 48.9466, 41.8613, and 48.0238, respectively, also indicating no significant differences

Improvements/Applications: However, the present 3D measurements based on data measured in two dimensions are expected to facilitate future studies and provide basic data for them.

Keywords: *pharynx, malocclusion, 3D, Pharyngeal, CBCT*

Introduction

The respiration function has a huge impact on maxillofacial growth and development, with the environmental factor of mouth breathing known to be closely related to malocclusion[1-2]. Mouth breathing is likely to result in problems related to occlusion, such as palatal stricture, posterior crossbite, and anterior open bite, and it also may increase the anterior facial height and lower the position of the tongue by affecting the skeletal structure[3]. These features have led to considerable interest in the relationship between mouth breathing and facial form, and the number of studies evaluating pharynges based on the skeletal form has been increasing[1–11]. Mouth breathing and airway obstruction have been reported to be related to malocclusion of Angle class 2 and division 1[4]. Some studies have evaluated the pharynges according to malocclusion, with recent ones examining the relationship between breathing during sleep and the pharynx[12-18].

A representative case is snoring sometimes being accompanied by sleep apnea and obstructive sleep apnea[16]. Such obstructive sleep apnea occurs as the pharyngeal airway is narrowed during sleep due to macroglossia, a posterior position of the mandible, and a receding chin[17]. Previous studies have found a high incidence of obstructive sleep apnea in malocclusion of Angle class 3[19-20]. Sleep apnea may therefore seem to be significantly affected by the pharyngeal size, depending on the severity of the Angle malocclusion. Although previous studies have tended to measure the pharyngeal form using cephalometric images, recent studies have observed pharyngeal forms by building three-dimensional (3D) images based on CT and MRI[1–11].

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However, there are some limitations when establishing pharyngeal forms based on constructing 3D images based on CT and MRI[21]. The present study was conducted to examine differences between malocclusion of classes I, II, and III and the pharynx by reconstructing 3D images from CBCT data using the Mimics program (version 17, Materialise, Leuven, Belgium), which allows actual measurement values to be acquired that are not affected by image distortion.

Materials and Method

Subjects: CBCT data of 15 male adults without missing or asymmetric teeth or psychological disorders from among orthodontics patients at Danguk University Dental Hospital were provided by the Department of Oral and Maxillofacial Radiology. The subjects were analyzed by dividing them into malocclusion of classes I, II, and III (with each group comprising five participants) according to their facial skeletal forms. This study was approved by the institutional review board of Danguk University Dental Hospital (approval no. DUDH IRB 2015-12-022).

Method

Reconstruction of Three-Dimensional Images: CBCT data of the subjects were obtained in DICOM format using a CBCT scanner (Alphard 3030, Asahi, Kyoto, Japan), and CT scanning was carried out with the following parameters: slice increment, 0.39 mm; slice thickness, 0.39 mm; and matrix, 512 px * 512 px.

The DICOM images were 3D images that were reconstructed using 3D image processing software (Mimics version 17, Materialise). The nasopharynx, oropharynx, and laryngopharynx parts of the upper airways of the subjects were categorized into malocclusion of classes I, II, and III.

Reference Points: The following reference points were measured [Figure. 1, Figure. 2, Figure. 3]:

1. **Nasopharynx:** from the posterior bone of the hard palate to the border below the sphenoid bone underneath the sinus.
2. **Oropharynx:** from the posterior end border of the soft palate to the middle and anterior borders of the second cervical vertebrae.
3. **Laryngopharynx:** from the posterior border of the hyoid bone to the low and anterior borders of the third cervical vertebrae.

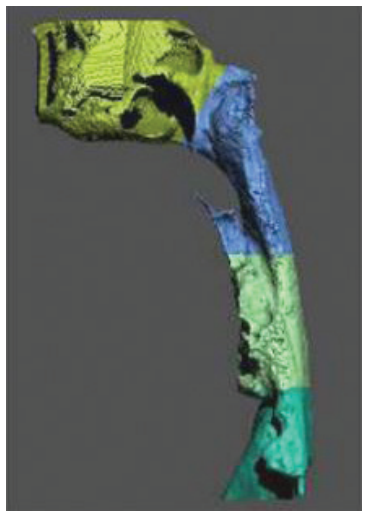

Figure 1: Thre –Dimensional measurement of pharyngeal structures in malocclusion case (Class I)

Figure 2: Three–Dimensional measurement of pharyngeal structures in malocclusion case (Class II)

Figure 3: Three–Dimensional measurement of pharyngeal structures in malocclusion case (Class III)

Measurement Items

The following parameters were measured:

1. Nasopharynx volume.
2. Oropharynx volume.
3. Nasopharynx volume ratio.
4. Oropharynx volume ratio.

Statistical Analysis

The measurement items were analyzed using SPSS (version 23.0, SPSS, Chicago). The presence of significant differences was tested using a regularity test, and one-way ANOVA was applied due to a small number of the subjects. The average differences according to each class was tested by conducting a posttest with a 95% confidence interval (p=0.05).

Results and Discussion

The volume of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III; the corresponding values for the oropharynx were 10946.0500, 8547.6125, and 12126.3125, respectively, indicating no significant differences. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III; the corresponding values for the oropharynx were 48.9466, 41.8613, and 48.0238, respectively, also indicating no significant differences [Table 1].

The breathing function is one of the environmental factors of malocclusion that plays an important role in maxillofacial growth and development, and is also known to be closely related to the occurrence of malocclusion[8-9]. Lee et al.[2] reported that the presence of more-serious mandibular protrusion in patients with class III malocclusion resulted in a larger laryngopharyngeal width. Lee et al.[11] reported that maxillofacial growth can be affected by maxillary retrusion and mandibular posteroinferior rotation when mouth breathing is present.

In addition, pharynges related to the respiratory and digestive systems are also closely associated with maxillofacial growth and occlusal disorder, since they are connected inside the mouth and to adjacent skeletal structures[7]. Ricketts[8] reported that the pharyngeal effects on the skeletal structure may vary depending on size, and mouth breathing can occur if the adenoid of the nasopharynx is large. In addition, Lixa et al.[14] reported that the size of the pharynx is associated with stroke, and Yun et al.[14] also indicated that the size of the pharynx affects sleep apnea.

While many studies have investigated the pharynx, quantitative measurements have been lacking. Most of the preliminary studies measured the size of the pharynx using lateral cephalometric radiography, CT, or MRI[1–18]. The present study therefore used the Mimics program in an attempt to identify differences between the pharynges in 3D images obtained from CBCT data and in the presence of malocclusion of classes I, II, and III.

This study found that the rhinopharyges are larger in malocclusion of class I than in classes II and III, whereas Lee et al.[2] reported that the rhinopharyges are larger in malocclusion of classes II and III than in class I. These discrepancies could have been due to errors in the measurements made on cephalometric radiographs[21]. The results of the present study are similar to those of Kim et al.[1], who found that the oropharynx was larger in class III than in class I, probably due to mandibular protrusion being more serious in class III skeletal structures[11]. The present results are also similar to Fakhri et al.[5] finding that the nasopharynx was larger in class II than in the other two classes, probably due to greater maxillary protrusion[11]. Finally, the present study found that volume ratios of the oropharynx were higher in class I than in class III, whereas Kim et al.[10] obtained the opposite result, probably due to errors.

The size of the pharynges appears to vary between skeletal structures of classes I, II, and III, and hence further studies are need to clarify the situation. This study is considered to have been limited by the small number of subjects resulting in no statistically significant differences between the size of pharynges among classes I, II, and III. However, the present 3D measurements based on data measured in two dimensions are expected to facilitate future studies and provide basic data for them.

Table 1: Comparison of Pharynges According to Malocclusion Class

	Class I Mean (SD)	Class II Mean (SD)	Class III Mean (SD)	P*
Nasopharynx	11521.9600 (3595.04708)	11925.5850 (1306.05734)	13167.2800 (2089.73790)	0.643
Oropharynx	10946.05500 (2755.05117)	8547.6125 (539.30330)	12126.3125 (1689.51491)	0.067
Volume ratlo of nasopharynx	51.0534 (2.46665)	58.1387 (3.97881)	51.9762 (5.33349)	0.074
Volume ratlo of oropharynx	48.9466 (2.46665)	41.8613 (3.97881)	48.0238 (5.33349)	0.074

Conclusion

This study examined the size of the pharynges according to different classes of malocclusion by comparatively analyzing the pharyngeal forms in patients with malocclusion of classes I, II, and III by reconstructing images derived from CBCT into 3D ones. The results can be summarized as follows:

1. The size of the nasopharynx was 11521.9600 for class I, 11925.5850 for class II, and 13167.2800 for class III, with no significant differences ($p>0.05$).

2. The size of the oropharynx was 10946.0500 for class I, 8547.6125, for class II, and 12126.3125 for class III, with no significant differences ($p>0.05$).

3. The volume ratio of the nasopharynx was 51.0534 for class I, 58.1387 for class II, and 51.9762 for class III, with no significant differences ($p>0.05$).

4. The volume ratio of the oropharynx was 48.9466 for class I, 41.8613 for class II, and 48.0238 for class III, with no significant differences ($p>0.05$).

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Coping Strategies Influencing Role Conflicts among Clinical Nurses

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ABSTRACT

Background/Objectives: This study was conducted to describe the level of role conflicts and coping strategies as well as the types of coping strategies influencing role conflicts among clinical nurses.

Method/Statistical Analysis: In this descriptive study, we enrolled 98 nurses in two hospitals in Korea. Role conflicts and coping strategies were assessed using a structured questionnaire. Data were analyzed using descriptive statistical analysis, independent t-tests, one-way ANOVA, Pearson's correlation, and multiple linear regression.

Findings: The overall mean score reflecting role conflicts was 3.41 ± 0.51. The mean scores for four subcategories of role conflicts (lack of ability, role ambiguity, disturbance of environment, and lack of help) were 3.32 ± 0.61, 3.36 ± 0.55, 3.59 ± 0.65, and 3.41 ± 0.77, respectively. The overall mean score for coping strategies was 3.02 ± 0.38. Among subcategories of coping strategies, the highest mean score was for tension reduction (3.29 ± 0.64), and the lowest mean score was for problem-focused coping (2.73 ± 0.53). Among subcategories of coping strategies, lack of ability was significantly correlated with wishful thinking (r=.219, p<.05), detachment (r=.224, p<.05), and seeking social support (r=.263, p<.01). Role ambiguity was significantly correlated with wishful thinking (r=.236, p<.05), seeking social support (r=.305, p<.01), and tension reduction (r=.294, p<.01). Both disturbance of environment and lack of help were significantly correlated with wishful thinking (r=.306, p<.01; r=.365, p<.01), seeking social support (r=.328, p<.01;r=.316, p<.01), and tension reduction (r=.275, p<.01; r=.247, p<.05). Multiple linear regression showed that role conflicts among nurses were coping strategies for seeking social support (t=2.726, p=.008).

Improvements/Applications: Nurses have been influenced by the help of people around them in reducing role conflicts. Therefore, it is necessary to build support infrastructure inside and outside the hospital.

Keywords: *Role conflict, Coping strategy, Hospital, Nurse, Marital status*

Introduction

In the hospital setting, nurses occupy the largest numbers and are directly responsible for providing health services to the clients. Thus, quality assurance of nursing largely determines the overall quality of health services provided by hospitals [1]. In a rapidly changing medical environment, nurses are constantly being asked to perform high-quality nursing services and friendly care by patients or hospital organizations [2, 3]. However, nurses inevitably experience conflicts while coordinating and communicating their work between various professional responsibilities and patients.

Clinical nurses experience role conflicts due to inconsistencies between role expectations and role performance [4]. If role conflicts are not properly controlled, they can affect the quality of patient care by lowering job satisfaction and job performance [5]. It is important that nurses are satisfied with their jobs if the ultimate goal of nursing is to provide high-quality patient care. This is because quality nursing is influenced by job satisfaction, which allows the nurse to perform efficiently and positively the tasks given to nurses [6].

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Role conflicts need to be reduced in order to increase job satisfaction and nursing performance. In order to minimize the dysfunction caused by these role conflicts, clinical nurses are required to maintain a psychological, cognitive, and behavioral balance [5]. According to previous research, nurses in Korea have chosen to make concessions or compromises among various problem-solving methods to minimize the impact of role conflict situations [7]. However, it is not considered desirable for nurses to choose concessions or compromises to resolve conflicts, as problem-solving is a behavioral approach that seeks to find solutions that meet the interests of both the self and the other. Therefore, this study was conducted to describe the extent of role conflicts and coping strategies and examine correlations between role conflicts and coping strategies among clinical nurses.

Materials and Method

Design and Sample: This descriptive study was conducted to identify the levels of role conflicts and coping strategies as well as the types of coping strategies influencing role conflicts among clinical nurses in Korea. A total of 98 nurses participated in this study from two hospitals. Two nurses who had insufficient responses were excluded from the analysis. The minimum sample size was calculated using G* Power version 3. 1. 2, with an effect size of .15, significance level (α) of .05, statistical power (1-β) of .8, and the number of predictors set to 6 [8]. These settings generated a minimum sample size of 98 participants.

Ethical Considerations and Procedure: Fundamentally, the ethical implications of this study and the potential risks to the participants' human rights were minimal. Nonetheless, a research assistant provided a full explanation of the purpose, content, and methods of the study before the distribution of written consent forms to all participants. All subjects participated voluntarily. Data collection was carried out in May 2014.

Measures

Role Conflicts: Role conflicts were measured using the Korean Role Conflicts (KRC) tool, developed by Kim and Park [4], which consists of 40 items with four subcategories. The components of the KRC are lack of ability, role ambiguity, disturbance of environment, and lack of help, all of which are assessed using a 5-point Likert-type scale, ranging from 1 ('no conflict') to 5('very severe conflict'). Cronbach's α of the original scale was .93, while the corresponding Cronbach's α for this study was .91.

Coping Strategies: Coping strategies that nurses applied to stressful situations were measured using the Korean Way of Coping (KWC) tool, developed by Han and Oh [9], which consists of 32 items with six subcategories. The KWC sections are problem-focused strategy, wishful thinking, detachment, seeking social support, focusing on the positive, and tension reduction, which are assessed using a 5-point Likert-type scale, ranging from 1('never used coping strategies') to 5('used coping strategies a lot'). Cronbach's α of the original scale was .82, while the corresponding Cronbach's α for this study was .80.

Statistical Analyses: Using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA), general characteristics of subjects were analyzed by descriptive statistics. To analyze the differences in role conflicts and coping strategies among participants, independent t-tests and one-way ANOVA were applied, and Pearson's correlation coefficient was applied to assess the linear relationships among variables. Finally, multiple regression analysis was applied to explain the types of coping strategies influencing role conflicts among clinical nurses. The significance level for testing statistical significance was estimated lower than .05.

Results and Discussion

Table 1 shows the general characteristics of the 98 participants. Half of the respondents were 20-29 years old, and all respondents were female. In terms of marital status, 66.3% of the participants were single. Forty-four percent of the participants had less than 5 years of work experience as a nurse.

Table 1: General Characteristics of Subjects

Variables		N	%
Age	20-29 years	49	50.0
	30-39 years	33	33.7
	40 years and over	16	16.3
Marital status	Married	33	33.7
	Single	65	66.3
Duration of work	<5 years	43	43.9
	<10, and ≥5 years	37	37.8
	≥10 years	18	18.3
Education	4-year course	39	39.8
	3-year course	59	60.2

Table 2 shows the mean scores reflecting role conflicts and coping strategies among study participants. The overall mean score for role conflicts was 3.41 ±

0.51. The mean scores for the four subcategories of role conflicts (lack of ability, role ambiguity, disturbance of environment, and lack of help) were 3.32 ± 0.61, 3.36 ± 0.55, 3.59 ± 0.65, and 3.41 ± 0.77. The clinical nurses reported the highest level of role conflict in the environment category, including lack of time and nursing facilities, excessive workload, and atmosphere of the nursing unit.

The overall mean score reflecting coping strategies was 3.02 ± 0.38. Among subcategories of coping strategies, the highest mean score was that representing tension reduction (329 ± 0.64) and the lowest mean score was for problem-focused coping strategy (2.73 ± 0.53). The clinical nurses were generally unable to use the most recommended problem-focused coping strategy.

Table 2: Role Conflicts and Coping Strategies of Clinical Nurses

Variables	M ± SD	Range
Total role conflicts	3.41 ± 0.51	1.78-4.50
Lack of ability	3.32 ± 0.61	1.90-4.50
Role ambiguity	3.36 ± 0.55	1.60-4.67
Disturbance of environment	3.59 ± 0.65	1.80-5.00
Lack of help	3.41 ± 0.77	1.60-4.80
Total coping strategies	3.02 ± 0.38	1.88-3.81
Problem-focused	2.73 ± 0.53	1.63-4.13
Wishful thinking	3.25 ± 0.63	1.60-4.80
Detachment	3.00 ± 0.51	2.00-5.00
Seeking social support	3.05 ± 0.51	1.86-4.43
Focusing on the positive	3.06 ± 0.63	1.33-4.33
Tension reduction	3.29 ± 0.64	1.33-5.00

Table 3 shows differences in role conflicts and coping strategies according to general characteristics. Marital status had a statistically significant effect on role conflicts (t=-2.224, p=.030), but no other general characteristic was associated with significant differences in coping strategies.

Table 3: The difference of role conflicts and coping strategies of clinical nurses by general characteristics

Variables		Role conflicts			Coping strategies		
		M ± SD	t/F	p	M ± SD	t/F	p
Age	20-29 years	3.45 ± 0.48	0.219	.804	3.01 ± 0.42	0.896	.411
	30-39 years	3.37 ± 0.53			2.98 ± 0.34		
	40 years and over	3.40 ± 0.59			3.13 ± 0.33		
Marital status	Married	3.25 ± 0.54	-2.224	.030	3.03 ± 0.37	0.081	.935
	Single	3.49 ± 0.06			3.02 ± 0.39		
Duration of work	<5 years	3.47 ± 0.47	0.602	.550	3.08 ± 0.34	1.863	.161
	<10, and ≥5 years	3.40 ± 0.54			2.93 ± 0.41		
	≥10 years	3.31 ± 0.51			3.07 ± 0.39		
Education	4-year course	3.45 ± 0.51	-0.324	.746	3.06 ± 0.37	-0.808	.421
	3-year course	3.42 ± 0.48			3.00 ± 0.37		

Table 4 shows there was a significantly positive correlation between role conflicts and coping strategies. Specifically, lack of ability had significantly positive correlations with wishful thinking (r=.219, p<.05), detachment (r=.224, p<.05), and seeking social support (r=.263, p<.01). Role ambiguity had significantly positive correlations with wishful thinking (r=.236, p<.05), seeking social support (r=.305, p<.01), and tension reduction (r=.294, p<.01). Disturbance of environment had significantly positive correlations with wishful thinking (r=.306, p<.05), seeking social support (r=.328, p<.01), and tension reduction (r=.275, p<.01). Finally, lack of help had significantly positive correlations with wishful thinking (r=.365, p<.01), seeking social support (r=.316, p<.01), and tension reduction (r=.247, p<.05).

Table 4: Pearson's correlation coefficients between role conflicts and coping strategies of clinical nurses

	Lack of ability	Role ambiguity	Disturbance of environment	Lack of help
Problem-focused	.176	0.87	.018	.102
Wishful thinking	.219*	.236*	.306**	.365**
Detachment	.224*	.047	.148	.168
Seeking social support	.263**	.305**	.328**	.316**
Focusing on the positive	.089	.064	.103	.090
Tension reduction	.127	.294**	.275**	.247*

Table 5 shows the result of the multiple linear regression analysis to identify coping strategies influencing role conflicts among study participants. Categorical data (marital status) were converted into dummy variable. The variances inflation factors were estimated from 1.17 to 1.72, which were lower than the criterion value of 10. The tolerance limits among predictive variables were calculated from 0.58 to 0.86, which were over 0.1 of the criterion value. There was neither multicollinearity nor high autocorrelations among predictor variables because the value of the Durbin-Watson test for autocorrelations among residuals was 2.007.

The multiple linear regression analysis revealed that role conflicts of clinical nurses were influenced by marital status (t=-2.487, p=.015) and coping strategies (especially seeking social support; t=-2.726, p=.008).

Table 5: Coping strategies influencing role conflicts of clinical nurses

Variables	Role conflicts		
	β	t	p
Problem-focused	-.001	-0.008	.994
Wishful thinking	.059	0.494	.623
Detachment	-.022	-0.198	.843
Seeking social support	-.326	-2.726	.008
Focusing on the positive	-.037	-0.313	.755
Tension reduction	.194	1.889	.062
Marital status (married nurse)	-.245	-2.487	.015
F(p)	4.463 (<.001)		
Adj. R^2	.260		
Tolerance	.58-.86		
VIF	1.17-1.72		
Durbin-Watson	2.007		

Clinical nurses were experiencing more than moderate levels of role conflicts at a score of 3.41 out of 5. Particularly, scores for disturbance of environment and lack of help were higher than for other subcategories. In other words, clinical nurses found that their working environments were not only unfriendly, but they also needed help and support from nearby people. The coping strategies used by nurses who experienced role conflicts were tension reduction and wishful thinking. Both methods are passive ways to make people feel less conflicted by modifying their thoughts rather than actively solving problems. Therefore, clinical nurses are likely to experience repeated role conflicts because the above strategies cannot solve fundamental problems [10].

After controlling general characteristics, the coping strategy of seeking social support influenced role conflicts among participants. Specifically, clinical nurses receiving support or help from nearby people experienced less role conflict than nurses who did not. However, the problem-focused strategy proposed to be the most effective in previous studies was not influenced by the role conflicts experienced by clinical nurses in this study [11, 12]. This was because most of the role conflicts experienced by the nurses were complicated organizational problems that were difficult to solve. Instead, the diverse support of the people who understand the conflict situation experienced by the nurses was considered to reduce the level of role conflicts among the nurses.

Conclusion

The purpose of this study was to identify the extent of role conflicts and coping strategies and examine how coping strategies influence role conflicts among clinical nurses. Participants showed the highest level of role conflict in the environment category, including lack of time and nursing facilities, excessive workload, and atmosphere of the nursing unit. Additionally, clinical nurses used wishful thinking and tension reduction—passive methods—to solve the role conflicts. Therefore, nurses need to learn more active problem-solving strategies.

Nursing administrators need to identify and improve the causes of nurses' the organizational problems that cause the strongest role conflicts. Moreover, nursing managers should be able to provide planned interventions in new nursing education initiatives, for example, to use effective coping strategies to overcome stressful situations.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Development and Validation of a Scale to Assess Dental Hygienists' Role as Knowledge Brokers in Korea

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ABSTRACT

Objectives: In this study, we aimed to evaluate the validity and reliability of the scale for dental hygienists' role as knowledge broker, a tool potentially useful to help to develop dental hygienists' role as a knowledge broker that meet the needs of the field and include it in dental hygiene curricula.

Method: This manuscript reports on a complex descriptive study involving both qualitative and quantitative sub-studies. It also includes a methodological study aiming to develop and verify the content validity and reliability of a scale for dental hygienists' role as a knowledge broker. The survey questionnaire was distributed to 240 dental hygienists who currently work in care institutions, including private hospital, dental hospital, or general hospital for at least three months, between June 8, 2015 and July 13, 2015.

Findings: To verify the reliability, validity, and unidimensionality of the 40 questionnaire items, exploratory factor analysis was performed with Varimax rotation. The exploratory factor analysis led to 17 items for three factors. In the confirmatory factor analysis, the path coefficients for all items were significant, at .588-.857.Based on the results of exploratory and confirmatory factor analyses and literature review of the role of knowledge brokers, its subfactors 1, 2, and 3 were named "explain and promote understanding", "deliver knowledge", and "link to resources", respectively. The goodness of fit of the structural equation model was examined using the following indices: =3.066, GFI=.860, AGFI= .805, TLI=.882, CFI=.904, RMSEA=.094

Applications: We developed and validated a scale to assess the roles of dental hygienists in Korea as a knowledge broker. Reflecting the newly demanded roles of knowledge brokers in educational curricula will surely help dental hygienists to advance and improve themselves as health professionals.

Keywords: *Dental hygienist, Dental hygiene, Educational curricula, Knowledge Broker, Role*

This paper is a part of the dissertation authored by Seo-Ha Yun of the Graduate School of Hanyang University

Introduction

Dental hygienists, along with dentists, play an essential role in preventing oral diseases and educating patients. Furthermore, they perform preventive treatments on dental patients, cooperate with dentists to promote efficient treatment, and instruct patients about oral management to prevent oral diseases[1].

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With increased economic standard and diverse medical demands in South Korea, the roles of dental hygienists are also expected to change. Professional dental hygienists are demanded to play a more diverse repertoire of roles, such as comprehensive dental hygiene treatment considering prophylactic treatment and aesthetic factors. As knowledge brokers, a recently emerged role, dental hygienists are required to equip the functions of questioning (plan on behalf of the patient), explaining (help patient to clearly understand healthcare information), and maintaining (hold onto the information delivered to the patient) [2,3].

Knowledge is information organized and analyzed to be used for problem-solving and decision-making[4,5].

A broker is a mediator at the center of information delivery who provides knowledge, resolves conflicts with collected information, and connect the two groups participating in knowledge exchange. In other words, a broker does not prefer a specific individual over the others and instead satisfies the needs of all. A knowledge broker is a compound term with the words of knowledge and broker. In other words, a knowledge broker is an individual or organization that partakes in the bidirectional exchange of knowledge between two parties, who delivers the knowledge or practice of one group to the another and mediates and connects the two parties, thereby creating a new opportunity for learning and innovation [6,7].

The roles of dental hygienists in Korea can be broadly categorized into cooperation with dental treatment, preventive treatment for oral diseases, oral health education, and hospital coordinator. Currently, dental hygienists in Korea are mostly involved in aiding dental care, but changes in the dental clinic environment and the resulting diversification, departmentalization, and specialization of clinical tasks call for an expansion of dental hygienists' scope of work as well. If a dentist's main work is dental care, a dental hygienist's main work is to provide preventive education to patients. Nevertheless, dental hygienists in Korea have been mostly involved in the works in dental care, as their fundamental role was not established properly. Since dental hygienists perform the roles of organizational managers or care aids at the same time they provide preventive treatment to people, oral health education and patient counseling, it is important to identify the skills, knowledge, and attitudes required in the clinical setting. This knowledge is critical to plan the education of new dental hygienists and dental hygiene students accordingly and empower them as professionals meeting the demands of the field.

South Korea's 2002 National Competency Standards (NCS) recommend scientific and systematic identification and education of the standardized work capacities (knowledge, skills, attitude) required for successful work performance. Therefore, there is a need for a new model that is commensurate with today's context to maintain a qualitative balance between theory and actual practice about the role of knowledge broker in educational institutions and in the field of employment. In order to develop the true role of dental hygienists, as opposed to merely giving theory education focused on delivering dental medical knowledge, and to reflect the roles of knowledge broker as demanded in the current era, it would be necessary to understand whether relevant knowledge is used or shared as a "common language" between dental hygienists and dental hygiene students.

In this study, we aimed to evaluate the validity and reliability of the Scale for Dental Hygienists' Role as Knowledge Broker, a tool potentially useful to help to develop dental hygienists' role as a knowledge broker that meet the needs of the field and include it in dental hygiene curricula.

Method

Study Design: This manuscript reports on a complex descriptive study involving both qualitative and quantitative sub-studies as shown in Figure 1. It also includes a methodological study aiming to develop and verify the content validity and reliability of a scale for dental hygienists' role as a knowledge broker.

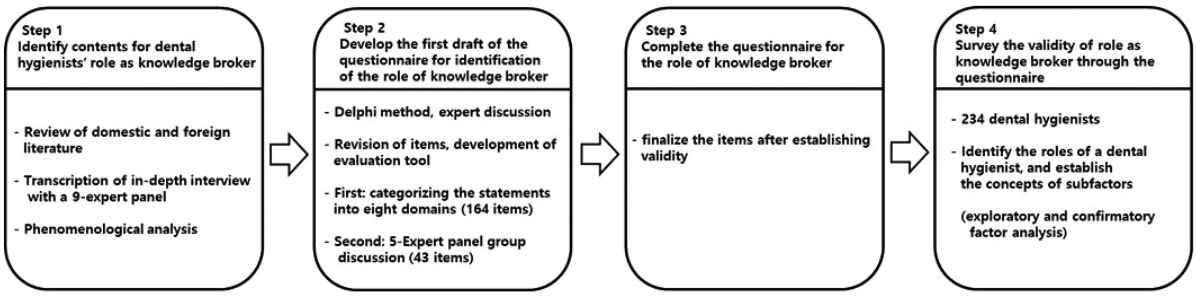

Figure 1: Study flowchart

Study Subjects: This study was approved by the Institutional Review Board at Hanyang University (IRB No: HYI-15-020-1). The survey questionnaire was distributed to 240 dental hygienists who currently work in care institutions, including private hospital, dental hospital, or general hospital for at least three months, between June 8, 2015 and July 13, 2015. All participants consented to participate in the study. All

of the 240 questionnaires were retrieved, and after excluding three questionnaires completed by a male dental hygienist and three incomplete questionnaires, a total of 234 questionnaires were included in the final analysis. The sample size was computed according to [8] using G-power 3.1.7 for correlational analysis with a significance of 0.05, power of 80%, and medium effect size of 0.2. The calculated sample size after considering dropout and loss rates was 200, so the sample size used in this study was adequate.

Study Procedure

Development of questionnaire items for Dental Hygienists' Roles as Knowledge Mediators: After analyzing the tasks of dental hygienists and the definition and duties of a knowledge broker based on a review of national and international literature, we conducted an in-depth interview of three dental hygienists who have been working in a care institution for more than 10 years and six dental hygiene professors, from April 11, 2015 to May 17, 2015, using a semi-structured questionnaire asking the following questions: What is the role of knowledge broker to a dental hygienist? How does a dental hygienist perform the role of a knowledge broker? Why is the role of a knowledge broker important to a dental hygienist? When does a dental hygienist perform the role of a knowledge broker? Where does a dental hygienist perform the role of a knowledge broker? What obstacles hinder a dental hygienist from performing the role of a knowledge broker? With the participants' consent, the interview data were recorded and then transcribed. Based on [9] phenomenological methodology, 187 meaningful statements were identified and clustered with similar categories, resulting in 164 statements. Based on discussion and revision by five healthcare majors, including this author, 43 questionnaire items for "knowledge broker" were developed.

Validity verification of the knowledge broker and questionnaire structure: The content validity of the role model for the dental hygienists as a knowledge broker developed in this study was verified by nine experts. The cutoff for Content Validity Index (CVI) by experts is generally set at 70%, but considering the fact that "knowledge broker" may be a newly emerged concept, we set the cutoff at 55%. As a result, three items in the first draft were removed, resulting in a final tool with 40 items

Study Instruments: The final instrument included 40 items that were validated by experts. Both affirmative and negative statements were randomly arranged to eliminate careless uniform responses. The items were structured so as to be answered with 1-2-3-4-5, and negative statements were reverse-coded during analysis to match the direction of the questionnaire items. The reliability of the 40 items was identified to be high, Cronbach's α= .946.

Data Analysis

Dental hygienists' general characteristics were analyzed to obtain descriptive statistics, including frequency and percentage, mean and standard deviation using SPSS 18.0 and AMOS 18.0. Dental hygienists' roles as a knowledge broker was examined with exploratory factor analysis and confirmatory factor analysis. The goodness of fit of the study model was analyzed with (Chi-square), TLI (Tucker-Lewis Index), CFI (Comparative Fit Index), and RMSEA (Root Mean Square Error of Approximation).

Results and Discussion

Participants' Demographic Characteristics: The mean age and mean career's length were 31.1 years and 4.28 years, respectively. 58.1% (n=136) of the participants were between 24-33 years old and 71.8% were single (n=168). With regard to the highest level of education, 72.2% had an associate degree (n=169), and 54.3% had a career of between 3-9 years (n=127). A total of 89.3% were under permanent employment (n=209). Most participants were single had an associated degree, and were in permanent positions. Further, 60.7% (n=142) worked in a dental clinic, 73.9% (n=173) worked in a treatment room, and 87.6% (n=205) were in charge of clinical work. About 54.3% (n=127) had taken a refresher course, while 79.5% (n=186) had never heard of the term knowledge broker. As shown here, most dental hygienists were in charge of clinical work in the treatment room in dental clinics.

Validity Analysis

Results of Exploratory Factor Analysis: To verify the reliability, validity, and unidimensionality of the 40 questionnaire items, exploratory factor analysis (principal component analysis) was performed with Varimax rotation. The cutoff for inappropriate items was set at .6 or below. The exploratory factor analysis led to 17 items for three factors

Results of Confirmatory Factor Analysis: In the confirmatory factor analysis, the path coefficients for all items were significant, at .588-.857. In general, a standardized factor loading between .50 and .95 is deemed good [10]. The t value shows the degree of agreement among various items that measure the same concept, and it must be greater than 1.96 [11]. All 17 items had a large t value, so the scale was considered unidimensional. An average variance extracted (AVE) of .50 or higher and a construct reliability of .70 or higher are considered to confirm the convergent validity. In the present study, the AVE ranged between .55 and .56 and the CR ranged between .83 and .89, confirming high convergent validity (Table 1 and Figure 2).

Based on the results of exploratory and confirmatory factor analyses and literature review of the role of knowledge brokers, its subfactors 1, 2, and 3 were named "explain and promote understanding," "deliver knowledge," and "link to resources," respectively. Our study model describes the complex mutual relationship among the sub-concepts. In the existing job model for dental hygienists, tasks such as: B3. establish project plan for local community oral health projects; B4. establish project plans for oral health projects by lifecycle; C1. enroll patients and prepare for care; C9. provide preventive dental care; and C33. launch local community oral health projects included similar concepts to the duties of a knowledge broker, but there is no specific job description for a "knowledge broker." The duties of dental hygienists as a knowledge broker defined in this study are all under one dimension, which suggests that the scale we developed is appropriate as a measurement instrument for further studies.

Table 1: Results of Confirmatory Factor Analysis

N = 234

Factor		Variables	FL	t-value	CR	AVE
Factor 1 Explain and promote understanding	26	Repeatedly explain to help understanding.	.857	10.38	.89	.55
	14	Play a mediating role between dentists and employees and between patients and dentists.	.811	10.00		
	8	First understand the most pressing need of the patient.	.771	9.64		
	35	While explaining to the patient about what will happen before and after treatment, additionally explain and help patient understand when the patient asks questions.	.765	9.59		
	6	Explain to the patient about the treatment plan, process, and diagnosis.	.735	9.45		
	15	Try to create a comfortable, friendly, and satisfactory atmosphere for the patient.	.610	8.15		
	32	More senior dental hygienists should teach clinical work to younger dental hygienists.	.609			
Factor 2 Deliver knowledge	12	Develop education programs.	.803	10.20	.88	.56
	11	Create an online posting containing verified knowledge and share it via social media.	.801	10.19		
	24	Give 1:1 online consultation.	.792	10.18		
	10	Regularly manage the bulletin board and change the contents of the video shown in the waiting room.	.748	9.80		
	19	Explain using a computer.	.648	10.22		
	25	Regularly check recalls to deliver customized knowledge.	.646			
Factor 3 Link to resources	37	Fulfill the role of a knowledge broker regardless of the place of work, including dental hospitals and clinics, health examination centers, public health centers, and culture centers.	.837	9.07	.83	.56
	28	Explain and promote the dental medical system to community residents to help them receive the benefits.	.812	8.97		
	33	Provide knowledge sources to help decision-making.	.714	8.29		
	40	Gladly participate in small or large medical volunteering activities in Korea and abroad.	.588			

Goodness of Fit: The goodness of fit of the structural equation model was examined using the following indices: =3.066, GFI=.860, AGFI= .805, TLI=.882, CFI=.904, RMSEA=.094 (Table 2).

Table 2: Goodness of fit

N = 234

Category	Recommended standard	Goodness of fit	Category	Recommended standard	Goodness of fit
/df	3≥/df ≥ 1	3.066	TLI	TLI≥ .9	.882
CFI	CFI≥ .9	.904	GFI	GFI≥ .9	.860
AGFI	AGFI≥ .8	.805	RMSEA	RMSEA≤ .08	.094

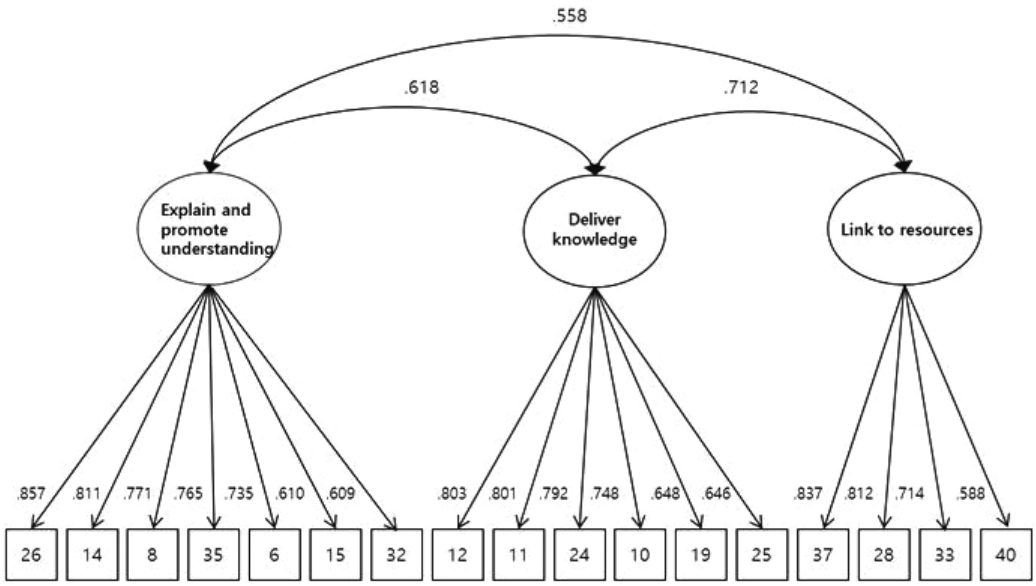

Figure 2: A Confirmatory Factor Analysis Model

Table 3 shows the results of the Pearson bivariate correlation analysis that was performed to analyze the correlations among each factor of the knowledge broker scale. There was a positive correlation between "explain and promote understanding" and "deliver knowledge" (r=.54, q=.000) and between "explain and promote understanding" and "link to resources" (r=.58, q=.000). Discriminant validity was tested with correlation coefficients and AVE values, where the correlation coefficient between each factor must be smaller than the AVE value. The correlation coefficients for the three factors ranged from r=.54-.59, and they were smaller than the square root of AVE (.74-.75), thereby establishing discriminant validity.

Table 3: Correlations Among Factors and Discriminant Validity

N = 234

	Explain and promote understanding	Delivery of knowledge	Link to resources
Explain and promote understanding	.74		
Delivery of knowledge	.54**	.75	
Link to resources	.58**	.59**	.75
Cronbach's α	.89	.88	.82

*p<.05 **p<.01 ***p<.001(The shaded section: discriminant validity, The non-shaded section: correlation)

A knowledge broker mediates two separate sectors by learning and acquiring knowledge or information produced in one context or other types of resources and introducing them to the other sector in which they are yet unknown[12,13]. In this study, we aimed to identify the roles of a knowledge broker, which would help us to establish the scope of oral hygiene services given by dental hygienists, and to develop relevant capacities that meet the needs of the healthcare field so as to include them in the dental hygiene curriculum. Currently, the national dental hygienist examination comprises a theoretical aspect focused on aiding in various types of care and a practical aspect that evaluates students' manipulation of particular devices. Due to the lack of education in regard to students' potential role as a knowledge broker, which is often demanded in the clinical setting, it takes a long time for newly licensed dental hygienists to adjust to their clinical work.

Identifying the duties of dental hygienists in the clinical setting and reflecting them in the educational curriculum to equip the prospective dental hygienists with the required skills is crucial if we want to develop education in dental hygiene. The ability to provide a comprehensive dental hygiene service, particularly by explaining and promoting understanding, delivering knowledge, and linking to resources, is a novel intellectual capacity and skill. "Explaining and promoting understanding" are important roles of knowledge brokers that could be separated from the existing health education. There is a need for professionals who mediate knowledge to assist dental hygiene consumers in making the correct choices and fulfill their rights and duties. The scale developed in this study can comprehensively assess the psychosocial factors and other factors involved in the development of dental hygienists' competence. We anticipate the scale can be applied in the clinical setting as well. However, given the dynamic nature of professional duties such as those discussed in this manuscript, replication studies should be conducted continually so as to keep abreast with the changes of jobs in this rapidly evolving healthcare environment

Conclusion

We developed and validated a scale to assess the roles of dental hygienists in Korea as a knowledge broker. The scope of dental hygienists' work, which had been largely focused on assisting in dental care, has been diversified, subdivided, and specialized according to the needs of service consumers. Reflecting the newly demanded roles of knowledge brokers in educational curricula will surely help dental hygienists to advance and improve themselves as health professionals.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Emotional Labor, Burnout and Job Satisfaction among Korean Clinical Nurses

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ABSTRACT

Background/Objectives: This was a cross-sectional descriptive correlation study to understand the effect of clinical nurses' emotional labor on burnout and job satisfaction. actors affecting nurses' emotional labor, burnout, and job satisfaction were also investigated.

Method/Statistical Analysis: Ninety clinical nurses from two general hospitals located in S city were participated. Emotional labor was measured by a scale which consists of 19 items with subcategories of diversification, frequency, intensity, expression, and internalization. Burnout was measured by a scale which consists of 21 items with physical burnout, emotional burnout, and psychological burnout categories. Job satisfaction was measured by a modified scale which consists of 25 items in the area of work related environment, benefits, personnel system, peer and senior relationship. All measurements had 5 point Likert scale. The higher the total score meant the higher emotional labor, burnout, or job satisfaction.

Findings: Most of the participants aged less than 39 years and 61 participants (67.8%) were not married. Most of them graduated at least college level. The range of duration of work was various from less than 2 years to more than 10 years. Nurses' age, marital status, religions, educational level, work unit, position, and employment status did not significantly affect nurses' emotional labor, burnout, or job satisfaction. However, nurses in their 20s (68.20 ± 10.12 vs. 63.30 ± 8.51, t=2.392, p=.019), and in two to five years of current unit experience (70.18 ± 8.75 vs. 58.60 ± 6.39, t=3.968, p=.010), and 11 to 20 patients in their care (70.56 ± 10.09 vs. 63.68 ± 8.82, t=3.738, p=.027) showed significant high levels of burnout. Also nurses in their 20s (73.24 ± 10.96 vs.78.97 ± 10.77, t=-2.435, p=.017) and salaries less than 2.5 million won (70.42 ± 7.56 vs. 79.86 ± 12.10, t=5.552, p=.005) showed significantly lower levels of job satisfaction. Nurses' emotional labor did not correlate with burnout or job satisfaction. However, burnout had negative relationship with job satisfaction with moderate intensity (r=-.487, p=<.001).

Improvements/Applications: Continuous effort to improve hospital work environment including salary and nurse-to-patient ratio would beneficial to prevent nurses' burnout and increase job satisfaction. Furthermore, special educational or continuing programs or strategies for young and less experienced nurses should be developed and implemented.

Keywords: *Emotional labor, Burnout, Job Satisfaction, Nurse, Correlation*

Introduction

The basic purpose of the hospital is to provide quality medical cares to customers. With the activation of the institutional quality of service assessment in South Korea, customers could select and evaluate medical institutions. Many hospital organizations are focusing on strategies for improving customer satisfaction in order to effectively cope with the changed medical environment[1].

As an employee of a hospital, a nurse must constantly contact different levels of people with various health needs in a socially acceptable manner [2]. Nurses should not only take care of the subject's physical illness, but also care about the emotional health of the subjects.

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Caring for emotional health of the subjects is also one of the evaluation items for hospital services.

In that situation, nurses' capabilities of dealing with emotion have become very important. For customer satisfaction, nurses must be able to control their negative feelings and understand patients, their families, and other medical staff's feedings and properly deal with [3]. Emotional labor was defined as the practice of managing and trying to express the desired emotion required by an organization [4]. In hospital services, emotional labor included everything that drives consumers to have a positive attitude toward hospitals, health cares and medical staffs. Nurses were required not to express individual feelings freely, but they had to show trained responses that assists in the management of patients' emotions.

However, the level of emotional labor affected emotional exhaustion, degradation of self-efficacy [3], which was found to have a direct and indirect impact on the effectiveness and benefits of the organization [4]. Excessive emotional labor at a nurse's personal level could increase work stress and burnout [5]. Increased job stress promotes professional exhaustion and reduces job satisfaction [6]. Furthermore, burnout was associated with mental health of the nurses. Also, it compromises productivity and performance as well as the quality of patient care.

The purpose of the study was to determine the effect of nurse emotional labor on burnout and job satisfaction. The general characteristics and job related characteristics of the subjects were identified and the degree of emotional labor, burnout, and job satisfaction was compared.

Materials and Method

Design and Sample: This was a cross-sectional descriptive correlation study in order to identify the relationships between emotional labor, burnout, and job satisfaction among Korean clinical nurses. The study participants were 90 nurses who worked in outpatients and wards of two general hospitals with more than 600 beds in S city and G province. Exclusion criteria were nurses with less than a year of service at the current units.

Ethical Consideration and Procedure: Researchers provided a full explanation of the purpose, content, and methods of the study before the distribution of survey questionnaires. All subjects participated voluntarily and signed consent forms before answering the questionnaire. In the consent, the anonymity and academic use of the survey was guaranteed. A structured questionnaire was distributed to be filled out in person for honest answers. Data was collected from May 1st to 28th 2017. The completed questionnaires were sealed for protection and collected by the researchers.

Measures

Emotional Labor: Emotional labor was measured by a scale which consists of 19 items with 5 subcategories [7]. The original scale included six aspects of emotional expression such as diversification, duration, frequency, intensity, expression, and internalization. However, in this study, 5 subcategories excluding duration of emotional expression were used. It consists of 5 point Likert scale of 19 items. The higher the total score meant the higher the level of emotional labor. The Cronbach's alpha for original scale was .78 and for this study was .79.

Burnout: Burnout was measured by a scale which consists of 21 items with physical burnout, emotional burnout, and psychological burnout categories [8]. Each category consists of 7 items of 5-point Likert scale. The higher the total score means the higher the level of burnout. The Cronbach's alpha for original scale was .90 and for this study was .90.

Job Satisfaction: Job satisfaction was measured by a modified scale by a researcher. The original scale consisted of 30 items to measure nurse' satisfaction with their work situation [9]. However, the subcategories of scale changed to 25 items of 5-point Likert measurement in the area of work related, work environment, benefits, personnel system, peer and senior relationship. The higher the total score means the higher the level of job satisfaction. The Cronbach's alpha for original scale was .83 and for this study was .88.

Statistical Analyses

Using IBM SPSS Statistics, version 21.0, general characteristics of participants were analyzed by descriptive statistics. Independent t-tests and one-way ANOVA were applied in order to identify the differences in emotional labor, burnout, and job satisfaction according to participants' characteristics. Pearson's correlation coefficient was applied to identify the

relationships among emotional labor, burnout, and job satisfaction of Korean clinical nurses. The significance level for testing statistical significance was estimated lower than .05.

Results and Discussion

Participants in the study were 90 clinical nurses with at least one year of service in two hospitals. As shown in Table 1, most of the participants aged less than 39 years and 61 participants (67.8%) were not married. Most of them graduated at least college level and half of them did not have any religions. Half of them received between 2 million won to 2.5 million won as their monthly salary. Eight one participants (90%) were hired as full-time nurse.

Work units were various from medical-surgical to outpatient clinics. The range of duration of work was various from less than 2 years to more than 10 years. However, most of them have worked current units less than 10 years. Seventy seven (85.6%) were working as a shift nurse. Most of them were staff or charge nurses. More than half of them were taking care of more than 16 patients per a nurse.

Table 1: General characteristics of clinical nurses (N = 90)

Characteristics		n	%	Characteristics		n	%
Age (years)	20~29	54	60.0	Work experience (months)	< 24	24	26.7
	30~39	33	36.7		25~48	20	22.2
	40~49	3	3.3		49~72	14	15.6
Married	Yes	29	32.2		73~96	15	16.7
	No				97-120	7	7.7
Education	College	24	26.7		≥121	10	11.1
	University	58	64.4	Current work unit experience (months)	< 24	24	26.7
	Graduate School	8	8.8		25~48	20	22.2
Religion	None	45	50		49~72	14	15.6
	Christian	30	33.3		73~96	15	16.7
	Catholic	12	13.3		97-120	17	18.8
	Buddhist	3	3.3		≥121	0	0
Salary (million won per month)	< 2	7	7.8	Position	Staff nurse	75	83.3
	2~2.49	45	50		Charge nurse	13	14.4
	2.5~3	23	25.6		Head nurse	2	2.2
	≥3	15	16.7	Type of work	Shift work	77	85.6
Employment status	Full-time	81	90.0		Day work	13	14.4
	Part-time	9	10.0	Number of patients per a nurse	<5	2	2.2
Work Units	Medical	14	15.6		6~10	41	45.6
	Surgical	3	3.3		11~15	4	4.4
	Maternal-Pediatrics	27	30.0		16~20	21	23.3
	Intensive Care Unit	9	10		≥ 21	22	24.4
	Emergency Unit	10	11.1				
	Outpatient clinic	27	30.0				

In order to compare the level of emotional stress, burnout, and job satisfaction according to general characteristics of the participants, statistical analysis was done as shown in Table 2. Nurses' emotional labor did not differ significantly depending on age, but the level of burnout and job satisfaction was found to be significantly different. Nurses less than 30 years old showed high levels of burnout (68.20 ± 10.12 vs. 63.30 ± 8.51, t=2.392, p=.019) and low levels of job satisfaction (73.24 ± 10.96 vs. 78.97 ± 10.77, t=-2.435, p=.017).

These results are similar to low job satisfaction among nurses with less than three years of work experience in other study [10]. According to the researcher's theory, the timing of adaptation which usually less than 3 years of work experience increased job stress and exhaustion and also increased the likelihood of changing jobs. However in this study, marriage, educational level, work unit, position, and employment status did not significantly affect nurses' emotional labor, burnout, or job satisfaction.

Interestingly, there was no significant difference between emotional labor and burnout depending on the level of salary. However the high salaried nurses showed a high level of job satisfaction (79.86 ± 12.10 vs. 70.42 ± 7.56, t=5.552, p=.005). This finding is consistent with the result that a professional nurse worked longer when an annual salary was high [11].

Also, the current work unit experience has a significant impact on burnout. Nurses with more than 10 years of experience have shown significantly lower levels of burnout than nurses with two to five years of experience (70.18 ± 8.75 vs. 58.60 ± 6.39, t=3.968, p=.010). This is believed to be associated with an increased ability to deal with various nursing situations as they entered a career stabilization stage after more than a decade of work experience [10].

The number of patients per nurse also had a significant impact on the nurses' burnout (70.56 ± 10.09 vs. 63.68 ± 8.82, t=3.738, p=.027). Interestingly, caring for more than 10 patients had shown that the level of burnout increased and then decreased with 20 or more patients. Although detailed factors were not investigated in this study, the severity of the patients is also likely to have affected the nurses' burnout. If the patients are less severe, nurses usually take care of more patients, but their emotional stress would not that high.

Table 2: The levels of emotional labour, burnout, job satisfaction according to characteristics

Characteristics		Emotional Labor M ± SD	t or F (p)	Burnout M ± SD	t or F (p)	Job Satisfaction M ± SD	t or F (p)
Age (years)	< 29	52.59 ± 1.53	-.299 (.766)	68.20 ± 10.12	**2.392 (.019)**	73.24 ± 10.96	**-2.435 (.017)**
	≥ 30	52.69 ± 1.65		63.30 ± 8.51		78.97 ± 10.77	
Married	Yes	52.55 ± 1.61	-.337 (.737)	64.13 ± 8.02	-1.554 (.125)	78.48 ± 10.12	1.731 (.087)
	No	52.62 ± 1.56		67.24 ± 10.40		74.15 ± 11.46	
Education	College	52.83 ± 1.52	.724 (.471)	66.60 ± 10.23	-.142 (.887)	74.04 ± 11.06	-.777 (.439)
	University	52.56 ± 1.59		66.33 ± 9.66		76.12 ± 11.26	
Salary (10,000 won)	< 200	53.00 ± 1.41	.202 (.817)	68.14 ± 9.92	.976 (.381)	**70.42** ± 7.56	**5.552 (.005)**
	200-250	52.60 ± 1.57		67.35 ± 10.52		72.65 ± 9.63	
	≥250	52.60 ± 1.63		64.57 ± 8.75		**79.86** ± 12.10	
Work Units	General	52.47 ± 1.46	.223 (.800)	64.64 ± 7.18	.276 (.760)	78.82 ± 11.91	.893 (.413)
	Pediatrics	52.55 ± 1.60		66.62 ± 10.77		74.92 ± 9.16	
	Special	52.73 ± 1.62		66.60 ± 10.09		74.71 ± 11.94	
Position	Staff	52.72 ± 1.55	1.169 (.245)	67.01 ± 9.49	1.687 (.095)	74.89 ± 11.20	-1.310 (.194)
	Charge	52.20 ± 1.65		62.40 ± 10.51		79.14 ± 10.76	
Employment status	Full-time	52.64 ± 1.58	.155 (.877)	66.59 ± 9.63	.913 (.384)	75.83 ± 11.53	.967 (.352)
	Part-time	52.55 ± 1.58		63.11 ± 10.98		73.11 ± 7.52	
Current work unit experience (years)	< 2	52.50 ± 1.95	.653 (.583)	65.16 ± 10.83	**3.968 (.010)**	76.00 ± 9.55	2.532 (.062)
	2-5	52.70 ± 1.29		**70.18** ± 8.75		72.07 ± 10.44	
	5-10	52.86 ± 1.38		66.10 ± 9.24		75.85 ± 12.83	
	≥10	52.10 ± 1.85		**58.60** ± 6.39		83.10 ± 8.99	
Number of patients per nurse	<10	52.69 ± 1.71	2.065 (.132)	65.04 ± 9.43	**3.738 (.027)**	75.44 ± 11.58	.648 (.525)
	11- 20	53.00 ± 1.52		**70.56** ± 10.09		73.87 ± 12.45	
	≥ 20	52.09 ± 1.23		**63.68** ± 8.82		77.63 ± 8.87	

In correlation between emotional labors, burnout, job satisfaction, emotional labor of clinical nurses did not correlated with burnout or job satisfaction. These results could be considered together with the results of no differences in emotional labor depending on the general characteristics of the participants. Repeated study with different measurements or larger or different sample could be used to clarify clinical nurses' emotional labor and burnout.

However, burnout had negative relationship with job satisfaction with moderate intensity(r=-.487, p=<.001). Other study reported that nurses' work related stress and burnout could be associated job satisfaction and even nurses' physical and mental health status [6]. One study reported that among 198 Portuguese family care nurses, 28% present emotional exhaustion and there was intention of leaving current work [12].Since the working areas of study participants were not limited, it could be thought that clinical nurses' burnout from emotional labor decreases job satisfaction rather than emotional labor itself.

Table 3: Relationships between emotional labour, burnout, job satisfaction

	Emotional Labor r(p)	Burnout r(p)
Burnout	-.168(.114)	
Job Satisfaction	-.015(.890)	**-.487(<.001)**

Conclusion

In this study, 90 Korean clinical nurses' emotional labor, burnout, job satisfaction were investigated. Interestingly, the emotional labor of clinical nurses was found to be consistent with the general characteristics including age, marital status, educational level, salary, work unit, position, employment status, current work unit experience, number of patients per nurse. Nurses' emotional labor was also not related with burnout and job satisfaction. Repeated studies with different methods or participants might be useful to identify causes of these findings.

However, there were significant differences in nurses' burnout and job satisfaction according to age, current unit experience, number of patients per nurse, and salary. Nurses in their 20s and in two to five years of current unit experience and 11 to 20 patients in their care showed significant high levels of burnout. Also, job satisfaction levels of clinical nurses significantly lowered when nurses were in their 20s and wages were below 2 million won.

Therefore, it is necessary to develop various support programs to prevent burnout of nurses with less than five years of work experience and in their 20s. In addition, to enhance job satisfaction of young nurses, continuing efforts to improve hospital working environment in terms of economic aspects and help with early professional adaptation should be provided.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Pre-therapeutic Device for Post-stroke Hemiplegic Patients' Wrist and Finger Rehabilitation

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ABSTRACT

Background/Objectives: This paper suggests a pre-therapeutic device for post-stroke hemiplegic patients' wrist and finger rehabilitation both to decrease and analyze their muscle tones before the main physical or occupational therapy.

Method/Statistical Analysis: We designed a robot which consists of a BLDC motor, a torque sensor, linear motion guides and bearings. Mechanical structure of the robot induces flexion and extension of wrist and finger (MCP) joints simultaneously with the single motor. The frames of the robot were 3D printed. During the flexion/extension exercise, angular position and repulsive torque of the joints are measured and displayed in real time.

Findings: A prototype was 3D printed to conduct preliminary experiment on normal subject. From the neutral joint position (midway between extension and flexion), the robot rotated 120 degrees to extension direction and 30 degrees to flexion direction. First, the subject used the machine with the usual wrist and finger characteristics without any tones. Second, the same subject intentionally gave strength to the joints in order to imitate affected upper limb of a hemiplegic patient. During extension exercise, maximum repulsive torque of the normal hand was 2 Nm whereas that of the firm hand was almost 5 Nm. The result revealed that the device was capable enough to not only rotate rigid wrist and fingers with the novel robotic structure, but also present quantitative data such as the repulsive torque according to the joint orientation as an index of joint spasticity level.

Improvements/Applications: We are planning to improve the system by applying torque control and arranging experiments at hospitals to obtain patients' data and feedbacks to meet actual needs in the field.

Keywords: *Stroke, Hemiplegia, Rehabilitation, Robotics, Wrist, Finger*

Introduction

Thanks to advanced medical treatments, the death rate of chronic and acute stroke has been gradually reduced. Since the brain injury usually accompanies loss of motor functions, increasing population of hemiplegic patients is naturally inevitable. More than months or even years of rehabilitation is mandatory because repetitive movements of affected joints and muscles practiced in hospitals stimulate neuroplasticity so that normal neurons nearby damaged ones would replace the lost functions[1,2,3].

The ultimate purpose of post-stroke hemiplegia rehabilitation is to recover performance of activities of daily lives(ADL) improving patient's quality of life (QoL)[4]. Recovery of wrist and finger functions is important to QoL because use of the joints is closely related to interactions with objects. However, those joints are considered most time-consuming and difficult to be fully recovered because restoration of upper limb functions starts from mesial to distal joints, hence from shoulder, arm, wrist, and finally to fingers. In addition, since wrist and fingers have multiple degree-of-freedoms actuated by multiple musculoskeletal systems and since they are quite sensitive compare to other upper limb

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joints, it is demanding both to patients and therapists to practice physical and occupational therapies on the very specific joints[5].

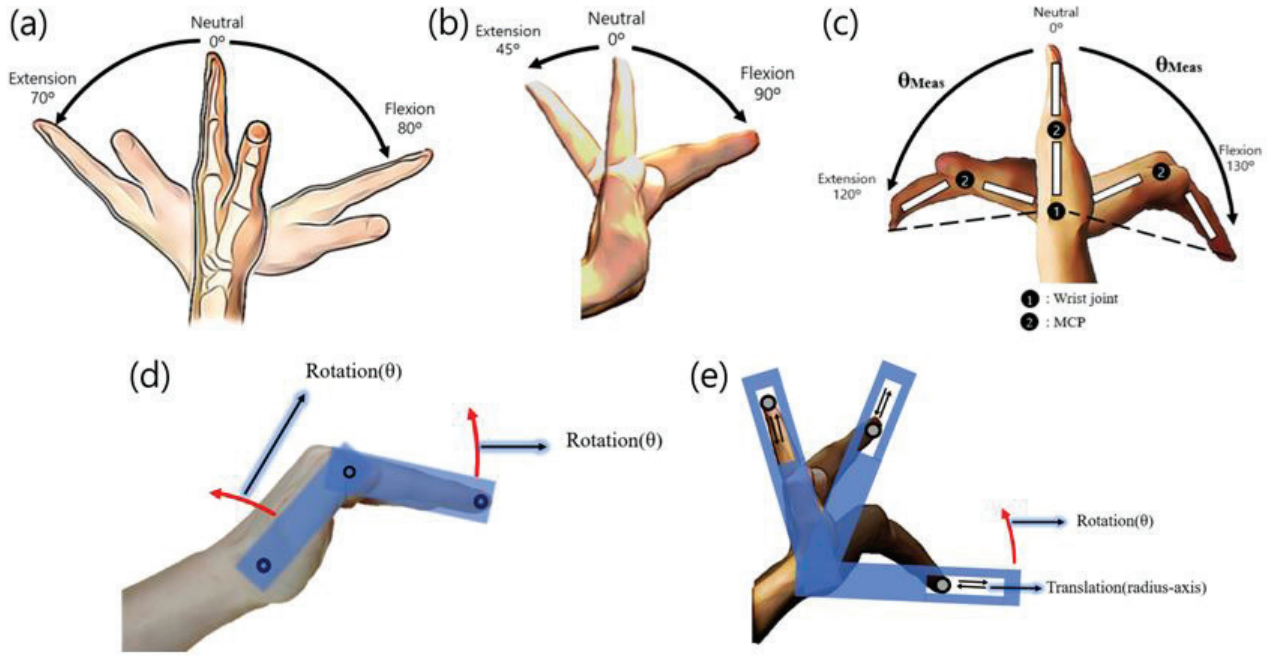

Figure 1: Target ROM of wrist and MCP joints and possible mechanical structures of therapeutic robots. (a) Wrist flexion/extension ROM. (b) MCP flexion/extension ROM. (c) Combined joint ROM. (d) Conventional exoskeleton structure. (e) Proposing structure. Conventional exoskeleton robots restrict all skeletal joints to the robot linakge, so they usually lack flexibility regarding user's body size. The proposing structure let MPC joint free and allow the tips of fingers slide back and forth. Therefore, the new robot has increased flexibility.

Today, more and more therapeutic robots are introduced to relieve their burden. The robots are considered useful because they 1) provide intensive and repetitive trainings, 2) suggest quantitative assessment about patient's motor functions, and 3) help build database[6]. However, complex structure of the robots and expensive prices make them impractical to use at small or medium hospitals. As a result, simple therapeutic robots are reported to be more patient- and therapist-friendly as well as easier to commercialize than complex robots[6]. In addition, a recent study on robot-assisted exercise suggests that 10 minutes of simple wrist flexion/extension are sufficient enough to temporarily reduce the joint tone of patients especially on Brunnstrom stage 3[8]. Therefore, we propose a simple and affordable robot that helps reduce the high wrist and finger spasticity before the main physical or occupational therapies.

Materials and Method

Mechanical Structure: One of the easiest yet effective ways to design a therapeutic robot would be following a similar pattern of physical therapy practiced by therapists over the past decades. When they perform the basic wrist/finger stretching exercise on patients, they gently and quite evenly apply a pushing force on the patients' palm and fingers. As a result, wrist joint is fully extended followed by finger joint extension. The target range of motion (ROM) of wrist and MCP is presented in figure 1 (a) and (b) [7]. To imitate the stretching exercise, we considered the combined ROM of the therapeutic robot as shown in figure 1 (c).

Conventional exoskeleton-type finger robots locate their actuators right beside desired human joints to apply torque thus to induce rotational movements[4,5]. The basic operation algorithm of the conventional method is shown in figure 2 (a). Although this method is intuitive to engineers, the robots become rather inconvenient for most hemiplegic patients with distorted joints. In addition, since users have different hand sizes, alignments between the robot linkages and human joints take too much time. Therefore, most exoskeleton robots are difficult to commercialize[6]. To overcome the difficulties, we considered a novel mechanical structure presented in figure 2 (b). Rather than restricting MCP

joint to the robot, we let them free. Instead, we installed linear motion guides to allow the fingertips freely move back and forth. Finally, wrist joint shares the same rotational axis with BLDC motor. Due to this mechanical structure, it is possible to move the two degrees of freedom with one driving actuator.

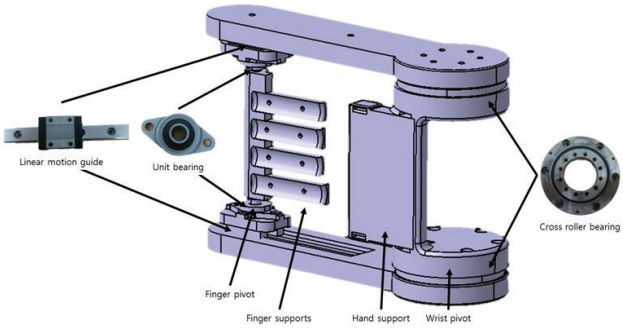

Figure 2: 3D model of the therapeutic robot frame and its mechanical components
When turned upside down, since the robot frame becomes symmetrical, it can be used for both hands.

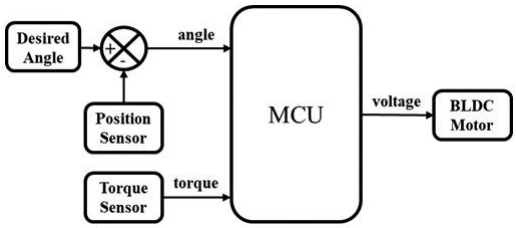

Figure 3: System control block diagram
USB-6009 was used as MCU to control the motor and collect the sensor data with a sample rate of 100 hz.

System Components: To implement the mechanical structure, we designed a robot frame as shown in figure 2. The robot frame consists of fingers, hand supports and a wrist pivot. According to human body size measurement by Statistics Korea, the average hand width of male is 8.2cm, female 7.3cm, and top 5% 9.5cm. Therefore, the width of the hand support is designed to be 10cm. Two linear motion guides, two unit bearings, and two cross roller bearing were assembled with the frame to induce wrist and finger flexion/extension using a single BLDC motor.

The power of the motor was selected based on the maximum wrist torque of healthy person[9,10].A BLDC motor MW-VBL24D030S-M-Gwith rated torque of 24Nm and rated rotational speed of 12.5 rpm was used. Too fast rotational speed is unnecessary to give patients a sense of safety and comfort. A torque sensor TCN16 (Dacell) with capacity of 49.03N-m was used in order to monitor and collect user's repulsive torque applied to the wrist pivot. The motor is linked to the torque sensor by coupling. A variable resistor was installed on the wrist pivot as a position sensor. Based on the torque and the joint angle data, spasticity level of the patient is expected to be estimated.

Control Algorithm: For wrist and finger flexion/extension exercise, angular position PID control was implemented to the BLDC motor. Underdamped control usually provides a fast response with low rising time and settling time, but overshoots should always be avoided due to a possible risk of fracture since most patients' joints are distorted. Since the maximum angular speed of the motor was quite slow (12.5 rpm) with a very high gear ratio (1:200), stable overdamped control was promising. Therefore, PID parameters were carefully chosen to be overdamped response. As shown in figure 3, USB-6009 (National Instrument) with C language on Visual Studio (Microsoft) was used to collect sensor data and control the motor with a sample rate of 100 Hz.

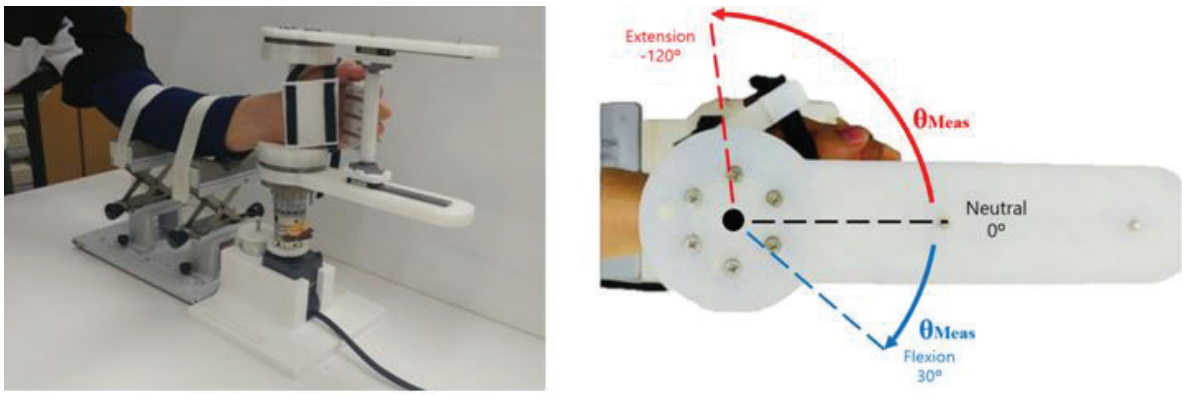

Figure 4: Prototype of the therapeutic robot

The prototype was 3D printed and tested by a normal subject beforehand. Over 60 seconds, the device rotated to 120 degrees toward extension direction and 30 degrees toward flexion direction with constant rotational speed of 7.5 deg/s.

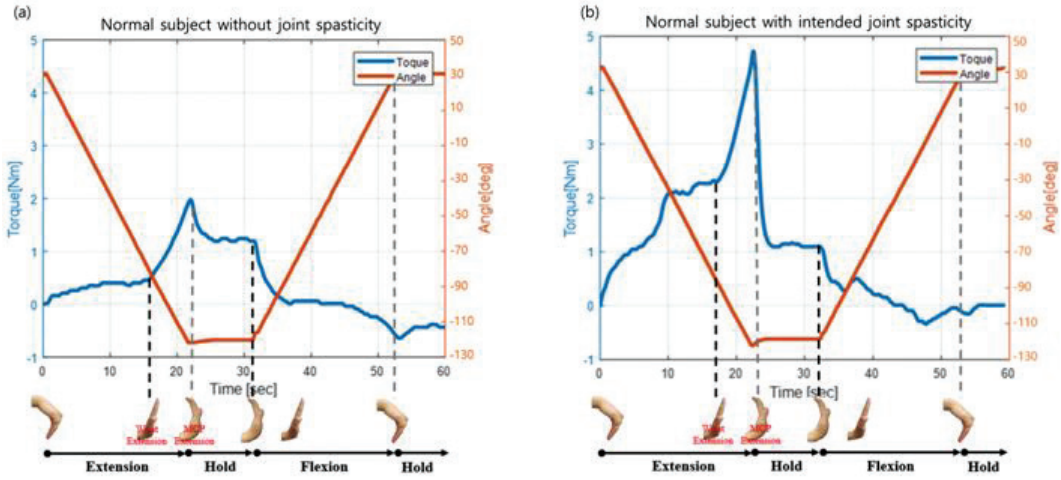

Figure 5: Preliminary experimental results with and without joint tones
(a) Normal subject without joint spasticity. (b) Normal subject with intended joint spasticity

Results and Discussion

Preliminary Experiment: Base on the hardware model in figure 2, a prototype was 3D printed as presented in figure 4. Prior to performing clinical trials on hemiplegic patients, we conducted a preliminary usability evaluation. From the neutral position, the device rotated 120 degrees to extension direction and 30 degrees to flexion direction with a constant speed of 7.5 deg/s over 60 seconds. First 22 seconds were assigned to full extension, next 10 seconds to holding, and last 28 seconds to full flexion.

Two preliminary experiments were conducted on a normal subject. A 25-year-old, right-handed man equipped the therapeutic robot on his left hand. First, the subject used the therapeutic device normally. Second, the same subject used the robot again with a moderate repulsive torque as if he had spasticity on his wrist and finger joints.

Torque and angular position data collected during the two experiments are depicted in figure 5. Figure 5 (a) shows data on ordinary joint stiffness in normal subjects during the first experiment. As the robot rotate to the extension direction, only wrist is extended and small increase in repulsive torque up to 0.5 Nm is observed. After the angular position pass by -90 degree, fingers start to extend as well. Together, wrist and fingers show maximum repulsive toque of 2 Nm at full extension position of -120 degrees. The repulsive torque slowly reduces to zero as the joints come back to the neutral position.

Figure 5 (b) illustrates data on moderate joint stiffness intended by the normal subjects during the second experiment. Up to -90 degrees, wrist alone shows a higher repulsive torque of 2 Nm. As the wrist and fingers start to stretch out together, the repulsive torque increase almost to 5 Nm which is 2 times more than the normal joints without spasticity in figure 5 (a). The result show that our device is possible to extend paralyzed wrist and fingers with spasticity as well as monitor tone characteristics based of robotic measures in terms of repulsive torque according to joint orientation.

Future plans and Improvements: We categorized our robot as a pre-therapeutic device because we know that robots cannot perform perfect wrist and finger treatments due to complex and sensitive characteristics of the joints. Therefore, the role of therapists and conventional therapies are still very important. Thus, what we are looking forward with our robot is to reduce the tones of the joint even temporarily before the main therapies to ease therapists' work load. The research about decrease in wrist stiffness after 10-minute robot-assisted exercise suggests the basis for the concept our robot[8].

We expect that our robot would also provide a quantitative assessment about user's joint condition and even motor function ability based on the short pre-therapeutic exercise. The data collected during the exercise is expected to be further processed. A research on cerebellum patients suggest that one's angular stiffness and viscosity can be derived from angular position, velocity, and torque data[11]. We can directly apply the method to our data to present spasticity in terms of the kinematic constants. A patient with severe spasticity would show a high magnitude in the kinematic constant

particularly a high stiffness due to spring-like nature of the affected joints. The quantitative assessments would help therapists evaluate patient's current condition and suggest future treatment direction.

In wrist and finger physical and occupational therapies, thumb is an important joint. Since tones of the other joints vary significantly depending on the thumb position, it should also be extended during extension exercise. Our device as of now does not have such component. Therefore, in order to provide more effective therapeutic device to hospitals, we should consider an appropriate thumb rest in the future.

More importantly, feedbacks from therapists and patients at local hospitals are important. Although MOU has been established with a rehabilitation hospital to conduct joint research, consistent comments on the specific robot is still in sufficient. The prototype we developed should be tested to hemiplegic patients, our target, before we finally confirm our hardware model before main clinical test. For example, safety considerations regarding the device are very important because the patients' hands are passively extended by the robot. Figuring out combination of suitable motor speed and position controls comfortable to patients would be necessary. Although we designed the frame size based on recommended measures from Statistics Korea, the national department of statistics, we observed that patients' hands were usually swollen due to edema. Therefore, fine tuning of the robot size must be considered.

A long term study should be carefully planned on actual post-stroke hemiplegic patients. Most case studies conduct clinical tests on their therapeutic device more than a month. We should recruit specific subject groups in terms of Brunnstrom stage, Fugl-Meyer assessment, or Modified Ashworth Scale through meetings with hospital doctors and therapists. Comparison between clinical and robotic measurements regarding motor control during and after the experiment would reveal validity and effectiveness of our robot. Also we expect task-oriented comparative experiment between normal people and patients using the robot.

Conclusion

In this study, we suggested a therapeutic robot to help hand and finger rehabilitation of post-stroke hemiplegic patients. Unlike previous studies on hand-finger exoskeleton robots, the proposing device was designed to extend the two joints with one actuator thus increasing flexibility and making more affordable to small and medium rehabilitation hospitals. Repulsive torque and angular position are collected by sensors to monitor exercise. A preliminary experiment was conducted on a healthy subject while applying a repulsive torque to the robot as if it was affected. The test revealed that not only the device is useful enough to stretch out the wrist and fingers similar to conventional physical therapies, but also help gather quantitative characteristics about the affected joints.

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Factors Affecting Satisfaction in Major of Male Nursing Students

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ABSTRACT

Background/Objectives: The purpose of this study was to examine the relation among Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of male nursing students.

Method/Statistical Analysis: A cross-sectional survey was conducted. 146 participants were selected from department of nursing or nursing college in G city, J city of J area, I city of J area. structured questionnaires were used as a study instrument which included general characteristics, WLEIS, KGHQ, Academic Emotion Regulation, Stress in Clinical Practice, Satisfaction in Major. Independent t-test, one-way ANOVA, Pearson correlation coefficient and multiple regressions were used for analysis.

Findings: It is revealed that the higher emotional intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major, additionally in order of stress in clinical practice, general mental health, emotional intelligence, academic emotion regulation in terms of extent of influence, these factors have a big effect on satisfaction in major

Improvements/Applications: Judging from these findings, it should be required to develop program for stress control and counsel the male students about stress, because stress in clinical practice is the biggest factor to affect satisfaction in major.

Keywords: *Male Nursing Students, Satisfaction in Major, Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice.*

Introduction

The Need of This Study: Satisfaction in major is a subjective experience that a student feels and is largely divided into the emotional part such as how much the student is contented with the major and the cognitive part such as value judgement on the major[1]. When the students are well informed of the related occupation, satisfaction in major is created and affects their attitude toward the occupation and career path[2]. Thus, when the students majoring in nursing science are well informed of nursing, satisfaction in major is created and affects their attitude as the professional nurse[3]. Indeed, according to the study of Lim(2014), when the students majoring in nursing feel dissatisfaction in major, their dissatisfaction has a bad effect on not only their university life but also nursing in a hospital in the future and eventually degrade the quality of nursing[4].

Thus, it is very important to conduct the study on satisfaction in major of the students majoring in nursing. According to an education statistics service data released by the Korean Educational Development Institute, as of the first half of 2018, the number of the male students majoring in nursing is 21,659 and occupies 20% of the total students majoring in nursing. Compared to the number of the male students majoring in nursing in 2013, the number of the male students in 2018 is up 5%, compared to the number in 2008, the number in 2018 is up as many as 13%. Though considering that the total number of the students majoring in nursing increased around 1.4 times compared with 2013, increased roughly 2.4 times compared with 2008, the proportion of the male

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students to the total students rapidly rose[5-7]. The increase of the number of the male students majoring in nursing means that the increase of the number of the male students who acquire the nurse license on their graduation. The most of the studies on satisfaction in major of the student majoring in nursing is currently related with the effect of satisfaction in major on the view of the professional, career preparation behavior and adaptation in campus life[8-9]. In regard to the study on the factor affecting satisfaction in major, the study of Cho(2015) focusing on gender stereotype and military obligation plan is cited as the example of the study[10], but other studies are rarely found. Thus, it is needed to conduct the study on the factor affecting satisfaction in major of the male student majoring in nursing. Therefore, this study intends to look into the factors influencing satisfaction in major of the male student majoring in nursing.

This study examines the extent of satisfaction in major of the male students majoring in nursing, the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice as the mental and emotional factor and satisfaction in major and the factors affecting satisfaction in major. Ultimately through these examinations, this study intends to suggest the basic data for the development of the program aimed at improving satisfaction in major of the male students majoring in nursing.

Materials and Method

The Design of This Study: This study is the descriptive correlation study conducted in order to find out the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male students majoring in nursing.

The Subject of This Study: The study chooses the male students majoring in nursing at the universities located in G city, J city, J province, I city and J province as the subject, offer sufficient information about this study to them and select the students who agree to participation in this study. The data are collected from Oct. to Nov., 2017. The researchers fully explained prior to filling in the questionnaire that in case of the students who feel the negative feelings such as difficulty in impulse control and depression while filling in the questionnaire related to satisfaction in major, emotional intelligence, general mental health, academic emotion regulation and stress in clinical practice, they stop participation in this study immediately. In addition, the researcher paid careful attention to it in preparation for the case that any subject might need treatment or guidance based on the result figure of general mental health obtained in the questionnaire.

The Tool of This Study: This study inquiries into age, grade level, reason for application, satisfaction in decision of department and grade as the general characteristic variable and includes satisfaction in major, emotional intelligence, general mental health, academic emotion regulation and stress in clinical practice as other variables.

Satisfaction in Major: The researchers use Lee(2004)'s tool that extracts the questions related with satisfaction in major from satisfaction in department(faculty)-related tool invented by Ha(2000) in order to measure satisfaction in major of the male student majoring in nursing[2].

Emotional Intelligence: In this study, the researchers use WLEIS, Wong and Law(2002) Emotional Intelligence scale adapted by Jung(2007) in order to measure emotional intelligence of the male student majoring in nursing[11].

General Mental Health: The researchers use The Korean General Health Questionnaire-20(KGHQ-20) standardized and adapted by Shin(2001) with The General Health Questionaire(GHQ) used globally since 90's in order to measure general mental health of the male student majoring in nursing[12]

Academic Emotion Regulation: This study uses the academic emotion regulation scale invented by Yu(2012) in order to measure academic emotion regulation of the male student majoring in nursing[13].

Stress in Clinical Practice: This study uses stress in clinical practice scale invented by Hwang(2006) in order to measure stress in clinical practice of the male student majoring in nursing[14].

Data Analysis

SPSS WIN 18.0 Version program is used for data analysis. General characteristic of the subject is used for frequency analysis and descriptive statistic. T-test, ANOVA, Pearson's Correlation Coeffi cient, Stepwise multiple regression analysis are used for analysis.

Results and Discussion

General Characteristic: Total 146 male students majoring in nursing join in this study as the subject. Their average age is 24.5. 135 students at the age of 20-29 occupy the majority(92.5%). 11 students over 30 account for 7.5%.

95 students(65.1%) are junior, 51 students(34.9%) are senior. Regarding the reason for application, 82 students(56.2%) applied following the recommendation of others, 64 students(43.8%) applied of their own will. In regard to satisfaction in decision of department, 90 students(61.6%) answer "satisfaction", 43 students(29.5%) answer "so so", 13 students(8.9%) answer "dissatisfaction". In regard to grade of the student, 115 students(78.8%) got the grade of "3.0-3.9" out of 4.5. 23 students(15.8%) got the grade of "over 4.0". 8 students(5.5%) got "2.0-2.9" as shown in Table 1.

Table 1: General Characteristic of Participants (n = 146)

Characteristics	Categories	n (%)
Age	20-29	135(92.5)
	over 30	11(7.5)
Grade level	junior	95(65.1)
	senior	51(34.9)
Reason for application	recommendation of others	82(56.2)
	one's own will	64(43.8)
Satisfaction in decision of department	satisfaction	13(8.9)
	so so	43(29.5)
	dissatisfaction	90(61.6)
Grade	over 4.0	23(15.8)
	3.0-3.9	115(78.8)
	2.0-2.9	8(5.5)

Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of the Male Student Majoring in Nursing: When it comes to looking into emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male student majoring in nursing, the result shows that the score of emotional intelligence is at 4.85 ± .72, the score of general mental health is at 2.68 ± .20, the score of academic emotion regulation stands at 3.34 ± .51, the score of stress in clinical practice is at 2.87 ± .57 and the score of satisfaction in major is at 3.71 ± .55 as indicated in Table 2.

Table 2: The Score of Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major (n = 146)

Variables	M ± SD	Range
Emotional Intelligence	4.85 ± .72	1-7
General Mental Health	2.68 ± .20	1-4
Academic Emotion Regulation	3.34 ± .51	1-5
Stress in Clinical Practice	2.87 ± .57	1-5
Satisfaction in Major	3.71 ± .55	1-5

Satisfaction in Major Depending on General Characteristic: With regard to the difference in satisfaction in major made depending on general characteristic, the result show grade level(t=-4.143, p=<.001), reason for application(t=-4.471, p=<.001), satisfaction in decision of department(F=16.684, p=<.001), which mean statistically significant difference, but age(t=1.152, p=.133), grade(F=1.948, p=.146), which mean to be not significant difference as shown in Table 3.

Table 3: Differences of the Satisfaction in Major Level by Characteristics (n = 146)

Characteristics	Categories	N	M ± SD	t Or F	P
Age	20-29	135	3.72 ± .56	1.512	.133
	Over 30	11	3.46 ± .45		
Grade Level	Junior	95	3.48 ± .59	-4.143	.000**
	Senior	51	3.16 ± .52		
Reason for Application	Recommendation of Others	82	2.67 ± .94	-4.471	.000**
	One's Own Will	64	3.47 ± .55		

Conted…

Satisfaction in Decision of Department	Dissatisfaction	13	3.41 ± .55	16.684	.000**
	So So	43	3.78 ± .46		
	Satisfaction	90	3.43 ± .56		
Grade	Over 4.0	23	3.42 ± .52	1.948	.146
	3.0-3.9	115	**3.43 ± .49**		
	2.0-2.9	8	3.43 ± .49		

In regard to the difference in satisfaction in major of the male student majoring in nursing made depending on general characteristic, there is the significant difference in grade level, reason for application and decision of department, by contrast the significant difference was not found out in age and grade Judging from these findings, it is inferred that in case that the students voluntarily choose nursing as the major, they have the positive mind for their future and career path and the positive mind has a great effect on their belief and desire, thus significant difference is made in the reason for application and decision of department. However, the significant difference is not found out in grade and age. The result is in agreement with the result of Cho's study(2015) on the factor affecting satisfaction in major of the male student majoring in nursing[10]. It is thought that though the students are satisfied with the major, they get poor grades because of difficulty in studying the major.

The Correlation between Emotional Intelligence, General Mental Health, Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major of the Subject: When it comes to looking into the correlation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male student majoring in nursing, the result show that correlation between satisfaction in major and emotional intelligence(r=.231, p<.001), general mental health(r=.164, p=.009), academic emotion regulation(r=.207, p=.001), which mean significant positive correlation, but stress in clinical practice(r=.207, p=.001), which means significant negative correlation. In other words, it means that the higher emotion intelligence is, the higher general mental health is, the better academic emotion regulation is, the lower stress in clinical practice, the higher satisfaction in major as illustrated in Table 4.

Table 4: Correlations among Emotional Intelligence, General Mental Health

	EI[1]	**GMH[2]**	**AER[3]**	**SCP[4]**	**SM[5]**
EI[1]	1	.122 (.143)	.625** (.000)	-.231** (.005)	.447** (.000)
GMH[2]		1	-.127 (.127)	-.150 (.070)	.306** (.000)
AER[3]			1	-.300** (.000)	.425** (.000)
SCP[4]				1	-.491** (.000)
SM[5]					1

[1]: EI, Emotional Intelligence,
[2]: GMH, General Mental Health,
[3]: AER, Academic Emotion Regulation,
[4]: SCP, Stress in Clinical Practice
[5]: SM, Satisfaction in Major

Academic Emotion Regulation, Stress in Clinical Practice and Satisfaction in Major: In regard to the correlation in this study, it is revealed that the higher emotion intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major is. First, regarding emotional intelligence, the findings of this study are in agreement with the findings of Kim et al's study(2017) on satisfaction in clinical practice[15]. It is thought that the student who possesses high emotional intelligence has a capability to understand well one's innermost feelings, control one's life effectively and make and implement a plan, In regards to general mental health, the findings of this study are in agreement with the findings of Jung & Kwon's study(2013) on stress, self-esteem and mental health[16]. The better general mental health is, the higher satisfaction in major is, because the student who has healthy mental thinks positively in all aspects.

Regarding stress in clinical practice, the result of this study is in line with the result of Lee et al's study(2016) on emotional labor, stress in clinic and satisfaction in clinical

practice[17]. It is deduced that the student of high emotion index improves ability to communicate and eases stress in clinical practice, thus satisfaction in major rises.

The Factor Affecting Satisfaction in Major: To grasp what factor affects satisfaction in major, the researchers analyze the regression model with the independent variable such as emotional intelligence, general mental health, academic emotion regulation and stress in clinical practice. As a result of the analysis, it turns out that the regression model is significant (F=28.134, p=<.001) and adjusted coefficient of determination to represent validness of the model R^2=.428.

The result shows that in order of stress in clinical practice(β=-.336, p=.000), general mental health(β=.253, p=.000), emotional intelligence(β=.239, p=.005) and emotion regulation(β=.206, p=.018), these factors have an influence on satisfaction in major as illustrated in Table 5.

The researchers test the condition of multicollinearity, independence, normality and homoscedasticity before conducting multiple regression analysis. the result of testing multicollinearity is that a tolerance limit is .533~884, which is over 0.1 and Variance Inflation Factor, VIF is 1.131~1.877, which is not over 10. In addition, the result of testing autocorrelation of error(independence) confirms that there is no autocorrelation because Durbin-Watson statistics is at 1.916, which is close to 2. The result of conducting residual analysis is that standardized residual range is –3.215~2.251, which satisfies homoscedasticity and confirms normality.

Table 5: Influencing Factors on Satisfaction in Major

Variable	B	SE	β	t	p
Emotional Intelligence	.184	.064	.239	2.873	.005**
General Mental Health	.686	.181	.253	3.788	.000**
Academic Emotion Regulation	.223	.093	.206	2.399	.018*
Stress in Clinical Practice	-.324	.065	-.336	-4.994	.000**
Adjusted R^2=.428, F=28.134, p=<.001					

The result of regression analysis conducted to grasp the factor affecting satisfaction in major shows that in order of stress in clinical practice, general mental health, emotional intelligence and academic emotion regulation in terms of extent of influence, these factors have a effect on satisfaction in major. The findings are in agreement with Kim et al's study(2017) on the factor affecting satisfaction in clinical practice[15]. Thus it is supported by these findings that stress in clinical practice of the male student majoring in nursing is the biggest factor to affect satisfaction in major

It is thought that particularly, the male student has a tendency to have difficulties in talking about different health problem of others and communicating with others including medical personnel during clinical practice, for this reason, stress in clinical practice becomes the biggest factor to influence satisfaction in major. In addition, low stress in clinical practice makes the male student have healthy general mental health and help ease stress in positive mind. High emotional intelligence helps to improve the communication ability and reduce stress in clinical practice, thus to raise satisfaction in major. Academic emotion regulation makes the student control himself so that he study in an active attitude, but if he fails to control academic emotion regulation, he feels anxiety and falls into a lethargy, accordingly his satisfaction in all aspects lowers. Thus, it is thought that the decreased satisfaction affects satisfaction in major.

Conclusion

This study is the descriptive correlation study conducted in order to grasp the relation between emotional intelligence, general mental health, academic emotion regulation, stress in clinical practice and satisfaction in major of the male university students majoring in nursing at the universities located in G city, J city, J province, I city and J province.

The findings of this study are as follows. In regard to satisfaction in major measured depending on general characteristic, there is significant difference in grade level, the reason for application and decision of department, by contrast there is no significant difference in age and grade. It is revealed that the higher emotional intelligence, general mental health, academic emotion regulation is respectively and the lower stress in clinical practice is, the higher satisfaction in major, additionally in order of stress in clinical practice, general mental

health, emotional intelligence, academic emotion regulation in terms of extent of influence, these factors have a big effect on satisfaction in major.

The researchers suggest that lots of studies are required to be carried out with various subjects in order to generalize the result of this study and the studies on diverse affecting factors of the male students majoring in nursing are required to be conducted in order to examine concrete satisfaction in major, additionally, it is needed to develop and use the program aimed at controlling stress in clinical practice and counsel the male students about stress in clinical practice.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Factors Affecting Implementation of Evidence-Based Fall Guidelines among Long-term Care Hospital Nurses

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ABSTRACT

Objectives: This study was designed to identify the factors affecting nurses' implementation of evidence-based fall guidelines in long-term care hospitals.

Method: Using a descriptive study design, the participants were 217nurses from long-term care hospitals in Korea. The data were used descriptive analysis, correlation, and multiple regression. The survey was designed to investigate nurses' EBP beliefs, EBP organizational culture, EBP implementation regarding implementation of evidence-based fall guidelines.

Findings: EBP beliefs ($\beta = .23$, $p < .001$), EBP organizational culture ($\beta = .49$, $p < .001$), and EBP implementation ($\beta = .15$, $p = .025$) were significant predictors which explained 57.6% of the variance reported in implementation of evidence-based fall guidelines.

Improvements/Applications: The results of this study support the need for nursing organizations to create cultures that promote EBP and to encourage nurses' beliefs about their confidence and capability to implement upon implementation of evidence-based fall guidelines. This could enhance patient care and outcomes, as well as organizational outcomes.

Keywords: *Evidence-based practice, Organizational Culture, Belief, Guidelines, Long-term care hospitals*

Introduction

Falls are considered one of the most common health problems among older adults in long-term care settings[1]. Even minor fall damage can cause morbidity [2] or mortality [3]. Therefore, it is important to implement fall prevention strategies to improve patient safety and nursing quality in long-term care settings [4]. Nurses play an active and essential role in fall prevention [1].

Worldwide, healthcare organizations aim to improve patient outcomes and quality and stability of care through the application of evidence-based practices (EBP)[5]. In addition, evidence-based guidelines are developed through a systematic review of literature to aid decision-making in specific clinical settings, facilitating the delivery of effective quality care [6], and evidence of recommendations and recommended grades are provided to guide scientific practice [7].EBP guidelines can be used in clinical and community nursing practice and can improve the variability of specific nursing practice [7].Therefore, the development and application of EBP guidelines have been increasing in clinical practice[8].

In a study implementing EBP for falls in long-term care nursing, the use of evidence-based fall guidelines was found to be effective not only in reducing fall incidences, but also in reducing medical costs [9]. Therefore, it is imperative to develop a strategy for extending the implementation of evidence-based fall guidelines. Although the Institute of Medicine aims for 90% of clinical decisions to be evidence-based by 2020 [10], the performance rate of EBP guidelines in the health care field is low [11], particularly in long-term care settings, such as long-term care hospitals [12]. Nurses tend to utilize their own experiences or other resources rather than implementing guidelines based on scientific evidence [11].

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The variables influencing the implementation of EBP guidelines are organizational culture, competence [12], personal knowledge, beliefs [13], and scope of implementation[14]. Because there are multiple influencing variables, it is necessary to identify which individual and organizational factors influence the implementation of evidence-based fall guidelines.

This study attempts to provide the basic data necessary for the development of strategies to increase EBP fall performance by identifying factors affecting the implementation of evidence-based fall guidelines by long-term care hospital nurses. The purposes of this study are:

(a) to examine the implementation of evidence-based fall guidelines by long-term care hospital nurses, (b) to identify correlations between EBP beliefs, EBP organizational culture, EBP implementation, and implementation of evidence-based fall guidelines, and (c) to identify factors affecting the implementation of evidence-based fall guidelines by long-term care hospital nurses.

Materials and Method

Research Design/Subjects: A secondary analysis of an EBP survey of fall management in geriatric hospitals (EBPSFM), sorted from primary data sets consisting of self-descriptive data, was carried out [15]. The questionnaire was distributed to all nurses (n = 217) in long-term care hospitals in South Korea.

Research Tool

EBP Beliefs Scale: The EBP beliefs scale consists of 13 questions with a 5-point recount response scale measuring participants' beliefs in the importance of EBP. Each item consists of a five-point Likert scale, with a total score ranging from 13 to 65 points [10]. A higher score reflects a stronger belief in EBP. In a study conducted by Melynk [13], Cronbach's α was .90; in this research, Cronbach's α was 0.93.

EBP Organizational Culture Scale: The EBP organizational culture scale also utilizes a five-point Likert scale, with 15 questions exploring the organization's characteristics, including benefits and opportunities to encourage EBP within the medical institution. The total score range of 15 to 75 points [16]. A higher score indicates a system that is moving toward embracing organizational EBP implementation. The Cronbach's α for internal consistency reliability was 0.95[16]; Cronbach's α in this study was 0.95.

EBP Implementation Scale: The EBP implementation scale consists of 10 items and evaluates the frequency of EBP-related activities performed during a nurse's working hours [13]. Each item consists of a five-point Likert scale, with a total range of 10 to 50 points. A higher score indicates more frequent EBP in practice. In a study by Melynk [13], Cronbach's α was .96; Cronbach's α in this research was 0.95.

Implementation of the Evidence-based Fall Guidelines Scale: The implementation of the evidence-based fall guidelines scale extracted recommendations for fall prevention and management of elderly adults based on EBP guidelines [17]. They were used after being reviewed for content validity by one rehabilitation clinic doctor, two senior nursing professors, two senior nurses, and one physical therapist. This scale consists of 30 questions; each scored on a five-point Likert scale, with total score range of 30 to 150 points. A higher score indicates that nurses are moving toward embracing EBP guidelines. The Cronbach's α for internal consistency reliability was 0.95[17]; Cronbach's α in this study was 0.96.

Results and Discussion

Sample Characteristics: This study included nurses working in long-term care hospitals. A total of 217 participants were eligible nurses and self- reporting questionnaires were completed at the beginning of the EBP survey[15]. The average age of participants in the study was 37.4 years (SD = 8.9), and most were women (98%, n = 213). The overall clinical experience of the study participants was approximately 9 years (SD = 7.7) and the clinical experience average for the current department was 3 years (SD = 2.1)[Table 1].

Table 1: Demographic Characteristics (N = 217)

Characteristic	N(%)
Gender	
Women	213(98.1)
Men	4(1.9)

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Age(Years)	
19-25	10(4.6)
26-35	91(42.0)
36-45	76(35.0)
46-55	32(14.7)
56 and Over	8(3.7)
Years of nursing experience	
0-5	53(24.4)
6-10	109(50.2)
11-15	24(11.1)
16-20	21(9.7)
Over 20	10(4.6)
Highest nursing degree learned	
College	153(70.5)
BSN	59(27.2)
MSN & PhD	5(2.3)
Education in fall management	
Yes	143(65.9)
No	74(34.1)
Education needed in fall management	
Yes	209(96.3)
No	8 (3.7)

Conted…

Experience with patient falls	
Yes	172(79.3)
No	45(20.7)
Use of EBP guidelines	
Yes	100(46.0)
No	117(54.0)

Correlations among Variables: EBP implementation and implementation of evidence-based fall guidelines were significant correlations($r = .58$, $p < .001$), where high levels of EBP implementation were associated with implementation of evidence-based fall guidelines. EBP beliefs and implementation of evidence-based fall guidelines were significant positive correlation($r = .65$, $p < .001$), where high levels of EBP beliefs were associated with implementation of evidence-based fall guidelines. EBP organizational culture and implementation of evidence-based fall guidelines were significant positive correlation($r = .73$, $p < .001$), where high levels of EBP organizational culture were associated with implementation of evidence-based fall guidelines [Table 2].

Table 2: Correlations among Variables (N = 217)

	EBP beliefs	EBP organizational culture	EBP implementation	Implementation of evidence based fall guidelines
EBP beliefs	1			
EBP organizational culture	.679***	1		
EBP implementation	.686***	.596***	1	
Implementation of evidence based fall guidelines	.648***	.727***	.581***	1

Note: ***p<.001

Predictor of Implementation of Evidence- based fall Guideline: The multiple regression analysis found that EBP beliefs, EBP organizational culture, and EBP implementation contributed to the prediction of implementation of evidence-based fall guidelines ($F = 58.324$, $p < .001$, $R^2 = .582$, R^2 adjusted = .576). Although all variables made statistically significant contributions to the regression equation, the EBP organizational culture standardized beta was highest. The significant predictors were EBP organizational culture ($\beta = .49$, $p < .001$), EBP beliefs ($\beta = .23$, $p < .001$), and EBP implementation ($\beta = .15$, $p = .025$), which combined, explained for 57.6% of the variance in the implementation of evidence-based fall guidelines [Table 3].

Table 3: Factors Influencing Implementation of EBP guidelines (N = 217)

	B	β	p
EBP Belief	.766	.225	.001
EBP Organizational culture	.860	.485	<.001
EBP Implementation	.364	.145	.022
$F= 58.324$. $p < .001$, $R^2 = .582$, R^2 adjusted = .576			

Discussion

In this study, EBP beliefs, EBP organizational culture, and EBP implementation were significant

predictors which explained 57.6% of the variance reported in implementation of evidence-based fall guidelines.

Stronger perceptions of EBP organizational culture were positively related to implementing evidence-based fall guidelines, suggesting that it is important to encourage an EBP organizational culture. These results are similar to the findings on strong perceptions of EBP organizational culture, which increase adherence to EBP guidelines by nurses [5, 12]. Therefore, it is necessary to establish a positive EBP organizational culture in addition to the provision of various organizational supports so that nurses can implement EBP guidelines. This may include providing opportunities for regular access to nursing journals and data. Organizations will also need to participate in academic and educational activities on EBP. Mentors have been proposed as a key element in forming and maintaining EBP organizational culture [5]. EBP mentors can help overcome individual and organizational barriers to the utilization and dissemination of evidence-based fall guidelines.

In this study, stronger EBP beliefs were associated with greater compliance with baseline fall guidelines, consistent with the results of previous studies suggesting that EBP beliefs are linked to clinical practice guidelines [18]. These results are important because individual beliefs can change through intervention. EBP beliefs can be improved through a variety of educational trainings and workshops, increasing positive attitudes toward and confidence in EBP.

In this study, EBP implementation was identified as a factor influencing evidence-based fall guidelines. Milner et al. [19] found that nurses with more active attitudes toward reading research articles performed EBP more often. The more EBP guidelines a nurse uses, the more they implement, resulting in greater attention to EBP research and insights, and more practical applications to prevent falls, through environmental strategies and trainings. In order to ensure optimal evidence, nurses should strive to read papers efficiently and foster knowledge of criticisms.

In addition, approximately 50% of the participants in this study found that they do not use evidence-based fall guidelines. This is the result of insufficient information and knowledge to implement evidence-based fall guidelines [20]. Individual or organizational factors in the guidelines may act as barriers for nurses to implement evidence-based guidelines [21]. Therefore, it is necessary for organizations to accept and establish a standard for patient safety, such as the medical institution certification system, for the implementation of evidence-based fall guidelines in nursing. Hospital executives will also need to establish and support budgets for the development and application of evidence-based fall guidelines.

Conclusion and Suggestion

To improve the implementation of evidence-based fall guidelines, an organizational culture should be established that facilitates the implementation of the guidelines and recognizes its performance with organization-wide support. It should also provide EBP education and access, thereby enhancing EBP beliefs and implementation.

This study has some limitations. Self-reporting questionnaires may overestimate or underestimate participants' perceptions of EBP beliefs, EBP organizational culture, EBP implementation, and implementation of evidence-based fall guidelines.

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Conflict of Interest: Nil

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Comparison of Nursing College Students and Other Major College Students Before and After Education on Bioethical Consciousness

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ABSTRACT

Background/Objectives: Preliminary health care ethics education is important for improving the ethical values in the field. This study examined the effects of ethics education on college students through various learning methods.

Method/Statistical Analysis: This study was an design with an 272 students in the first year of nursing college students of experimental group and 277 students in the first year of nursing college students of control group. Experimental groupwho undertook bioethics education, and control group who did not. The bioethics education was taught using textbooks, PPT, and video materials for two hours per week for 15 weeks. A post-questionnaire survey was conducted to measure the changes in the awareness of bioethics in before and after the training.

Findings: The correlation coefficient of 0.335 ($p = .000$) confirmed the improvement in bioethical consciousness and the necessity of bioethics education for college students. In addition, the correlation coefficient between the necessity of bioethics education in college and the self - ethics of the day was positively correlated with 0.233 ($p = .000$).

Improvements/Applications: These results show that bioethics education is an essential tool in improving bioethics awareness.

Keywords: *Health care, Bioethics, Consciousness, education, College student*

Introduction

The rapid development of modern scientific and medical technology has brought about changes in human morals and ethical values. Prior to the development of medical technology for the elderly, birth and death were believed to be natural and only artificially transformable. On the other hand, recent advances in medical technology based on science have brought tremendous changes to previous fixed beliefs. Current medical technology has made birth by artificial manipulation possible, as well as the possibility to artificially extend and shorten human life [1]. These changes have offered hope to mankind, but behind it are new ethical and moral problems that could not even be imagined in the past. In current society, the life-time trend due to the development of medical technology is prevalent and accelerating. Recently, issues concerning the ethics of life care include issues of human embryos, artificial abortion, prenatal diagnosis, life support, animal cloning and genetic manipulation, organ transplantation, and death. These issues have made it impossible to apply existing ethical judgments

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or assessments as they are, thereby calling for confusion in values and changes in ethics. The correct choice is difficult to make if one experiences an ethical conflict situation without the ethical value of the individual in the confused reality. Therefore, education on health and medical care, which nurture prospective health care providers, is strengthening education on biomedical ethics based on human respect [2, 3, 4]. In other words, education and training on biomedical ethics are very important for ethical value judgments in the medical field[5, 6, 7].

In addition to the development of information and communication technology, various educational methods have been emphasized in accordance with the educational needs of the students, and education using movies is also recommended [8, 9]. This can be used as very effective educational material in relation to a complex subject, such as biomedical ethics. Therefore, in this study, movie appreciation and evaluations related to the subject were written during the curriculum.

Bioethics education is an essential element for people living in this period to escape chaos and consolidate their values. The education of bioethics in universities positively influences moral judgments and ethics, and the education effect will be stronger than in any other period of life [10]. Nursing college students require education to develop biomedical ethics consciousness [10] because it is based on decision-making at the time of clinical practice[3].

The aim of this study was to identify the degree of biomedical ethics of nursing college students and non - nursing college students, compare them with the degree of education regarding biomedical ethics, and contribute to the development of the biomedical ethics consciousness.

Materials and Method

Research Design: This study is a narrative comparative study to compare the perceptions of the overall biomedical ethics of nursing college students and non-nursing college students and to compare the changes with education.

Research Subjects and Contents: The experimental group consisted of 272 students in the first year of nursing college students and control group consisted of 277 students in the first year of non-nursing college students. The first year of nursing college students in nursing college(272 students) who were participating in bioethics education and the first year of non-nursing college students(277 students) were not participating in bioethics education.

In the experimental and control group, a preliminary questionnaire on bioethics was conducted, and the experimental group underwent the biomedical ethics education for each subject for two hours per week for 15 weeks. Topics included education on bioethics, education on human embryos, artificial abortion, antenatal diagnosis, lifesaving, organ transplantation, suicide, brain death, and euthanasia. A post-questionnaire survey was conducted to measure the changes in the awareness of bioethics before and after the training in biomedical ethics education.

Research Tools

The tools developed by Lee [11] were revised and supplemented. Each item was scored on a 5-point Likert scale and scored from 1 ‘totally disagree’ to 5 ‘strongly agree’. The higher the score of each item, the higher the respect for life and the higher the awareness of biomedical ethics. Three items of brain death,three items of euthanasia, three items of euthanasia, three items of suicide, four items of animal cloning and genetic manipulation, one item of human embryo, four items of artificial abortion, one item of prenatal diagnosis, three items of organ transplantation, and three items of death. The reliability of this study was Cronbach’s = 0.749.

Data Analysis

The frequency and percentage (%) were calculated and the homogeneity was verified to understand the general characteristics of the subjects. The mean and standard deviations were tested and analyzed by t-test to see if there was any differences in the perception level of bioethics before and after the education of bioethics. Correlation analysis on the ethics and the need for education was also conducted using the SAS 9.4 program.

Results and Discussion

Awareness Distribution on General Bioethics: As shown in <Table 1>, the distribution of the pre-cognition survey results on bioethics was examined by dividing the subjects into an experimental group (nursing college

students) and control group (non-nursing college students). No difference was observed between the two groups in terms of evaluating their own bioethics. In addition, experience in bioethics education was highest in the school that was experienced through the media and books, and there was no difference in the general characteristics between the two groups.

Comparison of Bioethics Perceptions: The average of the items of bioethics education in the pre experimental group (nursing college students) and control group (non-nursing college students) were surveyed (Table 2). The prenatal diagnosis and postnatal survey showed the most significant difference in the diagnosis of antenatal diagnosis among the subjects related to reproduction. The preliminary survey of prenatal diagnosis revealed 2.61 ± 0.93 for the experimental group and 3.00 ± 0.99 for the control group.

In the problems with abortion area, the experimental group showed 2.80 ± 0.61, 2.61 ± 0.58, and 2.71 ± 0.64, respectively, compared to the control group: 2.69 ± 0.64 and 2.73 ± 0.64, respectively. There was little change in the post - war ethics, but the control group showed a significant decrease in the consciousness of ethics in the post - test.

Table 1: General Characteristics of Bioethics

	Experimental Group		**Control Group**		
Religion					
Christian	68	12.4%	66	12.0%	x^2 =2.79 P=0.59
Catholic	18	3.3%	30	5.5%	
Buddhism	21	3.8%	17	3.1%	
Atheism	162	29.5%	159	29.0%	
Other	3	0.5%	5	0.9%	
Ethics					
Very Ethical.	29	5.3%	41	7.5%	x^2 =4.84 P=0.183
Little Ethical	152	27.7%	120	21.9%	
Average	90	16.4%	113	20.6%	
Little Unethical	0	0.0%	3	0.5%	
Very Unethical	1	0.2%	0	0.0%	
Life Ethics Experience Medium					
School	145	33.5%	96	22.2%	x^2 =8.32 P=0.215
Media	83	19.2%	58	13.4%	
Book	15	3.5%	18	4.2%	
Parents	3	0.7%	2	0.5%	
Friend	0	0.0%	1	0.2%	
Other	7	1.6%	5	1.2%	

Table 2: Comparison of the Before and After Items According to Bioethical Consciousness Items

		Pre-test	**Post-test**	**t**	**p**
		Mean ± SD	**Mean ± SD**		
Problems with Human Embryos	Experimental Group	3.72 ± 1.12	3.84 ± 0.98	1.347	0.180
	Control Group	3.85 ± 1.02	3.63 ± 1.07	3.482	0.001
Problems with Abortion	Experimental Group	2.48 ± 0.61	2.61 ± 0.58	-0.913	0.363
	Control Group	2.69 ± 0.64	2.73 ± 0.64	-0.808	0.420
Problems of Prenatal Diagnosis	Experimental Group	2.61 ± 0.93	3.19 ± 0.93	3.792	<.001
	Control Group	3.00 ± 0.99	2.97 ± 0.96	0.691	0.490

Conted…

Problems with Brain Death	Experimental Group	3.60 ± 0.68	3.63 ± 0.57	1.845	0.067
	Control Group	3.49 ± 0.65	3.46 ± 0.63	1.924	0.056
Issues Relating to Netting Therapy	Experimental Group	3.59 ± 0.74	3.59 ± 0.64	-0.371	0.711
	Control Group	3.55 ± 0.72	3.46 ± 0.64	1.984	0.048
Problems with Euthanasia	Experimental Group	2.12 ± 0.69	2.37 ± 0.68	-2.680	0.008
	Control Group	2.19 ± 0.63	2.38 ± 0.66	-3.281	0.001
Problems with Suicide	Experimental Group	3.57 ± 0.86	3.21 ± 0.87	-0.368	0.714
	Control Group	3.56 ± 0.86	3.36 ± 0.87	-0.714	0.476
Problems with Organ Transplantation	Experimental Group	3.13 ± 0.63	3.02 ± 0.55	0.835	0.405
	Control Group	3.12 ± 0.62	3.11 ± 0.58	0.196	0.845
Animal Reproduction and Genetics	Experimental Group	3.46 ± 0.65	3.27 ± 0.69	2.127	0.035
	Control Group	3.41 ± 0.67	3.28 ± 0.69	1.495	0.136

As a result of observing the pre - and post – change shown in table 3 of the subject of the bioethical consciousness of the group of nursing university students who received the education of bioethics and the experimental group(nursing students) without bioethics education, 3.21 ± 0.53 in the nursing college students, 3.21 ± 0.50 in the experimental group, and 3.10 ± 0.54 in the control group, respectively. In the bioethics survey, the experimental group was 3.18 ± 0.31, the control group was 3.27 ± 0.34, and the nursing college students were 3.20 ± 0.31 and 3.17 ± 0.30, respectively. Significant results were displayed in the Anim production, Bioetics area.

Table 3: Pre-post Comparison of Bioethics Topics

		Pre-test	**Post-test**	**t**	**p**
		Mean ± SD	**Mean ± SD**		
Reproduction	Experimental Group	2.92 ± 0.51	3.21 ± 0.50	1.77	0.080
	Control Group	3.21 ± 0.53	3.10 ± 0.54	-1.30	0.197
Death	Experimental Group	3.18 ± 0.29	3.15 ± 0.26	-0.81	0.417
	Control Group	3.17 ± 0.28	3.15 ± 0.25	-1.02	0.310
Animal Reproduction	Experimental Group	3.46 ± 0.65	3.27 ± 0.69	2.13	0.036
	Control Group	3.41 ± 0.67	3.28 ± 0.69	0.59	0.556
Bioethics	Experimental Group	3.18 ± 0.31	3.20 ± 0.31	2.41	0.019
	Control Group	3.27 ± 0.34	3.17 ± 0.30	1.77	0.080

Sub-domain Correlation of Biomedical Ethics: The views on the enhancement of bioethical consciousness were analyzed according to the items. The subjects with the view that bioethical consciousness should be strengthened in the era of genetic engineering were more likely to have bioequivalence education at university with a correlation coefficient of 0.335 (p = .000) as shown in table 4. In addition, the respondents who answered that it is essential for the education of bioethics in school showed a positive correlation with 0.233 (p = .000).

Table 4: Analysis of the Need for Ethics and Education

		Ethics	**Past change**	**Ethics Education**
Ethics	Pearson Correlation Coefficient	1	.155**	.233**
	Significance Level (Both Sides)		.000	.000
Past change	Pearson Correlation Coefficient	.155**	1	.335**
	Significance Level (Both Sides)	.000		.000
Ethics Education	Pearson Correlation Coefficient	.233**	.335**	1
	Significance Level (Both Sides)	.000	.000	
**. The correlation is significant at 0.01 level (both sides).				

Discussion

This study examined the effect of biomedical ethics education on the improvement of biomedical ethics consciousness. In a previous study, the experimental group with biomedical ethics education increased from 3.07 before training to 3.31 after ($p < .001$). In the non-nursing college students, however, the consciousness of medical ethics decreased from 3.08 in the dictionary to 3.05 in the post [12]. In previous studies, nursing college students, who were experienced in participating in education related to biomedical ethics as well as the quality of life and ethics education, had a high ethical awareness of biomedical ethics [13, 3]. This shows that bioethics education is an essential tool for improving bioethical consciousness. As new-generation students want something new, they require new ways of teaching [9]. To educate biomedical ethics, it is essential not to inject ethics awareness or values but to teach various kinds of teaching and learning aimed at improving their thinking ability[14]. Moreover, it is necessary to develop an education program that can effectively improve the awareness of biomedical ethics. In this study, indirect experience using movies provides an easy understanding of clinics in those who are not experienced, such as first year students, and is advantageous as a tool of biomedical ethics education, but the movies may affect the ethics [12] when cultivating the judgment ability. In addition, there are some parts where it is difficult to maintain the sustainability of the instruction using only the video media, and the application effect of image data differ according to the subject. Using these tools, the implications for the theme that the film delivers were clarified.

Students are encouraged to participate actively in their lectures on biomedical ethics education, so that they have a good understanding of the concepts, such as knowledge and actual experiences on themes, discussions, and clinical activities.

Conclusions

This study examined the degree of bioethical consciousness among college students. In addition, the effects of education and biomedical ethics education were analyzed. The purpose of this study was to highlight the necessity and direction of biomedical ethics education to be provided to future medical practitioners. The subjects of education, which was applied only to experimental nursing college students, was biomedical ethics education related to human embryos, abortion, surrogate mothers, prenatal diagnosis, brain death, lifetime treatment, suicide, euthanasia, and organ transplantation. No training on animal cloning and genetic manipulation was conducted by any group. Before and after training, the same questionnaire was given to the students to understand the improvement of the biomedical ethics consciousness. In terms of the items and subjects in which nursing students were educated, the score of bioethical consciousness regarding the prenatal diagnosis was highest in the post-survey based on the preliminary survey, and the number of nursing college students was lower. In animal cloning and gene manipulation, in which no education was carried out, nursing students and nursing college students had lower scores in the post - test than pre - test. According to the themes, the scores on bioethical consciousness in the post-survey were increased based on the preliminary survey on reproductive health. The scores on overall bioethical awareness also tended to be higher in the post-survey than in the pre-study. In conclusion, biomedical ethics education has proved to be an essential tool for enhancing the awareness of biomedical ethics.

Based on these results, it is necessary for experts to fully research and discuss the direction of improvement and the development of the application of biomedical ethics education. In addition, the emphasis was on the necessity of implementing biomedical ethics education more effectively for prospective healthcare workers who will be working in the medical field in the age of chaos, where medical science and science are developing rapidly and their contents are difficult to predict. Follow-up research on educational tools and effective new educational methods to improve understanding and interest of nursing students' bioethics will be needed.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Analysis of Learning Effect in Neonatal Practice of Nursing Students-Utilization of Evaluation Criteria in Clinical Practice Guide

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ABSTRACT

Background/Objectives: The purpose of this study is to analyze the process related to the acquirement of the concept through the self - evaluation analysis that practical guidelines of the nursing student in practicing neonatal and neonatal intensive care unit.

Method/Statistical Analysis: A descriptive research design was used for this study. All 109 nursing students were obtained by from neonatal and neonatal Intensive Care Unit Nursing practice in one university located in Seoul. The Data was collected for from 2014 to 2015 by the checklist of practice guideline. Collected data was analyzed on SPSS Win 21.0

Findings: In the method of learning, it was confirmed that they learned the concept through most observation method. Handwashing, breastfeeding and elimination were the most frequently performed items, and pollution inspection, injection/syringe pump and TPN management were the lowest.

Improvements/Applications: In order to improve the quality of clinical practice education and improve the effectiveness of practical training, it is necessary to actively review and improve the use of practical training guideline so that students can receive training in clinical practice and practical courses in the class.

Keywords: *Learning effect, Neonate Practice, Nursing Students, Self-evaluation, Practice guidebook*

Introduction

The nursing curriculum to strengthen the professional competence of nursing requires very diverse and complex educational goals. In addition to theoretical education, clinical practice is indispensable to develop practical skills to solve the subject's health problems, especially in the clinical field for integrated nursing[1]. This can be done by applying theoretical knowledge through clinical practice education to they have attitudes and values necessary for nursing practice[1]. The goal of nursing education is to acquire skills based on professional knowledge and to have the ability and ability to cope with various clinical situations and needs of nursing subjects[2]. In particular, clinical practice education can be said to be a core curriculum that has the ability to solve critical thinking and creative problem solving based on prior knowledge of theories[3].

However, most of the clinical practice of nursing college students is focused on observation-based practice rather than actual nursing behavior [4], and they are doing simple and low-risk nursing activities such as measuring vital signs and patient movement [5] And it is difficult to acquire enough nursing care skills necessary for patient care [6]. It is difficult to obtain active cooperation and support for the clinical practice education because the hospital is established for the purpose of patient care and nursing, not an institution established and operated for nursing university students' practical training [7]. In addition, among the practical subjects, child nursing practice is a practice that includes vulnerable subjects such as neonatal and pediatric patients and their parents, so it is difficult to carry out direct nursing more than other subjects[8]. And due to the social problems of

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low fertility and the structure of the medical field that operates a small number of pediatric wards, it is difficult to secure an environment that allows a lot of experience in clinical practice.

Recently, in Korea, due to excessive nursing, new and expansion, sudden quantitative expansion has occurred in a short period of time[9]. However, there are only 41 schools with affiliated hospitals that can link clinical practice. Schools without attached hospitals are struggling to secure clinical training hospitals for students, and hospitals that must to educate them feel burdened by clinical training[8]. For this reason, the child nursing practice curriculum is the school's own hands-on training is important. In order to reinforce this, it is necessary for the students themselves to acquire knowledge and skills related to the hospital practice through self-study, observation, Learning is being applied. The most typical example of the learning method is the practice guideline. The Practice Guide line provide information for students to utilize the core information related to the practical exercises in which the objectives of the practical training and contents and methods of practical training are embedded. Practice Guidelines Self-evaluation is conducted according to the acquired method (observation, performance, self-learning) of each concept in learning contents.

However, for nursing college students, the practice guideline is not a tool for learning, but just for submitting a report. Therefore, it is not utilized as a material to provide sufficient information for strategic practice. There insufficient is research to review the composition of the contents of the practice guideline and to find ways to improve it and there is a lack of professional knowledge and basic data that will be a rational and standardized basis for constructing the content of the Practical Guides.

In this study is to investigate how to learn the contents of the practice guide line of neonatal and high-risk neonatal care. It for items that lack practical experience and learning, I would like to provide basic data for supplementing and improving the curriculum so that I can get the education in the practical course in the school.

Materials and Method

Design: This study was the analysis of learning process of practical intervention through self-evaluation in hospital clinical practice based on neonatal and neonatal intensive care unit. Based on this, a descriptive research was performed to provide basic data for future nursing practice improvement

Participants: The subjects are 3rd grade nursing students in nursing college of J university in S city who took an elective course of Newborn Department and Newborn Intensive Care Unit training and experience during 2014~2015. A total of 109 students who faithfully filled in the information in the final evaluation study were analyzed in this study.

Instruments: In order to collect the data of this study, the practical guideline used and described by students in clinical practice education were used as basic research data. The two tools used in this study are "Check list for learning concepts", and "self-evaluation." 'Clinical Nursing Skills Checklist', which is a self-learning evaluation sheet for each concept to be learned and practiced and 'Self-evaluation', which scored meaning the self-evaluation of the students in the overall practice by performing clinical practice.

Data Collection and Data Analysis

A total of 109 practice guideline were collected from the neonatal and neonatal intensive care unit from 2014 to 2015. The collected data were analyzed using SPSS WIN 21.0.Frequency, percentage, and mean were used.

Ethical Considerations: The study was approved by the IRB(1041078-201609-HRSB-170--01) of the relevant institution and analyzed the data. We explained that the content collected for the study was not used for any purpose other than research and that the participant could withdraw the participation at any time if desired. There was no disadvantage without participating in the study, and personal identification information was encrypted and statistically processed to protect the privacy and confidentiality of the subject. The collected data will be kept sealed in the research director's data archive for three years according to the data storage deadline, and then the information will be discarded.

Results and Discussion

General Characteristics: General characteristic is shown in table 1.The gender of 109(100%) students is females. There were 88 (80%) regular interdisciplinary

undergraduates who were incorporated into nursing program and 21 (20%) nursing program students. The number of students who had prior clinical practice experience was 99 (90%). The remaining 10 students (9.2%) had no prior clinical practice experience. Regarding to hospital type, 78 (71.6%) were assigned to Enterprise hospitals, 20 (18.3%) were assigned to Teaching hospitals, and 11 (10.1%) were assigned tonational public hospitals.

Table 1: General Characteristics of Participants

Characteristics	Categories	n (%)
Gender	Male	0(0)
	Female	109(100)
Educational System	University	88(80.7)
	Transferred	21(19.3)
Semester (3rd grade)	1st semester	44(40.4)
	2nd semester	65(59.6)
Complete subject (Newborn Nursing)	Yes	65(59.6)
	No	44(40.4)
Experience Nursing Practice	Yes	99(90.8)
	No	10(9.2)
Hospital	Enterprise Hospital	78(71.6)
Ownership	National/Public Hospital	11(10.1)
	Teaching Hospital	20(18.3)
Hospital Type	Tertiary Hospital	0(0)
	General Hospital	61(56)
	Special Hospital	48(44)

Clinical Nursing Skills Checklist: The Clinical Nursing Skills Checklist as shown in table 2. The Clinical Nursing Skills Checklist was divided into three types according to the types of learning that can be practiced in clinical practice. Observations is learned by observing behavior, experience is the actual experience of nursing skills and Self-Study is self-learning for that want concepts. The average score for types of learning was 2.25 time/2weeks points. in the item of subscale, average Observations was 4.03 times/2 weeks, average experience 1.44 times/2 weeks and average Self-Study 1.27 times/2 weeks indicating significantly high points with observation compared with average experience and self-study.

Clinical Nursing Skills Checklist: Observation: The Clinical Nursing Skills Checklist: Observation as shown in table 2. Observation of the type of clinical practice showed a total average of 4.03 cases. Among the total 36 items, 'Washing' was the highest among the items of 'Observation', 'Hand washing' was the highest at 7.89, 'Neonatal Vital Signs Measurement' was average 6.59, 'Newborn Observation Record' was average 6.45, 6.31 times, and 6.26 times in 'Nutrition-Breast feeding, Formula feeding'. The lowest level of observation method was' indoor pollution check 'average of 0.94,' infusion pump 'average 1.28 times,' TPN management 'average 1.31,' therapeutic diet management 'average 1.93 times,' Gavage feeding 'Average 1.97 times.

Observation among the methods of learning was the highest in 4.03 times. The present study supports the results of Joe Mi-hye and Kwon In-su [10] study that the education through observation is performed rather than the performance - oriented education in which clinical nursing students directly participate. Nursing students have little opportunity to apply theoretical knowledge directly to the practice[5] and It is also interpreted as reflecting the reality that observation-oriented practice is still maintained. Therefore, it is necessary to construct a learning strategy and a variety of learning environments that fully reflect the interests and needs of the students, not just the assessment of educational situation and design characteristics and educational performance[11]. It is also necessary to prepare and improve measures to learn items such as 'indoor pollution check', 'infusion pump', 'TPN management', 'treatment diet management', 'Gavage feeding'. I think that it will be possible to increase the quality of clinical practice education by increasing the learning effect to understand and integrate comprehensive clinical practice and clinical field.

Table 2: Clinical nursing skill: Observation

Observation	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Infection control method: Hands washing	7.89	1
- Vital sing check	6.59	2
- Administration of newborn	6.45	3
- Positioning (Nesting)	6.31	4

Conted…

- Nutrition: Breast feeding/ Formula feeding	6.26	5
- Gavage feeding	1.97	32
- Nutrition: oro/naso-gastric tubes	1.93	33
- TPN management	1.31	34
- Infusion pump	1.28	35
- Indoor pollution check: air culture)	0.94	36
Total Average/Practice session	**4.03/2weeks**	

Clinical Nursing Skills Checklist: Experience: The Clinical Nursing Skills Checklist: Experience as shown in table 3. Experience of the type of clinical practice showed a total average of 4.03 cases. In the total of 36 items, the highest level of learning method was 'hand washing' (9.28), 'Nutrition (Breast feeding, Formula feeding)' was 5.72 and 'meconium' was 3.72, 3.46 times in 'keeping the position' and 3.40 times in 'using standardized terms'. The lowest score was 0.06 for 'TPN management', 0.06 for 'other' (newborn immunization and congenital anomaly) and 0.06 for 'infusion pump'. The mean number of treatment regimens was 0.08, that of 'Oxygen therapy' was 0.11, and that of 'Syringe pump' was 0.11.

Experience Among the methods of learning, hand washing items showed the highest average of 9.28. As the importance of hospital infection is emphasized, it is interpreted that nursing college students are also aware of infection management. Hand washing is the most basic and essential way to reduce hospital infection and it can be interpreted that the hand washing is performed because it emphasizes[12] and education that all hospital workers are important activities to performance. If active interactions between clinical and schools are strengthened, we can get more opportunity to practice more items, and at the same time, we will be able to play a more systematic and active role as a nursing student in the clinical field.

Table 3: Clinical Nursing Skill: Experience

Experience	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Infection control method: Hands washing	9.28	1
- Nutrition: Breast feeding/Formula feeding	5.72	2
- Elimination: meconium, diaper	3.72	3
- Positioning (Nesting)	3.46	4
- Standardized terminology	3.40	5
- Oxygen therapy (O_2 hood, respirator)	0.11	31
- Syringe pump	0.11	31
- Dietary Therapy Management (Parenteral nutrition)	0.08	33
- TPN management	0.06	34
- Infusion pump	0.06	34
Total Average/Practice session	**1.44/2weeks**	

Clinical Nursing Skills Checklist: Self-Study: The Clinical Nursing Skills Checklist: Self-study as shown in table 4. Self-study of the type of clinical practice showed a total average of 1.27 cases. In the total of 36 items, the highest level of self-study was 'average of standardized usage' 1.96, '1.83 times of knowledge and theory related to nursing practice' and 1.83 times of 'neonatal vital signs', 'Physical assessment' average 1.79 times, and 'Body measurement' average 1.64 times.

The lowest intake of self-study items was 'indoor pollution check' at the lowest 0.70, 'infusion pump' average 0.79, 'syringe pump' 0.83, 'gavage feeding' 0.88, 'infant care system' Application and monitor 'average of 0.91.

Self-study 1.27, indicating the lowest level of learning. Although they are expecting to acquire concepts through self-study, students may not be able to use time and clinical practice autonomously in clinical

practice, suggesting that there is a limit to effective learning. It can be expected that the granting of learning time during the practice can link intellectual curiosity to learning motivation, and the effect of the practice will be enhanced. In addition, it can be a strategy to increase the utilization of the practice guide, improve the confidence and coping ability of the new situation faced by nursing students, and improve the skills of professional nursing[13].

Table 4: Clinical nursing skill: Self-study

Self-study	Average (Number of times)/ Practice session (2weeks)	Rank
Categories		
- Standardized terminology	1.96	1
- Nursing knowledge and theory: Newborn nursing	1.83	2
- Hypothermia, radiant warmer	1.36	3
- Physical assessment	1.79	4
- Growth measurements: BW, Length, HC, CC, AC	1.64	5
- Infant care system monitoring	0.91	32
- Gavage feeding	0.88	33
- Syringe pump	0.83	34
- Infusion pump	0.79	35
- Infection control guidelines (Indoor pollution check: air culture)	0.70	36
Total Average/Practice session	**1.27/2weeks**	

Self-Evaluation: Self-Evaluation as shown in table 5. Self-evaluation of students performing clinical practice assessed themselves on questions about nursing ability, communication, performance, and attitude Score. The average score was 24.72 points out of 30 points and 1.65 points out of 2 points for each item. The average score for 24.72 points in 30-point scale, in the item of questions, 'structure and understanding of the neonatal and neonatal intensive care unit' showed the highest points with 1.98 and 'Ability to cope with problem situation' showed the lowest Points with 1.27.

The self-evaluation showed an average of 1.65 points out of 2 points, The highest item was 'Understanding the Structure and Function of the Ward' with an average of 1.98 points. This is considered to be a result of the orientation of the practical guidance professor before the training and the sufficient pre-training through the field manager during the training period. On the other hand, the lowest item was 'Ability to deal with problem situations', with an average of 1.27 points. This is because the actual nursing in the clinical field is not simply performed in a single nursing area but is performed in a complicated and dynamic nursing environment [14], t is considered to be a result of the fact that practical training alone can`t be enough to improve adaptation and practical ability of clinical field. It is that the program can be modified and supplemented so that students can experience various kinds of practical education and if they are improved by reflecting the needs of the students, it will be possible to cope effectively with nursing in the clinic by cultivating critical thinking ability.

Table 5: Self Evaluation

Categories	Good n(%)	Moderate n(%)	Failing n(%)	Average (2 points)
1. Nursing assessment skills	83(76.2%)	24(22.0%)	2(1.8%)	1.74
2. Comfort care	79(72.5%)	27(24.8%)	3(2.7%)	1.68
3. Ability to use the equipment and drug	56(51.4%)	49(44.9%)	4(3.7%)	1.48
4. Performing nursing skills	60(55.1%)	43(39.4%)	6(5.5%)	1.50
5. Communication skills	64(58.7%)	37(33.9%)	8(7.4%)	1.51
6. Newborn department of structure and function	107(98.2%)	2(1.8%)	0(0%)	1.98
7. Infection control	89(81.7%)	20(18.3%)	0(0%)	1.81
8. Educational needs	59(54.1%)	47(43.2%)	3(2.7%)	1.51
9. Priorities of nursing job	69(63.3%)	37(34%)	3(2.7%)	1.60
10. Ability to apply nursing process	68(62.4%)	38(34.9%)	3(2.7%)	1.60

Conted…

11. Reporting skill	87(79.8%)	21(19.3%)	1(0.9%)	1.79
12. Ethical principles and accountability	93(85.3%)	16(14.7%)	0(0%)	1.85
13. Coping skill	41(37.6%)	56(51.4%)	12(11.0%)	1.27
14. Clinical data identification	66(60.6%)	41(37.6%)	2(1.8%)	1.59
15. Discussions and feedback skill	85(78.0%)	24(22.0%)	0(0%)	1.78
Total (Score/Average)	**24.72 /**			**1.65**

Conclusion

The purpose of this study was to analyze the process related to the acquisition of the concept through the self - evaluation analysis in the practice guide for the nursing students of the clinical practice nursing department of neonatal and neonatal intensive care unit. Nursing college students were learning the concepts to be learned in clinical practice mainly through observation methods and found that it is confirmed that there is a limit to the sufficient practical training. In order to improve the quality of clinical practice education and improve the effectiveness of the practical training, it is necessary to make efforts to supplement the course of practical training so as to be able to receive training in practical training courses and to prepare improvement plans. Based on the results of this study present above, suggest to necessity of research to verify the effectiveness of repetitive research and to verify the practical use of clinical guidelines.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Study of Social Distance and Knowledge on Attitude toward Mental Illness in University Students

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ABSTRACT

Background/Objectives: Mental illness was one of the major health problems in modern society. The purpose of this study was to investigate knowledge, social distance, and attitude toward mental illness in university students, determine correlation among these variables, and analyze their effects on the attitude toward them mental illness. It intended to identify the factors for the attitude toward mental illness and provide basic data that could help develop research and programs to form positive attitude toward them.

Method/Statistical Analysis: Participants were 482 university students in G metropolitan city. The collected data were analyzed using SPSS/win 23.0 program. The general characteristics of the subjects were frequency, percentage, mean and standard deviation. Data were analyzed with independent t-test, ANOVA and Pearson's correlation coefficients and multiple regression analysis.

Findings: The participants were aged 21.89 ± 3.20 on average, 72.7% were female. The most frequent major was public health 48.1%, followed by science and engineering 37.1%, humanities 10.7%, and art 42.0 %. The most frequent channel of getting information about mental illness was media 41.5%, followed by voluntary service 26.8%, practical training 10.6%, someone around them 10.6%, education 6.4%, a mental illness person 4.1%.The level of knowledge was 10.52 ± 2.04, the minimum value was 0.00, and the maximum value was 15.00. Social distance was 2.61 ± 0.56, the minimum value was 1.00, and the maximum value was 4.67. Attitude toward mental illness was 3.59 ± 0.35, the minimum value was 2.88, and the maximum value was 4.70. The mean score of knowledge was 10.52 out of 15.00, social distance was2.61out of 5.00 and attitude toward mental illness was 3.59 out of 5.00.Attitude toward mental illness was positively correlated with knowledge (r=.212, p<.001) and was negatively correlated with social distance (r=-.603, p<.001). The more knowledgeable and shorter the social distance was the more positive attitudes toward mental illness. The stepwise regression analysis found that knowledge (β=.195, p<.001), social distance (β=-.590, p<.001), and having a mental illness person around (β=.075, p=.039), significantly affected the attitude toward mental illness, with the variables accounting for 40.5%.

Improvements/Applications: It has confirmed that correct knowledge and decrease in social distance are factors for positive attitude toward mental illness in the respect of research. Further studies are necessary to develop an effective educational and experiential program that can help get knowledge and reduce social distance.

Keywords: *Attitude toward mental illness, Community attitude, Knowledge, Social Distance, University Students*

Introduction

Mental illness was one of the major health problems in modern society. For the South Korean people, in 2016, the lifelong prevalence of mental illness was 23.1% and its one-year prevalence was 11.9%; in other words, about 47,000 persons reportedly experienced mental illness during the year[1]. What is problematic

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is that only about 9% of them made an attempt to get positive treatment from a psychiatrist or a mental health professional[1]. They avoid counseling with an expert or positive treatment, despite such an increase in the number of mental health problems, probably because the members of the society lack correct knowledge of mental illness and have prejudices and negative attitude toward it[2,3].Knowledge of mental illness universally means contents regarding the causes, symptoms, and treatment of mental illness[4]. Those more knowledgeable about mental illness are more likely to be positive or compassionate toward the mental illness, whereas poor knowledge about symptoms or treatment of disease can make it hard to predict and fearful[4]. In particular, unreliable, wrong information about mental illness from an uncertain source can increase distorted knowledge and prejudices and lead to negative awareness of mental illness. Social distance generally means the degree of personal permission of social interactions or relations in many different areas[5]. Putting emphasis on the subjective aspect rather than on the objective aspect of individuals, this concept means individuals' subjective feelings of the members of a certain group or class. Therefore, social distance that the members of society have from the mental illness serves as a crucial predictor of how they illness s act for interaction or exchange[6,7]. Attitude means a mental and psychological state directly affecting individuals' response to a certain object or situation. So an attitude that the members of society have from the mental illness can have a significant impact on vocational rehabilitation as well as on early detection and proper treatment of the diseases[8].A negative attitude toward mental illness prevents them from getting a chance to exert their ability as a member of society fully and makes them hardly return and adapt themselves to the community, consequently having adverse effects on treatment[9,10,11,12].This study aimed to investigate knowledge, social distance, and attitude toward mental illness in university students, determine correlation among these variables, and analyze their effects on the attitude toward the mental illness. It intended to identify the factors for the attitude toward the mental illness and provide basic data that could help develop research and programs to form positive attitude toward them.

Materials and Method

Participants & Data Collection: The purpose of this study was to investigate knowledge, social distance, and attitude toward mental illness in university students, determine correlation among these variables, and identify the factors for the attitude toward mental illness. The subjects were 482 students. The data collection period was from June1, to July 30, 2017.

Instrument

General Characteristics: The general characteristics are 9 items including age, gender, major, grade, religion, mental illness person around them, experience of learning mental health, experience of contacting with a mental illness person, channel of getting information about mental illness.

Knowledge: The existing measurement tools were used [4]. A total of 15items were composed of 1 points scoring of 'correct answer= 1 point', 'wrong answer= 0 points', 'don't know= 0 points' scale. Reliability analysis showed Cronbach's α coefficient was .71.

Social Distance: The existing measurement tools were used[13].The 12 items were composed of 5 points scoring of 'strongly disagree = 5 point', 'disagree = 4 points', 'normal = 3 points', 'agree = 2points', and 'strongly agree = 1 points' scale. It has two sub-areas: physical distance and interpersonal distance. The higher score means longer social distance. Reliability analysis showed Cronbach's α coefficient was .89.

Attitude toward Mental Illness: The existing measurement tools were used[14,15].The 40 items were consisted of 5 points scoring. It has four sub-areas authoritarianism, benevolence, social restrictiveness, and community mental health with negative items reversely calculated. The higher score means more positive attitude. Reliability analysis showed Cronbach's α coefficient was .71.

Data Analysis

The collected data were analyzed using SPSS/ win 23.0 program. The general characteristics of the subjects were analyzed using descriptive statistics. T-test and ANOVA were used to analyze knowledge, social distance, and attitude toward mental illness by the general characteristics, and sheffe's test was used for post-hoc test. Pearson's correlation coefficient was used to determine inter-variable correlation, and stepwise multiple regression was used to identify the factors for attitude toward mental illness.

Results and Discussion

The participants in this study were aged 21.89 ± 3.20 on average, 72.7% were female. The most frequent major was public health 48.1%, followed by science and engineering 37.1%, humanities 10.7%, and art 42.0 %. Freshmen 31.1%, sophomores 23.9%, juniors 34.6%, and seniors 10.4%. Had no religion 72.6%, had no mental illness person around them 90.9%. Had experience learning about mental health 41.7% and had no such experience 58.3%. Had experience of contacting with a mental illness person 68.2% and had no such experience 31.8%. The most frequent channel of getting information about mental illness was media 41.5%, followed by voluntary service 26.8%, practical training 10.6%, someone around them 10.6%, education 6.4%, a mental illness person 4.1%, as shown in table 1.Knowledge differed by major (F=6.823, p<.001), grade (F=11.208, p<.001). Had learning about mental health (t=3.152, p=.002), and had contacting with a mental illness person (t=2.123, p=.034), the channel of getting information by voluntary (F=2.635, p=.016), scored higher for knowledge. Social distance differed by major (F=3.371, p<.001). Had a mental illness person around them (t=-2.802, p=.005), had learning about mental health (t=-4.077, p<.001), had contacting with a mental illness person (t=-3.516, p<.001), showed shorter social distance. Attitude toward the mental illness differed by had a mental illness person around them (t=3.277 p=.002), had learning about mental health (t=2.032, p=.040), and had contacting with a mental illness person (t=3.620, p<.001), showed more positive attitude toward mental illness. There was a significant difference as shown in table 1.

Table 1: General Characteristics and Variables differences according to the General Characteristics

Characteristics	Category	N(%) or M(SD)	Knowledge		Social distance		Attitude toward the mental illness	
			M(SD)	t or F (p) Scheffe	M(SD)	t or F (p) Scheffe	M(SD)	t or F (p) Scheffe
Age (yr)		21.89(3.20)						
Gender	Male	131(27.2)	10.12(3.02)	-1.323 (.187)	2.63(0.58)	1.446 (.856)	3.50(0.40)	-1.394 (.164)
	Female	351(72.7)	10.54(2.21)		2.61(0.58)		3.58(0.34)	
Major	Health[a]	232(48.1)	11.12(2.12)	6.823 (<.001) a>b,c,d	2.60(0.58)	3.371 (.001) a<b,c,d	3.69(0.34)	1.310 (.192)
	Science, Engineering[b]	156(37.1)	10.29(2.20)		2.91(0.80)		3.62(0.35)	
	Humanities[c]	52(10.7)	10.11(1.47)		2.74(0.82)		3.65(0.31)	
	Art[d]	42(8.71)	9.98(1.88)		2.81(0.90)		3.64(0.41)	
Grade	1st[a]	150(31.1)	10.17(1.79)	11.208 (<.001) a,b<c,d	2.55(0.61)	3.286 (.061)	3.59(0.34)	0.845 (.470)
	2nd[b]	115(23.9)	9.89(2.20)		2.61(0.55)		3.57(0.35)	
	3rd[c]	167(34.6)	10.89(1.47)		2.60(0.49)		3.58(0.31)	
	4th[d]	50(10.4)	11.74(1.88)		2.44(0.59)		3.66(0.41)	
Religion	Yes	132(27.4)	10.50(2.22)	-1.499 (.135)	2.58(0.52)	-0.399 (.690)	3.59(0.37)	0.336 (.737)
	No	350(72.6)	10.87(1.75)		2.61(0.58)		3.57(0.34)	
Mental illness person around	Yes	44(9.1)	10.13(2.19)	-0.853 (.394)	2.40(0.58)	-2.802 (.005)	3.75(0.41)	3.277 (.002)
	No	438(90.9)	10.55(2.22)		2.63(0.55)		3.57(0.35)	
Experience learning about mental health	Yes	201(41.7)	10.90(1.90)	3.152 (.002)	2.48(0.60)	-4.077 (<.001)	3.63(0.37)	2.032 (.040)
	No	281(58.3)	10.24(1.87)		2.70(0.51)		3.56(0.32)	
Experience of contacting with a mental illness person	Yes	329(68.2)	10.67(1.94)	2.123 (.034)	2.55(0.58)	-3.516 (<.001)	3.63(0.36)	3.620 (<.001)
	No	153(31.8)	10.20(1.79)		2.75(0.52)		3.50(0.29)	

Conted…

Channel of getting Information about mental illness	Media[a]	200(41.5)	10.73(1.88)	2.635 (.016) b>f	2.69(0.58)	1.826 (.092)	3.57(0.30)	0.813 (.561)
	Voluntary[b]	129(26.8)	11.91(1.44)		2.53(0.54)		3.61(0.36)	
	Practical training[c]	51(10.6)	10.64(1.72)		2.44(0.58)		3.65(0.37)	
	Mental illnesspatient[d]	20(4.1)	10.23(1.67)		2.69(0.68)		3.54(0.37)	
	Education[e]	31(6.4)	10.54(2.19)		2.60(0.50)		3.53(0.31)	
	Surrounding people[f]	51(10.6)	9.45(2.06)		2.55(0.44)		3.61(0.37)	

They scored an average of 10.52 ± 2.04 out of 15 for knowledge about mental illness. They scored an average of 2.61 ± 0.56 out of 5 for social distance. Of its sub-areas, they scored an average of 2.63 ± 0.74 for physical distance and 2.58 ± 0.52 for interpersonal distance. They scored an average of 3.59 ± 0.35 out of 5 for attitude toward the mental illness; of its sub-areas, they scored 3.70 ± 0.41 for authoritarianism, 3.68 ± 0.43 for benevolence, 3.58 ± 0.45 for social restrictiveness, and 3.38 ± 0.04 for community mental health ideology as shown in table 2.

Table 2: Degree of Knowledge, Social Distance and Attitude toward Mental Illness

Variables	M ± SD	Max	Min
Knowledge	10.52 ± 2.04	15.00	0.00
Social distance	2.61 ± 0.56	4.67	1.00
Physical distance	2.63 ± 0.74	5.00	1.00
Interpersonal distance	2.58 ± 0.52	3.83	1.00
Attitude toward mental illness	3.59 ± 0.35	4.70	2.88
Authoritarianism	3.70 ± 0.41	5.00	2.30
Benevolence	3.68 ± 0.43	4.80	2.27
Social restrictiveness	3.58 ± 0.45	5.00	2.10
Community mental health ideology	3.38 ± 0.04	4.80	1.90

Attitude toward mental illness was positively correlated with knowledge (r=.212, p<.001) and was negatively correlated with social distance (r=-.603, p<.001). That is, the more knowledgeable and the shorter social distance, the more positive attitude toward the mental illness as shown in table 3.

Table 3: Correlation among Knowledge, Social Distance and Attitude toward Mental Illness

Variables	Knowledge r(p)	Social Distance r(p)	Attitude toward Mental Illness r(p)
Knowledge	1	-.041(.365)	.212(<.001)
Social Distance	-.041(.365)	1	-.603(<.001)
Attitude Toward Mental Illness	.212(<.001)	-.603(<.001)	1

To determine the predictability of the factors for the attitude toward the mental illness, those general characteristics having a mental illness person around, experience of learning mental health, and contacting mental illness person which made statistical differences in the attitude toward mental illness were treated as dummy and processed by stepwise multiple regression analysis along with principal variables, such as knowledge and social distance. When the basic assumption of the regression analysis was reviewed, there was autocorrelation with Dubin-Watson 1.994, no variable exceeded multicollinearity among independent variables with the Variance Inflation Factor (VIF) ranging from 1.029 to 1.2161. The regression model was significant (F=66.366 p<.001). The stepwise regression analysis found that knowledge (β=.195, p<.001), social distance (β=-.590, p<.001), and having a mental illness person around (β=.075, p=.039) significantly affected the attitude toward the mental illness, with the variables accounting for 40.5% as shown in table 4.

Table 4: Influencing Factors on Attitude toward Mental Illness

Measuring Items	B	S.E	β	t	p
	4.199	.086		46.909	<.001
Knowledge	.032	.006	.195	5.475	<.001
Social Distance	-.368	.023	-.590	-16.322	<.001
Mental illness person around	.095	.046	.075	2.073	.039
R^2 : .411, Adj R^2 : .405, F : 66.366, p<.001					

The efforts to raise the level of empathy and understanding through knowledge about mental disorder and to increase many different types of contact, including voluntary service, are associated with formation of a positive view of mental disorder[16].

Knowledge, social distance, and having a mentally ill person around were found to be factors for the attitude toward the mental illness, with these variables accounting for 40.5%. It is crucial to give university students many different types of education so that they can have a good understanding of mental disorder and accept it as disease with the objective of forming positive attitude toward the mentally disordered and changing their attitude. Therefore, the efforts to give good publicity related to mental disorder and give more chances to be taught by a relevant expert with the aim of giving a better understanding of the mental illness, including basic human rights and rights to social participation, as well as knowledge-based education are expected to contribute to formation of positive attitude toward the mental illness. The efforts to give more chances to have an empathic talk and form a friendly and positive relationship with them by giving chances for stable contact through various types of small service groups and circle activity to reduce social distance are expected to make positive changes in the attitude toward the mental illness. Since having a mental illness person around also has effects, the efforts to assist the mentally ill with rehabilitation, direct rehabilitation, and social adjustment through various community mental health measures as well as through policies for helping them adapt themselves to the community are expected to facilitate changes in the attitude toward the mentally disordered.

This study is significant in that: First, it has confirmed that theoretical education and experience of contact aimed at forming positive attitude toward mental illness are important in the educational respect. Second, it has confirmed that correct knowledge and decrease in social distance are factors for positive attitude toward mental illness in the respect of research. Third, it is expected to help university students accept the life of the mental illness and help them return to the community by providing basic data that are useful to develop a program.

Conclusion

Knowledge, social distance, and having a mental illness person around were found to be factors for the attitude toward the mental illness, with these variables accounting for 40.5%. It is crucial to give university students many different types of education so that they can have a good understanding of mental disorder and accept it as disease with the objective of forming positive attitude toward the mental illness and changing their attitude. Therefore, the efforts to give good publicity related to mental disorder and give more chances to be learned by a relevant expert with the aim of giving a better understanding of the mental illness, including basic human rights and rights to social participation, as well as knowledge-based education are expected to contribute to formation of positive attitude toward the mental illness. The efforts to give more chances to have an empathic talk and form a friendly and positive relationship with them by giving chances for stable contact through various types of small service groups and circle activity to reduce social distance are expected to make positive changes in the attitude toward the mental illness. Since having a mental illness person around also has effects, the efforts to assist the mental illness with rehabilitation, direct rehabilitation, and social adjustment through various community mental health measures as well as through policies for helping them adapt themselves to the community are expected to facilitate changes in the attitude toward the mental illness.

Ethical Clearance: Not required

Source of Funding: Kwangju Women's University

Conflict of Interest: Nil

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Exploring the Influence of Safety Perception and Safety Control on Clinical Performance Ability and Self Confidence in Patient Safety in Korean Nursing Students

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ABSTRACT

Background/Objectives: This study aims to explore the effect of increased awareness of safety perception and safety control in providing self confidence in patient safety and clinical trials for Korean nursing students.

Method/Statistical Analysis: The data were gathered using several questionnaires that were surveyed by 309 students located in C,I,J cities who gaved their permission to participate in this study. To identify the correlations among clinical performance ability, self confidence in patient safety, safety perception and safety control, SPSS 20.0 correlation program was used. We applied descriptive statistics, which include t-test, analysis of variance(ANOVA_Scheffe), Pearson's correlation coefficient analysis, and multiple-regression analysis.

Findings: There was a statistically significant positive correlation among safety perception, safety control, self confidence in patient safety and clinical performance ability. The regression model explained approximately 54.0% of self confidence in patient safety. Meanwhile, safety perception($p<.001$), safety control($p<.001$), experience of incident($p<.001$), academic record(Less 3.0)($p=.008$), clinical performance ability($p=.008$), and major satisfaction(Satisfaction)($p=.045$) were determined to influence factors on self confidence in patient safety. The multiple-regression analysis model explained approximately 53.0% of clinical performance ability. Furthermore,safety control($p<.001$), major satisfaction(Moderate)($p<.001$), safety perception($p=.012$), self confidence in patient safety ($p=.012$), and academic record(3.0-3.5)($p=.019$) were determined to be influencing factors on clinical performance ability.

Improvements/Applications: The results are anticipated to be utilized as a reference basis for devising strategy for self confidence in patient safety and clinical performance ability for prospective nursing students.

Keywords: *Clinical Performance Ability, Self Confidence in Patient Safety, Safety Perception, Safety Control, Nursing Students*

Introduction

Recently more patients expect to receive high-quality medical services in a safe environment[1]. These changes in the hospital require nursing students to possess the ability to quickly identify and resolve complex problems that are inherent in clinical trials[2]. Nowadays, patient safety is an important part of nursing, and medical practitioners should consider patient safety first. The focus on patient safety prevents unexpected injuries or accidents from happening to patients while receiving medical services[3]. In order to provide patient safety, improvement of awareness through education is important, and the number of safety education a nursing student participates is an important factor[4]. Furthermore, the efforts to increase awareness of safety in an organization are necessary to create an environment that nurtures patient safety[5].In particular, as a nurse after graduation nursing students will be in charge of practical affairs in hospital. Nursing students are a group that

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can directly affect patient safety because they received systematic education from the undergraduate courses to maximize patient safety capability to contribute to patient safety[6]. Therefore, this study examines the relationship between the patient's safety capability and the degree of care performance among nursing students by examining the degree of safety awareness, safety control, and patient safety.

This study aims to accomplish the following goals: first, to identify the level of nursing students' safety perception, safety control, self-confidence in patient safety and clinical performance ability; second, to identify differences in nursing college students' safety perception, safety control, self-confidence in patient safety and clinical performance ability according to their general characteristics; third, to identify the correlation between safety perception, safety control, self-confidence in patient safety and clinical performance ability as perceived by nursing students; fourth, to identify the influence of the safety perception, safety control and clinical performance ability on self-confidence in patient safety and clinical performance ability; fifth, to identify the influence of the safety perception, safety control and self-confidence in patient safety on clinical performance ability.

Materials and Method

Study Design: This study is on a descriptive correlation model that examines the factors affecting clinical performance ability and self confidence in patient safety among nursing students.

Participants and Data Collection: The data were gathered using several questionnaires that were surveyed by 309 nursing students located in C,I,J cities who gave their permission to participate in this study. The all participators were comprised of Juniors and Seniors in nursing college who already had extensive experience involving in clinical trials, so it was not too difficult to make them understand the research goals. As it is a customary practice, we obtained approval from department chairs and student representatives for participators. The data were collected for a period of 60 days, from September 2016 to October 2016. The sample size calculation was performed using G*Power 3.1.3 program, which was 267 with an effect size of 15%, a significance level of 5%, and a power of 95% [7]. The calculations yielded a total minimum sample size of 267 participants, which proved that our sample size was sufficient for data analysis.

Ethical Concerns: The data used for this study(IRB No: SMU-2015-06-003; SMU-2018-05-003) were collected following the approved IRB guidelines and screening procedures of"S" university located in J city. We described the purpose of the study to participants and informed they could choose to not participate. For those who participated gave their written consent, and the process was directed in accordance with the Helsinki Declaration. All participants were given some small token of gratitude.

Research Variables: All instruments used in this study were validated in previously published works. Among those published works, Korean-translated versions continue to possess acceptable validity and reliability.

Safety Perception: The safety perception questionnaire was developed by Ramanujam, Abrahamson and Anderson[8,9]. For the safety perception questionnaire, there were 5questions and the responses follow a five-point scale. The sum of response scores can be between 5 to 25, in which higher the score, higher the safety perception for patients. Cronbach's α was 0.74 in the original scale and 0.71 in the present study.

Safety Control: The safety control questionnaire was developed by Anderson. For the safety control questionnaire, there were 7 questions and the responses follow a five-point scale. The sum of response scores can be between 5 to 35, in which higher the score, higher the safety control for patients. Cronbach's α was 0.84 in the original scale and 0.84 in the present study.

Self Confidence in Patient Safety: The self confidence in patient safety questionnaire was developed by Park. For the self confidence in patient safety questionnaire, there were 10questions and the responses follow a five-point scale. The sum of response scores can be between 10 to 50, in which higher the score, higher the self confidence in patient safety. Cronbach's α was 0.86 in Park's research conducted by this measure and 0.85 in the present study.

Clinical Performance Ability: The clinical performance ability questionnaire was developed by Choi. For the clinical performance ability questionnaire, there were 45 question and the responses follow a five-point scale. The sum of responses can be between 45 to 225, in which higher the score, higher the clinical performance ability. Cronbach's α was 0.92 in the original scale and 0.97 in the present study.

Method of Data Analysis

The PASW (Predictive Analytic SoftWare) 20.0 was used to analyze the data. The general characteristics of the participants were identified using descriptive statistics, which include average, standard deviations, frequency distribution, and percentages. The characteristics of participants can be categorized into safety perception, safety control, clinical performance ability and self confidence in patient safety, and the characteristics were analyzed with t-test, ANOVA, and post hoc analysis was guided with Scheffe's. Pearson's correlation coefficient analysis was used to identify the effect of clinical performance ability with regard to safety perception, safety control and self confidence in patient safety. The multiple-regression analysis was used to determine the influence of clinical performance ability and to determine its correlation with safety perception, safety control and self confidence in patient safety.

Results

General Characteristics: In regards to general characteristics, 211 people (68.3 percent) have received training on patient safety, and 200 people (64.7 percent) have experienced patient safety related campaigns (poster, patient safety events, videos, etc.).180 people (58.3 percent) have witnessed medical errors during clinical practice, 62 people (20.1 percent) were reported to the professor after witnessing medical errors, 33 people (10.7 percent) reported medical errors during clinical practice[Table 1].

Table 1: Socio-demographic Characteristics of Subjects

Characteristics	Categories	n (%)
Experience of Safety education	Yes	211(68.3)
	No	98(31.7)
Experience of Safety campaign	Yes	200(64.7)
	No	109(35.3)
Experience of Incident	Yes	129(41.7)
	No	180(58.3)
Experience of Reporting Incident (academic adviser)	Yes	62(20.1)
	No	247(79.9)
Experience of Reporting Incident (medical team)	Yes	33(10.7)
	No	276(89.3)

Differences of Self Confidence in Patient Safety and Clinical Performance Ability according to Socio-demographic Factor: No significant difference was detected in the self confidence in patient safety of clinical performance satisfaction, experience of safety campaign, experience of reporting incident(academic adviser), or experience of reporting incident(medical team). On the contrary, there was a significant difference by major satisfaction(F=12.65, p=<.001), academic record(F=5.60, p=.001), experience of safety education(t=2.58, p=.010), and experience of incident(t=-3.16, p=.002).

No significant difference was found in the clinical performance ability in regards to experience of incident, experience of reporting incident(academic adviser) or experience of reporting incident(medical team). However, a significant difference was demonstrated by major satisfaction(F=18.71, p=<.001), clinical performance satisfaction(F=11.71, p=<.001), academic record(F=10.11, p=<.001), experience of safety education(t=2.66, p=.008) and experience of safety campaign(t=1.99, p=.047)[Table 2].

Table 2: Differences of self confidence in patient safety and Clinical Performance Ability according to Socio-demographic Factor

Characteristics	Categories	self confidence in patient safety		Clinical Performance Ability	
		Mean ± SD	t or F (p)	Mean ± SD	t or F (p)
Major Satisfaction	Very Satisfaction	4.43 ± 0.12	12.65 (.000)*	3.31 ± 0.69	18.71 (.000)*
	Satisfaction	4.12 ± 0.33		3.56 ± 0.47	
	Moderate	3.90 ± 0.42		3.49 ± 0.44	
	Dissatisfaction	4.20 ± 0.47		3.90 ± 0.48	
	Very Dissatisfaction	4.15 ± 0.48		4.13 ± 0.48	

Conted…

Clinical Performance Satisfaction	Very Satisfaction	4.16 ± 0.24	2.38 (0.52)	3.53 ± 0.60	11.71 (.000)*
	Satisfaction	3.93 ± 0.49		3.34 ± 0.57	
	Moderate	4.11 ± 0.44		3.71 ± 0.48	
	Dissatisfaction	4.20 ± 0.46		3.91 ± 0.47	
	Very Dissatisfaction	4.25 ± 0.63		4.07 ± 0.52	
Academic Record	Over 4.0	4.27 ± 0.53	5.60 (.001)*	4.02 ± 0.42	10.11 (.000)*
	3.5-4.0	4.23 ± 0.47		3.93 ± 0.51	
	3.0-3.5	4.14 ± 0.43		3.67 ± 0.55	
	Less than 3.0	3.93 ± 0.48		3.59 ± 0.39	
Experience of Safety Education	Yes	4.20 ± 0.49	2.58 (.010)*	3.86 ± 0.54	2.66 (.008)*
	No	4.05 ± 0.42		3.68 ± 0.45	
Experience of Safety Campaign	Yes	4.16 ± 0.49	.48 (.630)	3.85 ± 0.54	2.00 (.047)*
	No	4.14 ± 0.45		3.72 ± 0.48	
Experience of Incident	Yes	4.06 ± 0.48	-3.16 (.002)*	3.79 ± 0.52	-.47 (.638)
	No	4.23 ± 0.46		3.81 ± 0.52	
Experience of Reporting Incident (academic adviser)	Yes	4.11 ± 0.48	-.86 (.392)	3.90 ± 0.49	1.62 (.108)
	No	4.17 ± 0.47		3.78 ± 0.52	
Experience of Reporting Incident (medical team)	Yes	4.15 ± 0.53	-.08 (.940)	3.73 ± 0.58	-.84 (.400)
	No	4.16 ± 0.47		3.81 ± 0.51	

Correlations between Safety Perception, Safety Control, Self Confidence in Patient Safety and Clinical Performance Ability: The correlations between variables are displayed in Table 3. There was a statistically significant positive correlation among self confidence in patient safety, safety perception(r=.61, p<.001), and safety control(r=.63, p<.001). Also, there was a statistically significant positive correlation among clinical performance ability, safety perception(r=.56, p<.001), safety control (r=.69, p<.001), and self confidence in patient safety (r=.56, p<.001) [Table 3].

Table 3: Correlations between variables

Variables	Safety Perception	Safety Control	Self Confidence in Patient Safety	Clinical Performance Ability
	r(p)	r(p)	r(p)	r(p)
Safety Perception	1			
Safety Control	.63(.000)	1		
Self Confidence in Patient Safety	.61(.000)	.65(.000)	1	
Clinical Performance Ability	.56(.000)	.69(.000)	.56(.000)	1

Influencing factors on Self Confidence in Patient Safety: The regression analysis for self confidence in patient safety model is displayed in Table 4. To determine the influence of safety perception, safety control and clinical performance ability on self confidence in patient safety, a multiple-regression model was used. The presence of auto-correlation and multicollinearity for the regression model were analyzed using Durbin–Watson's statistic (1.95), and the variance inflation factor (1.012-1.724), which indicated that the base requirements of regression analysis were satisfied. The explanatory power was a statistically significant 54.0% (Adj $R^{2=}$=.530; F=15.90, p<.045). Among these factors, safety perception(p<.001), safety control(p<.001), and experience of incident(p<.001) were proved to exert a significant influence on self confidence in patient safety (β=.32). And academic record(Less 3.0)

(p = .008), clinical performance ability(p=.008), and major satisfaction(Satisfaction) (p = .045) were presented as the influential factors. It proved to have the greatest influence on self confidence in patient safety[Table 4].

Table 4: Regression Analysis for Self Confidence in Patient Safety

Variables	B	SE	β	t	p
(Constant)	1.28	0.17	-	7.57	.000
Safety Control	0.30	0.05	.32	5.43	.000
Safety Perception	0.32	0.05	.32	6.20	.000
Experience of Incident (reference=yes)	0.14	0.04	.15	3.67	.000
Academic Record_Less 3.0 (reference=over 4.0)	-.14	0.05	-.11	-2.67	.008
Clinical Performance Ability	0.14	0.05	.15	2.67	.008
Major Satisfaction_ Satisfaction (reference= Very Satisfaction)	0.17	0.09	.08	2.02	.045
R^2=.54, Adj R^2=.53 F=15.90, p<.045					

Influencing factors on Clinical Performance Ability: The regression analysis for clinical performance ability model is displayed in Table 5. To determine the influence of safety perception, safety control and clinical performance ability on self confidence in patient safety, a multiple-regression model was used. The presence of auto-correlation and multicollinearity for the regression model were analyzed using Durbin–Watson's statistic (1.83), and the variance inflation factor (1.030-2.048), which indicated that the base requirements of regression analysis were satisfied. The explanatory power was a statistically significant 53.0% (Adj R^2=.520; F=5.57, p<.019). Among these factors, safety control(p<.001), and major satisfaction(Moderate)(p<.001) were proved to exert a significant influence on clinical performance ability. And, safety perception (p=.012), self confidence in patient safety (p=.012), and academic record(3.0-3.5) (p = .019) were presented as the influential factors.; it was shown to have the greatest influence on clinical performance ability[Table 5].

Table 5: Regression Analysis for Clinical Performance Ability

Variables	B	SE	β	t	p
(Constant)	1.02	0.21	-	4.78	.000
Safety Control	0.47	0.06	.47	8.29	.000
Major Satisfaction_ Moderate (reference= Very Satisfaction)	-0.16	0.05	-.14	-3.24	.001
Safety Perception	0.13	0.06	.12	2.20	.028
Self Confidence in Patient Safety	0.15	0.06	.14	2.52	.012
Academic Record_3.0-3.5 (reference=over 4.0)	-0.10	0.04	-.09	-2.36	.019
R^2=.53 Adj R^2=.52 F=5.57, p<.019					

Discussion

This study presents the outcome of questionnaires surveyed to identify safety perception, safety control and self confidence in patient safety and to determine the effects of these factors on clinical performance ability among nursing students. The difference in clinical performance ability according to general characteristics showed that the higher the clinical performance ability, major satisfaction, clinical performance satisfaction and academic record the more confident students experienced in performing the patient safety education. This should be done in a way to improve students' major and practical satisfaction, and education on patient safety should be linked with school classes and working environment[10].

This study indicates that there was a positive correlation among clinical performance ability, safety perception, safety control, and self confidence in patient safety, which matches the results of Park's study[11]. Park's study was a significant positive correlation between knowledge and confidence on patient safety. The current study shows that confidence on patient safety is directly linked with safety perception and that nursing

students have greater knowledge if they have high-level tendencies to form self confidence in patient safety[11].

The more safety perception and safety control increased, the greater its influence was on self confidence in patient safety. The more experience of incident decreased, the greater its influence was on self confidence in patient safety. Students should be aware of the potential to witness medical errors during clinical practice. It also needs education based on accurate guidance on how to identify and deal with the situation[12]. The more safety control increased, the greater its influence was on clinical performance ability. These outcomes support the postulation that nursing students who possess high safety perception and safety control demandsocial connection by developing self confidence in patient safety and that they want to improve clinical performance ability[13].

This study has some limitations. First, we considered only Juniors and Seniors in nursing college in 3 areas. Therefore, a longitudinal research design is recommended for tracking the progress of students' patient safety competence over time. Second, since the data analysis was performed on a small number of participants, it will be infeasible to infer the findings of this research to other analysis. In order to expand the outcomes of this study to other areas, follow-up studies must be conducted. Third, the self-reporting of structural questionnaires introduces the risk of recall bias, as well as potential situation of actual safety perception, safety control, self confidence in patient safety and clinical performance ability. Additional studies in a number of cultures and contexts should be conducted to recognize various aspects of patient safety and improve knowledge of factors influencing patient safety in nursing curriculum.

Conclusion

There was a statistically significant positive correlation among safety perception, safety control, self confidence in patient safety and clinical performance ability and there were positive correlations between these factors. The regression model explained approximately 54.0% of self confidence in patient safety. Meanwhile, safety perception(p<.001), safety control(p<.001), experience of incident(p<.001), academic record(Less 3.0)(p=.008), clinical performance ability(p=.008), and major satisfaction(Satisfaction)(p=.045) were responsible for influencing factors on self confidence in patient safety. The regression analysis model showed approximately 53.0% of clinical performance ability. Meanwhile, safety control(p<.001), major satisfaction(Moderate)(p<.001), safety perception (p=.012), self confidence in patient safety (p=.012), and academic record(3.0-3.5)(p=.019) were responsible for influencing factors on clinical performance ability. This study found that clinical performance ability could be managed by safety perception, safety control and self confidence in patient safety. Specifically, clinical performance ability can be controlled by safety perception, safety control and self confidence in patient safety. This requires an understanding that self confidence in patient safety is not result associated with individual skills, but result associated with safety perception and safety control.

Based on this study results, additional studies are suggested to seek strategy and devise measurements for the improvement of safety perception, safety control, self confidence in patient safety and clinical performance ability. Also acurriculum should be established that will increase nursing students' self confidence in patient safety and clinical performance ability. By participating such a program, nursing students should be mindful of the self confidence in patient safety, and design and suggest a clinical performance ability to reduce its occurrence. Moreover, methodological studies are suggested to verify factors that have effects on the self confidence in patient safety and clinical performance ability of nursing students and to develop a valuation scale for measuring nursing students' patient safety that is appositely divided to reflect current trends.

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The Effects of Grit and Academic Self-Efficacy on Major Satisfaction among Students in Health-Related College Majors

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ABSTRACT

Background/Objectives: The present study was conducted to investigate the effects of grit and academic self-efficacy on major satisfaction for students in health-related majors.

Method/Statistical Analysis: Self-report questionnaire were consisted grit, self-efficacy, major satisfaction scale and completed by 290 university students in health-related majors. The collected data were analyzed with the SPSS 22 software program using ANOVA,Scheffe post-hoc test, the Pearson correlation coefficient, and multiple regression.

Findings: The grit score was higher in the male students (M=3.03) than in the female students (M=2.89). Academic self-efficacy was higher among the male students (M=3.24) than among the female students (M=2.97) and higher in the seniors (M=3.11) than in the juniors (M=2.95). Grit and academic self-efficacy were not significantly dependent on the major. The results of a multiple regression analysis were found that academic self-efficacy had a positive (+) effect on major satisfaction (β=.349,p<.001). Among the sub-factors, perseverance of effort and self-control efficacywas found to have a significant positive (+) effect on major satisfaction.

Improvements/Applications: Educational and counseling programs may need to be developed to help the students establish long-term goals and develop their capabilities in regard to making continuous efforts to accomplish the goals.

Keywords: *Grit, Academic self-efficacy, Major satisfaction, College students, Health-related majors*

Introduction

A university student's satisfaction with his or her chosen major frequently shows in the student's academic achievement. Major satisfaction influences not only a student's academic achievement but also college life, as well as career choice[1]. Therefore, research on the various factors affecting major satisfaction is necessary.

Grit is a concept that has recently been identified as a significant factor in goal achievement. Grit can be defined as the effort and determination to achieve one's goals. Grit is the ability to perform, despite the time and obstacles one faces in achieving a goal. In a study of college students, the factor of grit was found to affect students' academic achievement, grades, college life satisfaction, sense of belonging, faculty-student interaction, and persistence[2]. In a study of international students in Korea, grit was a factor found to be closely connected to a student's decision to remain in school rather than dropping out, as well as in adaptation to college life[3].

Academic self-efficacy is the most important variable affecting a college student's major satisfaction. Academic self-efficacy is an individual's belief and expectation that he or she is capable of solving academic problems without assistance. Students with high self-efficacy showed high rates of satisfaction with their major as well as ability to adjust to college life. If students improve their self-efficacy, they can expect to be able to excel in academic achievement. In a study

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of 1141 college students, self-efficacy was found to be positively correlated with college life adjustment and negatively correlated with stress and depression, thus indicating self-efficacy's positive role in college students in relation to academic achievement[4].

Students in health-related majors are required to work hard, considering an academic workload that includes professional theoretical education, on-site clinical practice, and national exams. Therefore, research on grit and academic self-efficacy as factors that can improve satisfaction with the major of health department students is necessary yet insufficient. The present study was therefore conducted to investigate the effects of grit and academic self-efficacy on major satisfaction for students in health-related majors.

Materials and Method

Research Tools: Self-report questionnaire surveys were completed by 290 university students in health-related majors. The surveys used the grit scale translated by Lee and Son[5] the academic self-efficacy scale developed by Kim and Park[6], and the major satisfaction scale revised by Song[7].

The grit scale, developed by Duckworth et al. to measure grit, consists of six questions to measure each of the two factors constituting grit, which are consistency of interest and perseverance of effort[8].A higher total score, reflecting the reverse scoring, is considered to indicate greater perseverance and enthusiasm for accomplishing long-term goals.

The self-efficacy scale consists of 12 questions using a five-point Likert scale to investigate three sub-factors of self-efficacy, which are task difficulty, self-control efficacy, and confidence.

The major satisfaction scale consists of 22 questions using a five-point Likert scale to investigate four sub-factors of major satisfaction, which are general satisfaction, subject satisfaction, relationship satisfaction, and recognition satisfaction.

Statistical Analysis

In the present study, the reliability (Cronbach's α) of the research tools was high, specifically 0.673 for the grit scale, 0.894 for the academic self-efficacy scale, and 0.964 for the major satisfaction scale. The collected data were analyzed with the SPSS 22 software program using a frequency analysis to investigate the demographic characteristics of the subjects, and an independent sample t-test, a one-way analysis of variance (ANOVA), and a Scheffe post-hoc test to investigate the differences in the key variables depending on the characteristics of the subjects. In addition, a Pearson's correlation analysis was performed between the key variables. A multiple regression analysis was performed to test the effects of the grit and academic self-efficacy of the university students in health-related majors on the major satisfaction. The statistical significance was tested with reference to the significance level of 0.05.

Results and Discussion

Among the 290 subjects in the present study, there were 72 men (24.8%), and 218 women(75.2%). A total of 160 subjects (55.2%) were seniors, and 130 (44.8%) were juniors. The major of 91 subjects (31.4%) was nursing, while 79 (27.2%) subjects studied dental hygiene, 57(19.7%) physical therapy, and 63(21.7%) emergency service. An independent sample t-test, a one-way ANOVA, and a Scheffe post-hoc test were performed to investigate differences in grit, academic self-efficacy, and major satisfaction depending on the demographic characteristics of the subjects. The results are shown in Table 1.

The grit score was higher in the male students (M=3.03) than in the female students (M=2.89). With regard to grade (t=2.497, p<.05), the grit score was higher in the senior students (M=2.98) than in the junior students (M=2.86). Academic self-efficacy was significantly dependent on sex and grade. With regard to sex(t=4.276, p<.001), academic self-efficacy was higher among the male students (M=3.24) than among the female students (M=2.97). Regarding grade (t=2.768, p<.01), academic self-efficacy was higher in the seniors(M=3.11) than in the juniors(M=2.95). Grit and academic self-efficacy were not significantly dependent on the major (p>.05).

Satisfaction with the major was significantly dependent on the major (F=7.784, p<.001).Major satisfaction was higher in students of nursing and dental hygiene than in students of emergency service. Major satisfaction was not significantly dependent on the sexor grade of the subjects (p>.05).

Table 1: Demographic characteristics and grit, academic self-efficacy, and major satisfaction of subjects

Item	Grit		Academic self-efficacy		Major satisfaction	
	M ± SD	t/F	M ± SD	t/F	M ± SD	t/F
Male	3.03 ± 0.42	2.678**	3.24 ± 0.51	4.276***	3.64 ± 0.80	-0.453
Female	2.89 ± 0.40		2.97 ± 0.47		3.69 ± 0.68	
4th	2.98 ± 0.40	2.497*	3.11 ± 0.46	2.768**	3.64 ± 0.75	-1.11
3rd	2.86 ± 0.42		2.95 ± 0.52		3.73 ± 0.65	
Nursing	2.94 ± 0.40	0.230	3.08 ± 0.51	0.808	3.81 ± 0.61	0 7.784***
Dental hygiene	2.89 ± 0.40		3.07 ± 0.53		3.86 ± 0.55	
Physical therapy	2.91 ± 0.43		2.99 ± 0.53		3.58 ± 0.65	
Emergency service	2.94 ± 0.42		2.97 ± 0.38		3.36 ± 0.93	

** p<.01 *** p<.001

As shown in Table2, the average grit score was 2.92 points out of 5 points, and the average scores for perseverance of effort and consistency of interest, the sub-factors of grit, were 3.08 and 2.76 points, respectively. The average academic self-efficacy score was 3.03 points out of 5 points, and the average scores for task difficulty, self-control efficacy, and confidence, the sub-factors of academic self-efficacy, were 2.82, 3.26, and 3.02 points, respectively. The average major satisfaction score was 3.68 points out of 5 points, and the average scores for general satisfaction, subjects satisfaction, relationship satisfaction, and recognition satisfaction, the sub-factors of major satisfaction, were 3.66, 3.62, 3.53, and 3.90 points, respectively.

Table 2: Sub-factors of grit, academic self-efficacy, and major satisfaction

Item	Sub-factors	M ± SD
Grit	Perseverance of effort	3.08 ± 0.54
	Consistency of interest	2.76 ± 0.53
	Total	2.92 ± 0.41
Academic self-efficacy	Task difficulty	2.82 ± 0.69
	Self-control efficacy	3.26 ± 0.60
	Confidence	3.02 ± 0.77
	Total	3.03 ± 0.49
Major satisfaction	General satisfaction	3.66 ± 0.79
	Subject satisfaction	3.62 ± 0.71
	Relationship satisfaction	3.53 ± 0.76
	Recognition satisfaction	3.90 ± 0.82
	Total	3.68 ± 0.71

To measure the effects of the grit and academic self-efficacy of the university students with a health-related major on their major satisfaction, a multiple regression analysis was performed, and the results are shown in Table 3. The regression model was found to be appropriate (F=22.056(p<.001)), and the explanatory power of the model was about 13.3%. Testing the significance of the coefficient of regression showed that academic self-efficacy had a significant and positive (+) effect on major satisfaction (β=.349,p<.001). In other words, university students with a health-related major who had higher academic self-efficacy scores showed higher major satisfaction scores. In contrast, grit did not show a significant effect on major satisfaction (p>.05).

Table 3: Association between grit, academic self-efficacy, and major satisfaction assessed by multiple regression

Variable	B	S.E	β	t	p	VIF
	2.00	0.31		6.511	<.001	
Grit	0.06	0.11	.033	0.534	.594	1.262
Academic self-efficacy	0.50	0.09	.349	5.649***	<.001	1.262
F=22.056(p<.001), R^2=.133, adjusted R^2=.127, Durbin-Watson=1.198						

*** p<.001

Table 4 shows the results of the multiple regression analysis performed to test the effects of the sub-factors of grit on major satisfaction. The regression model was found to be appropriate (F=16.081(p<.001)), and the explanatory power of the model was about 10.1%. Among the sub-factors, perseverance of effort was found to have a significant positive (+) effect on major satisfaction (β=.322,p<.001). In other words, university students with a health-related major who had higher perseverance of effort scores showed higher major satisfaction scores. In contrast, consistency of interest did not show a significant effect on major satisfaction (p>.05).

A multiple regression analysis was performed to examine the effect of the sub-factors of academic self-efficacy on major satisfaction. The regression model was found to be appropriate (F=47.336(p<.001)), and the explanatory power of the model was about 33.2%. Among the sub-factors, self-control efficacy was found to have a significant positive (+) effect on major satisfaction (β=.589,p<.001).). In other words, university students with a health-related major who had self-control efficacy scores showed higher major satisfaction scores. In contrast, task difficulty showed a weak positive effect, and confidence did not show a significant effect on major satisfaction (p>.05).

Table 4: Association between sub-factors of grit, academic self-efficacy and major satisfaction assessed by multiple regression

Variable	B	S.E	β	t	p	VIF
	2.659	0.285		9.345	<.001	
Perseverance of effort	0.420	0.074	.322	5.662***	<.001	1.033
Consistency of interest	-0.101	0.076	-.075	-1.325	.186	1.033
F=16.081(p<.001), R^2=.101, adjusted R^2=.095, Durbin-Watson=1.340						
	1.561	0.221		7.079	<.001	
Task difficulty	-0.111	0.054	-.108	-2.041*	.042	1.199
Self-control efficacy	0.699	0.061	.589	11.393***	<.001	1.142
Confidence	0.048	0.048	.052	1.011	.313	1.146
F=47.336(p<.001), R^2=.332, adjusted R^2=.325, Durbin-Watson=1.521						

* p<.05 *** p<.001

The goal of education in health-related majors is to foster competent healthcare and medical experts. Attaining the goal requires various studies and efforts to elevate the academic achievements of the students obtaining education in these majors. Therefore, the present study was conducted to investigate grit and academic self-efficacy as the factors involved in high major satisfaction, which affects academic achievements. The results of the present study showed that perseverance of effort, one of the sub-factors of grit, has a positive effect on major satisfaction. This result is consistent with the existing study, in which the authors concluded that not only intelligence quotient and talent but also grit are important in achievements by students, as grit helps to maintain talent over time and to concentrate effort[8]. A study which conducted with 253 university students reported that perseverance of effort has a positive effect on not only academic achievements but also occupational attitude[9].

Grit refers to the sincerity to set long-term goals and make efforts to accomplish them. Therefore, helping individual students to establish definite long-term goals is important. The major satisfaction and academic achievements of university students with a health-related major may be elevated by offering programs to help individual students to establish their own realizable goals and experience the sense of accomplishment through efforts to attain the goals, and by actively providing personalized education in relation to the programs.

In addition, the results of the present study showed that academic self-efficacy has a positive effect on major satisfaction. This finding is consistent with the report by an existing study, in which the authors stated that self-efficacy is highly associated with adaptation to college life and has a negative correlation with stress and depression[4].Learners having a high level of self-efficacy may continue with their studies in spite of adversities. Creating own solutions in the face of various challenges that are hard to bear is important to university students, rather than simply focusing on high academic performance[10].

University students with a health-related major are required to manage heavy class loads and work placements while preparing for the national examinations. Therefore, these students need instruction that will help them to continue in their major through their own motivation and willpower. Educational and counseling programs may needed to be developed to help the students establish long-term goals and develop their capabilities in regard to making continuous efforts to accomplish the goals, as well as creating their own solutions to problems they confront.

Conclusion

The grit score was higher in the male students than in the female students. Academic self-efficacy was higher among the male students than among the female students and higher in the seniors than in the juniors. Grit and academic self-efficacy were not significantly dependent on the major. Academic self-efficacy had a positive effect on major satisfaction. Among the sub-factors, perseverance of effort and self-control efficacy was found to have a significant positive effect on major satisfaction. A strategy to develop perseverance of effort and self-control efficacy is essential for health related department college student because they are under much academic stress. Therefore, educational and counseling programs for developing and establishing long-term goals may be needed to help them to make continuous effort.

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Difference In Multicultural Awareness and Multicultural Efficacy between Regular People of Multi-Cultural Backgrounds and North Korean Refugees, as Perceived by Nursing Students of South Korea

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ABSTRACT

Background/Objectives: This study was conducted to identify the difference in multicultural awareness and multicultural efficacy between regular people of multi-cultural backgrounds and North Korean refugees, as perceived by nursing students.

Method/Statistical Analysis: Data were collected using a total of 717 copies of a questionnaire. A frequency analysis, paired t-test, and Pearson's correlation coefficients were used for the analysis.

Finding: The analysis showed that the multicultural awareness of university students majoring in nursing, towards North Korean refugees was lower than the multicultural awareness they had towards regular people of multicultural backgrounds excluding North Korean refugees. In addition, both multicultural awareness and multicultural efficacy towards regular people and North Korean refugees had a positive correlation. This researcher suggests developing a program to promote multicultural capabilities in university students of nursing towards North Korean refugees.

Improvements/Applications: This program would have to address the culture-specific awareness towards North Korean refugees in addition to general multicultural awareness.

Keywords: *Multicultural family members, Multicultural awareness, Multicultural efficacy, Nursing student, North Korean refugees*

Introduction

Since the 1990s, there has been an increase in North Korean refugees who fled the famine in North Korea. As of February, 2018, the number of North Korean refugees reached three-fold that of the figure in 2001[1]. The South Korean government includes North Korean refugees among those with a different cultural background. Due to a long history of the two Koreas being divided, North Korean refugees have a different vocabulary, value system, life style and ideology. Such difference makes it difficult to understand them simply based on the fact that the same ethnicity is shared with South Koreans [2]. In fact, North Korean refugees are in the absolute and relative minority in South Korea in terms of political, economic and social status, as well as the power they have. As such, they are classified as the same category as regular immigrants [3]. Therefore, it is important to conduct education on building cultural capabilities in university students of nursing to prepare them for cases when they come across North Korean refugees in a clinical setting.

Cultural capabilities refer to the ability to provide effective medical services by taking into account the cultural beliefs, behavior and needs of the person in

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question. Cultural awareness is important in fostering such capabilities [4]. Cultural awareness is the first stage of fostering cultural capability, and refers to the values and beliefs of an individual towards other cultures, awareness of stereotypes and ethnocentric views, as well as awareness of other cultures [4]. According to a study conducted in Korea, university students of nursing show a low level in supportive attitude towards North Korean refugees among the categories of intimacy, accepting attitude and supportive attitude [5], they also showed a negative attitude towards providing preferential treatment to North Korean refugees [2]. This can be said as the result of their views towards North Korean refugees as heterogeneous the same way they would view other refugees, rather than viewing them as of the same ethnicity. Such a perception is driven by the difference in life style, life experience and sentiment due to having lived in a different political system and ideology [5]. Therefore, training must be provided to university students of nursing who will provide therapeutic care-giving to North Korean refugees in a clinical setting, so that they can avoid aloofness and reluctance towards North Korean refugees but have a positive perception towards them.

One of the key cognitive factors in developing cultural capabilities in nurses is transcultural efficacy [6]. Transcultural efficacy is the confidence that one can carry out transcultural nursing techniques [6]. That is, nurses with a high degree of transcultural efficacy have a high level of confidence that she can overcome obstacles or weaknesses in her own transcultural nursing techniques, leading her to execute a high degree of cultural capabilities [6]. Therefore, transcultural efficacy is a useful concept in indirectly measuring the cultural capabilities of nursing students whose cultural capabilities cannot be measured directly as they have not been staffed in clinical settings yet.

As such, this study seeks to review the awareness and cultural efficacy of nursing students towards North Korean refugees. To that end, their multicultural awareness and multicultural efficacy towards North Korean refugees and towards regular people of different cultural backgrounds will be surveyed to see if there is any difference. This analysis will provide basic data that can contribute to the development of a systematic nursing program that can help improve the cultural capabilities of nursing students towards North Korean refugees.

The purpose of this study is to investigate the multicultural awareness and multicultural efficacy of regular people of North Korean refugees and those with multicultural backgrounds who are not North Korean refugees to review whether there is a difference. Specific objectives were set as follows.

1. The difference in multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees, as perceived by nursing students is reviewed.
2. The correlation between multicultural awarness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees, as perceived by nursing students is reviewed.

Materials and Method

Design of the Study: This study is a descriptive survey using a self-reported questionnaire to improve the cultural nursing capabilities towards North Korean refugees, by reviewing the difference in the multicultural awareness and multicultural efficacy towards North Korean refugees and towards regular people with multicultural backgrounds, as perceived by nursing students.

Study Subjects: The study subjects were university students majoring in nursing studies in their first to fourth year at three universities located in regions K, I and C. Data were collected from March to June, 2017 using a structuralized questionnaire that study subjects were asked to fill out themselves. Out of the total of 730 copies of the questionnaire that were collected, 717 copies with sufficient responses were used for the final analysis.

Research Tools

Multicultural Awareness: Service Having multicultural awareness means having the cognitive, conscious and behavioral factors of multi-culturalism. To measure multicultural awareness, the multicultural awareness questionnaire reconfigured by [7] based on the questionnaire that [8] developed by incorporating the characteristics of the Korean society into the tools used in the preceding studies of [9,10]. The scale for multicultural awareness consisted of 5 questions on the cognitive factors, 5 questions on the conscious factors and 5 questions on the behavioral factors, measured on

a 5 point Likert scale. A higher scale represents a higher degree of multicultural awareness in the nursing student. In the study by [7], Cronbach's α or the reliability of the tool was .799, while it was .847 for this study. For the multicultural awareness on North Korean refugees, the same tool was used as above, but by replacing the subject with North Korean refugees. Before applying the revised tool, it was reviewed and verified for its validity of content by an expert on North Korean issues and a professor of nursing studies. In this study, Cronbach's αor the reliability of the tool for measuring the awareness towards North Korean refugees was .891.

Multicultural Efficacy: Job Multicultural efficacy refers to the confidence one has in learning and executing cultural nursing techniques towards diverse parties [6]. To measure multicultural efficacy, the TCSE-scale developed by [11] for Korean nurses by reflecting the health and medical services system associated with multiculturalism in Korea and the sociocultural characteristics of Korea was revised to be better fit for university students of nursing and applied. The scale for multicultural efficacy consists of 4 questions on the cognition, 12 questions on practice and 9 questions on emotions. Multicultural efficacy was measured on a 4 point Likert scale, with a higher score representing a higher degree of multicultural efficacy in the nursing student. A higher score represents a higher multicultural efficacy in nursing students. At the time of the tools' development, Cronbach'α for reliability was .880, while for this study, it was .949.

To measure multicultural efficacy towards North Korean refugees, the same above tool was used, but with the subject replaced to refer to North Korean refugees. Before applying the revised tool, it was reviewed and verified for its validity of content by an expert on North Korean issues and a professor of nursing studies. In this study, Cronbach's α or the reliability of the tool for measuring the awareness towards North Korean refugees was .972.

Data Collection and Procedures

For this study, data were collected using a structuralized questionnaire from March to June, 2017 on students majoring in nursing studies and enrolled in their 1st to 4th years at universities located in regions K, I and C.To abide by ethical standards, the study purpose, methodology, privacy protection of study subjects and the time it would take to fill out the questionnaire were sufficiently described to the professors and potential candidates of each university and asked for their voluntary participation, as well as a written consent. It was explained that study participants would be kept anonymous, and the data collected would not be used for any other purpose than this study. Subjects were also told that they can withdraw from this study at any point in time, in which case they would not undergo any disadvantage. It took approximately 10 minutes for a subject to fill out the questionnaire. Participants were offered a small gift in return.

Data Analysis

Data collected were analyzed as follows, using SPSS 20 (PASW Statistics 20).

1. The degree of multicultural awareness and multicultural efficacy towards regular people of multicultural backgrounds and towards North Korean refugees, as well as the general characteristics of university students majoring in nursing were analyzed in terms of frequency, percentage, mean and standard deviation, minimal value and maximum value.
2. A paired t-test was used to analyze the difference in the mean value of the multicultural awareness and multicultural efficacy of nursing students towards regular people and towards North Korean refugees.
3. Pearson's correlation coefficients were used to analyze the correlation between the multicultural awareness and multicultural efficacy of nursing students towards regular people and towards North Korean refugees.

Results and Discussion

General Characteristics of Study Subjects: The general characteristics of the 23 study subjects were as seen in Table 1

Table 1: General Characteristics (N = 717)

Characteristics	Categories	n	%
Gender	Male	628	88.7
	Female	80	11.3
Age(years)	First grade	229	32.3
	Second grade	252	35.5
	Third grade	205	28.9
	Fourth grade	23	3.2

Conted…

Religion	Catholicism	85	12.0
	Christian	241	34.1
	Buddhism	32	4.5
	None	336	47.5
	Other	13	1.8

Multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and North Korean refugees: The multicultural awareness and multicultural efficacy that nursing students have towards regular people with multicultural backgrounds and towards North Korean refugees were as seen in Table 2.

Multicultural awareness was scored 3.77 ± 1.58 points on a 5 point scale. Multicultural awareness towards North Korean refugees scored 3.40 ± 0.54 points.

Multicultural-efficacy scored 3.16 ± 2.75 points on a 4 point scale. Multicultural efficacy towards North Korean refugees was 3.12 ± 0.46 points which was lower than multicultural efficacy.

Table 2: Degree of the Variable of the Subject (N = 717)

Variables		Total Item				Item	
		Mean	SD	Min	Max	Mean	SD
Multicultural awareness	Cognition	20.01	2.50	5	25	4.00	0.50
	Consciousness	18.65	2.81	5	25	3.73	0.56
	Behavior	18.30	2.97	5	25	3.66	0.59
	Total	56.58	7.92	0	75	3.77	1.58
Multicultural awareness towards North Korean refugees	Cognition	17.46	2.71	5	25	3.49	0.54
	Consciousness	17.31	3.26	5	25	3.46	0.65
	Behavior	16.42	3.20	5	25	3.28	0.64
	Total	51.05	8.16	0	75	3.40	0.54
Multicultural -efficacy	Cognition	12.37	1.81	4	16	3.09	0.45
	Practice	37.93	5.26	12	54	3.16	1.31
	Emotion	29.23	4.25	9	45	3.24	1.06
	Total	79.21	11.00	0	115	3.16	2.75
Multicultural efficacy towards North Korean refugees	Cognition	12.15	1.92	4	16	3.03	0.48
	Practice	37.79	5.07	12	54	3.14	0.42
	Emotion	28.59	3.92	9	45	3.17	0.43
	Total	78.08	11.60	0	115	3.12	0.46

The difference in multicultural awareness and multicultural awareness towards regular people with multicultural backgrounds and towards North Korean refugees

The difference in multicultural awareness and multicultural efficacy of nursing students towards regular people with diverse backgrounds and towards North Korean refugees is as seen in Table 3.

In nursing students, multicultural awareness towards regular people with multicultural backgrounds was higher than their multicultural awareness towards North Korean refugees. This difference was statistically significant (t=19.37, p<.001). In all three sub-categories of cognition (t=23.83, p<.001), consciousness (t=22.31, p<.001), and behavior (t=16.57, p<.001), multicultural awareness towards regular people was significantly higher than towards North Korean refugees. For multicultural efficacy in nursing students, too, it was higher towards regular people with multicultural backgrounds than towards North Korean refugees. This difference was statistically significant (t=3.41, p=.001). In terms of sub-categories, cognition (t=3.30, p=.001) and emotion (t=5.08, p<.001) was significantly higher towards regular people, but in the sub-category of practice, it cannot be said to be higherm (t=0.63, p=.524).

Table 3: The difference in multicultural awareness and multicultural awareness towards regular people with multicultural backgrounds and towards North Korean refugees (N = 717)

Characteristics	Categories	Mean	SD	t	p
Multicultural awareness towards North Korean refugees	Cognition	2.53	2.82	23.83	<.001
	Consciousness	1.30	3.07	11.31	<.001
	Behavior	1.86	3.00	16.57	<.001
	Total	5.52	7.63	19.37	<.001
Multicultural efficacy towards North Korean refugees	Cognition	0.21	1.70	3.30	.001
	Practice	0.10	4.25	0.63	.524
	Emotion	0.64	3.37	5.08	<.001
	Total	1.12	8.85	3.41	.001

The correlation between multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds and towards North Korean refugees

The correlation between major variables is as seen in Table 4. Multicultural awareness towards regular people and towards North Korean refugees had a positive correlation of a medium level (r=.54, *p*<.001), while the multicultural efficacy towards both groups had a strong positive correlation (r=.69, p<.001). Multicultural awareness and multicultural efficacy towards regular people had a medium-level positive correlation (r=.55, *p*<.001), while multicultural awareness and multicultural efficacy towards North Korean refugees had a strong positive correlation (r=.63, *p*<.001). Moreover, multicultural awareness towards regular people with multicultural backgrounds and multicultural efficacy towards North Korean refugees had a medium-level positive correlation (r=.47, *p*<.001). Multicultural awareness towards North Korean refugees and multicultural efficacy towards regular people with multicultural backgrounds, too, had a medium-level positive correlation (r=.43, *p*<.001).

Table 3: Relationships among the Study Variable

(N = 717)

Variables	MA	MANK	ME	MENK
	r(p)	r(p)	r(p)	r(p)
MA	1	.549 (<.001)	.552 (<.001)	.473 (<.001)
MANK		1	.435 (<.001)	.636 (<.001)
ME			1	.694 (<.001)
MENK				1

MA=Multicultural awareness; MANK=Multicultural awareness towards North Korean refugees

ME=Multicultural–efficacy; MENK=Multicultural efficacy towards North Korean refugees

Discussion

This study was conducted to seek measures to improve the cultural nursing capabilities towards North Korean refugees, by identifying the difference in multicultural awareness and multicultural efficacy of nursing students towards regular people with multicultural backgrounds and towards North Korean refugees.

The multicultural awareness of nursing students towards North Korean refugees was found to be lower than that towards regular people with multicultural backgrounds who are not North Korean refugees. The multicultural awareness of nursing students towards North Korean refugees scored significantly lower in all three sub-categories of cognition, consciousness and behavior. In other studies conducted in Korea, too, nursing students scored the lowest in supportive attitude, among the three categories of intimacy, accepting attitude and supportive attitude [5], and university students showed a negative attitude towards

providing preferential treatment towards North Korean refugees [2]. This can be attributed to the fact that to university students who have lived under a different political system and ideology despite being of the same ethnicity, the difference in life style, life experience and emotions make them view North Korean refugees as foreign refugees rather than as those of the same race [5]. Therefore, effective multicultural education related to North Korean refugees must be provided to university students of nursing who will serve as therapeutic care-givers of North Korean refugees in clinical settings in the future, to ensure that these students to not have a reluctant attitude but a positive perception towards North Korean refugees. Moreover, in terms of multicultural efficacy, too, university students majoring in nursing studies had significantly lower multicultural efficacy towards North Korean refugees than towards regular people, indicating an urgency for training to boost the students' multicultural capabilities related to North Korean refugees. There was a positive correlation between the nursing students' multicultural awareness towards regular people and towards North Korean refugees, between their multicultural efficacy towards the two groups, between their multicultural awareness and multicultural efficacy towards regular people with multicultural backgrounds, between multicultural awareness and multicultural efficacy towards North Korean refugees, between multicultural awareness towards regular people with multicultural backgrounds and multicultural efficacy towards North Korean refugees, and between multicultural awareness towards North Korean refugees and multicultural efficacy towards regular people of multicultural backgrounds.

These finding suggest that it would be effective to apply multicultural education related to North Korean refugees within the framework of general multiculturalism education when conducting education programs on university students of nursing to reinforce their multicultural capabilities. The model by Papadopoulos, Tilki and Taylor (the PTT model) which is a leading model for multicultural capabilities education, classifies learning into culturally generic competencies and culturally specific competencies [12]. That is, culturally generic competencies focus on the deep understanding and perception of fundamental social or organizational structures that promote or undermine cultural capabilities nursing, or how cultural identity affects health. During the practice stage, the focus is on the acquisition of specific cultural capabilities within a specific cultural group [4].

Therefore, to improve the cultural capabilities of nursing students towards North Korean refugees who are of the same ethnicity as the students themselves but are perceived as people with a different cultural background, a program to promote multicultural capabilities towards North Korean refugees must be developed based on the model for culturally specific competencies should be applied to university students of nursing..

Conclusion & Suggestions

This study was conducted to identify measures that can improve the cultural nursing capabilities towards North Korean refugees, by understanding the difference in multicultural awareness and multicultural efficacy of university students of nursing, towards regular people with multicultural backgrounds and towards North Korean refugees.

The study results show that nursing students' multicultural awareness towards North Korean refugees was lower than their multicultural awareness towards regular people with multicultural backgrounds excluding North Korean refugees. The same was found for their multicultural efficacy. Moreover, there was a positive correlation between their multicultural awareness towards regular people and towards North Korean refugees, and between their multicultural efficacy towards regular people and towards North Korean refugees.

Therefore, this researcher suggests that to improve the cultural capabilities of nursing students towards North Korean refugees who are of the same ethnicity as the students themselves but are perceived as people with a different cultural background, a program to promote multicultural capabilities towards North Korean refugees must be developed based on the model for culturally specific competencies should be applied to university students of nursing.

This study is the first of its kind to compare the multicultural awareness and multicultural efficacy of South Korean nursing students at universities towards regular people with multicultural backgrounds and towards North Korean refugees, and thus is meaningful in that it provides basic data that can contribute to the development of a curriculum for the fostering of

multicultural nursing capabilities in university students of nursing. However, as this study was conducted on students of only three colleges of nursing, its findings cannot be generalized. As such, this researcher suggests an expanded study or an iteration of this study to acquire more general findings.

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Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Flipped Learning Classes in Nursing Students

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ABSTRACT

Background/Objectives: This study was conducted to verify the effects that flipped learning classes have on the satisfaction with classes after applying flipped learning classes to university students of nursing

Method/Statistical Analysis: This study is a descriptive and investigative study that verifies the effects of flipped learning on satisfaction with classes, after applying flipped learning to the course of nursing management for university students of nursing.

Findings: Through this study, it was found that factors affecting the satisfaction with flipped learning classes were learning attitude and satisfaction with the subject.

Improvements/Applications: In order to improve the satisfaction of learners during flipped learning classes, measures to improve learning attitude and the satisfaction with the subject would be needed.

Keywords: *Flipped Learning, learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject, satisfaction with the class*

Introduction

Nursing education covers a wide range of content and leads to a national accreditation test in written form based on the theory learned. As such, lectures that focus on the delivery of knowledge are still the mainstream method of teaching. To overcome the constraints of rote learning, efforts have gradually been made to improve nursing capabilities of students by incorporating aspects of clinical practice. Korean Accreditation Board of Nursing Education, too, recommends various instruction methods to ensure students of nursing achieve certain levels of core capabilities [1].

In recent years, a learner-oriented instruction method has been highly valued, and technological progress led to a wider application of flipped learning that puts the focus on the learner [2]. Flipped learning is conducted focusing on the learner and the interaction between the instructor and the student. Students carry out individual learning outside the classroom using online media, and engage in learning in the classroom through various methods. The online media used outside the classroom offers flexibility in adjusting the amount to be covered and the pace at which it progresses. Learning is promoted through individual studies, then complemented by the interaction between the student and the instructor [3]. In addition, learners take a proactive role in being responsible for their own learning, while instructors can run a class based on individual learning and acquired knowledge according to the individual student's abilities [4]. Flipped learning is meaningful in that it is a self-guided learning method where the students study before the class, then takes part in the classroom.

Preceding studies note that through flipped learning, the learning effects were improved [5], that learning motivation was promoted and academic achievements were improved [6]. Moreover, by having the learner study in advance of the classroom session, the student's responsibility and confidence are improved, which in turn led to higher self-efficacy [7]. Through improved critical thinking, their communication skills were also improved [8]. Flipped learning is applied in various

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classes, and studies have been conducted on flipped learning, but most of them focus on verifying the academic achievements. There has been a lack of studies on the satisfaction students feel with the flipped learning method. While learning ability and an improvement in such ability are important, studies would be needed on the variables that improve the learners' satisfaction with the classes.

As such, this study applied flipped learning to the courses of nursing management studies and reviewed after the class the learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class to identify factors affecting satisfaction with the class to provide basic data for nursing education.

Study Methodology

Design of the Study: This study is a descriptive and investigative study that verifies the effects of flipped learning on satisfaction with classes, after applying flipped learning to the course of nursing management for university students of nursing.

Objectives of the Study: This study seeks to apply flipped learning to the subject of nursing management for university students of nursing, review the general characteristics of nursing students, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the course and satisfaction with the class, as well as identify factors affecting satisfaction with classes using flipped learning methods. Specific study goals are as follows.

- The general characteristics of the study participants, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class will be reviewed.
- The difference in burnout in accordance with general characteristics of the study participants, their learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class will be reviewed and correlation among these variables will be identified.
- Factors affecting study participants' satisfaction with flipped learning classes will be identified.

Study Participants and Data Collection

Criteria for Selecting Study Participants: This study was conducted on students majoring in nursing studies at a university in city S. The number of study participants was analyzed using the G* power program. For multiple regression analysis, a significance level of 5%, effect size of 0.1, a power of 95% and an attrition rate of 10% were assumed. The resulting number was 260 participants. The questionnaire was distributed to a total of 283 participants, but among those questionnaire copies, 277 copies were used for the final analysis.

Study Tools

Learning Attitude: Learning attitude refers to the physical, mental attitude and stance in learning [9]. In this study, the scale for learning attitude as revised by Hwang [10] was used. This tool consists of 16 questions. Each question was measured on a 5 point Likert scale, with a higher score indicating a higher learning attitude. In this study, Cronbach's α=.93.

Learning Motivation Moderation Strategy: For learning motivation moderation strategy, the scale developed by Schwinger et al. [11], later revised by Wolters [12] and complemented by Lee [13] was used. In this study, this score refers to the total score consisting of 7 categories of improved interest and meaning, self-order for execution and approach, environmental control, self result measures, mastering self orders, execution avoidance self order and near goal setting. Cronbach's α for learning motivation moderation strategy was found to be within the range of .76 and .90 according to the sub-factors [13]. In this study, Cronbach's α= .89.

Academic Self-efficacy: Academic self-efficacy refers to the judgment of one's own ability to organize and execute acts necessary for the learner to carry out academic tasks [14]. In this study, it refers to the score measured using the academic self-efficacy scale of Kim et al.[14], consisting of the three categories of preference for the difficulty level of the task, self-control efficacy and confidence. In the study by Kim et al. [14], Cronbach's α=.87 and in this study, Cronbach's α= .93.

Satisfaction with the Subject: Satisfaction with the subject refers to the score measured by the scale originally developed by Shin [15] and later revised by Ju et al. [16]. A higher score indicates a higher level of satisfaction with the subject. In this study, Cronbach's α= .94.

Satisfaction with the Class: Satisfaction with the class refers to the degree that the students' needs for learning are met as perceived by the students themselves, or in other words, the maximum degree to which the learning content as deemed necessary for the learner is being provided [17]. In this study, it refers to the score measured using the scale revised by Kim[18]. In this study, Cronbach's α= .92.

Collection of Data and Ethical Considerations

Data Collection Method and Process: The researcher met with the students in person to explain the objectives of the study and seek consent to data collection. The goal and methodology of the study were also explained. After acquiring consent to participation from those who wished to take part in the study, a signed consent form was also acquired. It took approximately 10-15 mintues per participant to conduct the questionnaire. Participants read the questionnaire and filled it out themselves.

Data Collection Method and Process: To abide by ethical standards in regards to the study participants, a consent form for study participation was attached. The consent form describes the objective and content of the study, states the autonomy of the study subjects to take part in the study, as well as the anonymity of the subjects that will be guaranteed. It also noted that subjects are free to withdraw their participation at any point in time at no risk of disadvantage, and that the collected data would be used for no other purpose than this study. Considering the ethical aspects concerning the study subjects, the researchers gave the explanation to them in person.

Study Procedures

Design of the Flipped Learning Class: Flipped learning is a self-guided learning method where the student checks her level of knowledge before the classroom session and collaboration between the coaching instructor and students during the classroom session is used for problem-solving [Table 1].

The flipped learning class applied in this study consisted of 2 hour sessions running for a total of 4 weeks to meet the study goals of nursing management studies. The class design framework for flipped learning with the three stages of pre-class, in-class and after-class elements were used as the basis. Before the class, a notification was sent out to inform students of the pre-class reading materials in the relevant chapter. Students were also asked to watch the lecture video posted on the website which included a quiz. During the class, the quiz, a question and answers session and small group collaborative activities were carried out for problem-solving, presentation and feedback. After the last class, what was learned was summarized, a reflective journal and a concept map for the relevant chapter were used to compile the lessons, evaluate the class and share opinions.

Table 1: Design of the Flipped Learning Class

Theme	Stage	Instruction Method	Duration	Deliverable
Management of the Quality of Nursing	Pre-Class	Advance study via online videos	minutes*4 sessions	- Online video - Quiz
	In-Class	- Confirmation and evaluation of online learning - Interaction between the instructor and student - Drafting and presentation of the concept map learned - Lecture		- Review of the online video quiz and resolution -Q&A and feedback through online learning -Summary and compilation of concept map
	After-Class	-Reflective journal -Feedback and exchange of opinions		Reflective journal

Data Analysis

The data used in this study were analyzed with SPSS 20(PASW Statistics 20) program as follows.

1. The general characteristics of university students of nursing studies were analyzed using frequency, percentage, mean and standard deviation.
2. All variables concerning university students of nursing studies were analyzed for their mean and standard deviation.
3. The correlation among learning attitude after the flipped learning class, learning motivation moderation strategy, academic self-efficacy,

satisfaction with the subject and satisfaction with the class was analyzed suing Pearson's correlation.

4. Factors affecting the satisfaction level with classes in flipped learning classes for university students of nursing studies were analyzed through a multiple regression analysis.

Results and Discussion

General Characteristics of Study Subjects: An analysis of the general characteristics of the study subjects showed that for the total of 277 subjects, average age was 22.91(± 2.65) years. In terms of the type of high school they graduated, 258 subjects (92.8%) had graduated from a liberal arts high school, while 13 subjects (4.7%) had marked their high school type as 'other'. In terms of marital status, 273 subjects (98.2%) were single. For religion, 137 subjects (49.3%) responded as 'other', followed by 84 subjects (30.2%) who identified themselves as Christians [Table2].

Table 2: General Characteristics (N = 277)

Characteristics	Categories	n (%) or M ± SD	t or F(p)
Age(years)	20~30	268(96.8)	1.33(.158)
	31~40	9(3.2)	
	22.91 ± 2.65		
Graduated High School Type	Academic High School	258(92.8)	.76(.768)
	Vocational High School Education	3(1.1)	
	Specialized High Schools	2(0.7)	
	Characterization High School	2(0.7)	
	Other	13(4.7)	
Marital Status	Single	273(98.2)	1.14(.305)
	Married	5(1.8)	
Religion	Christian	84(30.2)	.69(.846)
	Buddhism	13(4.7)	
	Catholicism	44(15.8)	
	Other	137(49.3)	

The subject's learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class: Learning attitude scored 3.32(± 0.39) points, learning motivation moderation strategy scored 3.45(± 0.39) points, academic self-efficacy scored 3.76(± 0.42) points, satisfaction with the subject scored 3.94(± 0.62) points and satisfaction with the class scored 4.26(± 0.47) points[Table 3].

Table 3: The subject's Learning attitude, Learning motivation moderation strategy, Academic self-efficacy, Satisfaction with the subject and Satisfaction with the class (N = 277)

Variables	M ± SD
Learning attitude	3.32 ± 0.39
Learning motivation moderation strategy	3.45 ± 0.39
Academic self-efficacy	3.76 ± 0.42

Conted…

Satisfaction with the subject	3.94 ± 0.62
Satisfaction with the class	4.26 ± 0.47

Correlation Among the Variables: Correlation with learning attitude was found to be significant with learning motivation moderation strategy (F=.38, p<.001), with academic self-efficacy (F=.50, p<.001), with satisfaction with this subject (F=.40, p<.001), and with satisfaction with the class (F=.36, p<.001). Correlation with learning motivation moderation strategy was found to significant with academic self-efficacy (F=.30, p<.001), with satisfaction with the subject (F=.23, p<.001), and with satisfaction with the class (F=.24, p<.001). Academic self-efficacy was found to have a significant correlation with satisfaction with the subject (F=.40, p<.001) and with satisfaction with the class (F=.35, p<.001). Satisfaction with the subject was found to have a significant correlation with satisfaction with the class (F=.37, p<.001)[Table 4].

Table 4: Relationships among the Study Variable (N = 117)

Variables	Learning attitude	Learning motivation moderation strategy	Academic self-efficacy	Satisfaction with the subject	Satisfaction with the class
	r(p)	r(p)	r(p)	r(p)	r(p)
Learning attitude	1	.38(<.001)	.50(<.001)	.40(<.001)	.63(<.001)
Learning motivation moderation strategy		1	.30(<.001)	.23(<.001)	.24(<.001)
Academic self-efficacy			1	.40(<.001)	.35(<.001)
Satisfaction with the subject				1	.37(<.001)
Satisfaction with the class					1

Factors Affect Satisfaction with the Class in Flipped Learning: [Table 5] shows a multiple regression analysis analyzing all the variables that have a significant effect on the degree of satisfaction felt by university students of nursing with the class using a flipped learning method.

Variables affecting satisfaction levels in flipped learning were learning attitude (β=.15 p=.025) and satisfaction with the subject (β=.22, p<.001). The F value in the regression model was 13.99 at p<.001, with the regression equation having an explanatory power of 22.5%.

Since the Durbin-Watson value is 1.85 which is close to the reference value of 2 and not close to 0 or 4, correlation between the residuals was deemed unlikely, and thus the regression model is seen as fit. In addition, the model has all the tolerance limits being of 0.1 or higher, indicating that there are no issues of multi-linearity [19].

Table 5: Factors affect satisfaction with the class in flipped learning

Variables	B	S.E	β	t	p	TI	VIF
(Constant)	1.96	.29		6.75	<.001		
Learning attitude	.18	.08	.15	2.27	.024	.64	1.57
Learning motivation moderation strategy	.11	.07	.09	1.58	.115	.83	1.21
Academic self-efficacy	.08	.09	.07	.90	.369	.51	1.96
Satisfaction with the subject	.17	.05	.22	3.66	<.001	.78	1.28
Satisfaction with the class	.09	.05	.12	1.84	.068	.72	1.39

Discussion

This study was conducted to verify the effects that flipped learning classes have on learning attitude, learning motivation moderation strategy, academic self-efficacy, satisfaction with the subject and satisfaction with the class, as well as to identify factors affecting satisfaction with the class, thereby providing basic data for education of nursing studies.

Seung&Lee [20] presented the characteristics of flipped learning as follows. First, pre-class learning is carried out using high-tech media. Second, when compared with traditional lecture-style classes, students engage in self-guided learning which leads to more active class participation. Third, in the classroom session, various activities can be carried out to promote higher dimension learning and creative problem-solving skills [20]. Fourth, the instructor, rather than simply forwarding knowledge to the students, plays the role of promoter and collaborator. Fifth, pre-class learning using high-tech media and classroom sessions allows for more integration and in-depth blended learning.

Conclusion

In this study, the factors affecting satisfaction with flipped learning classes were found to be learning attitude and satisfaction with the subject. To improve the student's satisfaction with the flipped learning class,

measures would be needed to improve the student's learning attitude and their satisfaction with the subject. The following is suggested based on the findings of this study. First, as this study was conducted on nursing students of one university, a follow-up iteration is recommended to generalize the findings. Second, a qualitative study is recommended to compile the various opinions felt by the study participants focusing on the reflective journal. Lastly, through the application of various instruction methods to university students of nursing, education methods that can realize high quality nursing based on improved problem-solving skills and critical thinking in clinical settings must be developed, and studies that verify the effects of such methods must be carried out.

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The Effect of Bilateral Upper Limb Training on Recovery of Upper Limb Function in Patients with Acute Stroke

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ABSTRACT

Background/Objectives: The purpose of this study was to survey the influence on action observation of meaningful tasks on upper limb function in patients with stroke. Thirty stroke patients were prospectively randomized to bilateral upper limb training task (BULTT) group or general upper limb rehabilitation (GULR) group.

Method/Statistical Analysis: We studied 30 acute stroke patients. The experimental group (N = 15) applied bilateral upper limb training task (BULTT) and the control group (N = 15) performed general upper limb rehabilitation (GULR) for the affected side. Both groups executed 5 times per week and 30 minutes per session for 4 weeks. To assess the effects of intervention, the paired t-test was used to contrast before and after intervention results of each group. The independent t-test test was used to contrast changes in outcome measures between the groups.

Findings: The Fugl-Meyer Assessment (FMA) before-test score BULTT group was 17.00 ± 3.74 and after-test score was 21.27 ± 4.62. Significant changes in the FMA were observed in both groups. However, the results from the observation of BULTT were most significant. The mean change in FMA score was 4.27 ± 2.09 in the BULTT group and 1.80 ± 1.78 in the GULR group, showing a statistically significant difference. The BULTT group showed a significant increase in upper limb function after training intervention.

Improvements/Applications: This study demonstrated that action observation of meaningful bilateral upper limb training in patients with stroke. We present evidence that action observation of meaningful tasks has a beneficial effect in occupational therapy for movement disorders after stroke.

Keywords: *stroke, bilateral upper limb training, upper limb motor function, meaningful tasks, Fugl-Meyer Assessment*

Introduction

Stroke is caused by vascular occlusion such as hypoxia, ischaemia, or infarction, or by intracranial hemorrhage. Cerebral infarction is the most frequently occurring type. This is related to the central nervous system being very sensitive to oxygen deficiency or ischemia in various organs of the body[1]. Stroke patients generally develop muscle weakness, coordination problems, abnormal muscle tension, and motor paralysis[2]. Stroke patients with these neurological symptoms have social, mental and physical impairments, of which 40% have some dysfunction and 15-30% have sensory disturbances[3,4]. A significant reduction in the function of the affected side is generally associated with reduced use of the injured upper limb in real life. Therefore, it can induce learned nonuse, which can result in weakened function of the affected side and increase the restriction of daily life[2,5].

Bilateral activity is based on the assumption that the right and left muscle groups are simultaneously activated

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and similar neural activation occurs in both cerebral hemispheres[6]. Simultaneous execution of both upper limbs can also increase activation of the affected cortical area, which can be attributed to the bilateral distribution of the channels that transmit commands and the common initiation of motion commands through simultaneous execution of both upper limbs[7,8]. It is known that the enhancement of the efferent connection of the ipsilateral upper limb by activation of the uninjured brain region improves motor control of the affected upper limb[9].

Activation of the primary motor and somatosensory cortex of the affected side is further enhanced by the simultaneous performance of the both upper limbs which is compared to the single side of the affected, which is related to the activation of both the cerebral hemispheres[7,10]. Also, when performing tasks with both hands, in order to move of both hands complex interactions between both cerebral hemispheres can occur and this interaction can promote the effect of the affected upper limb[11].

Many actions in real life are performed by coordination of both hands. Repeated, similar tasks used in daily life may improve function even in patients with severe upper limb paralysis[12]. This treatment approach using both hands is closely related to daily life and the affected side upper limb is improved functionally to the help rehabilitation and daily activities of stroke patients[13].

Several studies have demonstrated the effect of bilateral exercise to induce the recovery of motor function using both the affected and less affected upper limbs[14-16]. These studies have reported that bilateral activity in the early level of stroke rehabilitation improves symmetric body and reduces abnormal muscle tone[15]. In addition, it has been reported that complex interactions are activated in the cerebrum for the exercise planning of both upper limbs[16].

Therefore, based on the above facts, this study investigated the effect of bilateral upper limb training task on upper limb function in patients with acute stroke.

Materials and Method

Subjects: In this study, we randomly divided the 30 study subjects into two groups (Table 1) : the BULTT group and the GULR group. These participants met the selection criteria and gave voluntary knowledgeable consent to take part in the study. The incorporation criteria were as follows:

First, hemiplegic patients with stroke duration less than 6 months

Second, a score of ≥ 24 in the MMSE-K (Korean version of the Mini-Mental Status Examination)

Thirdly, a level of ≤ Brunnstrom recovery of upper limb stage 3

Fourth, in the line bicection test, patients without unilateral neglect

Fifth, patients without musculoskeletal disorders such as joint building or limited range of motion

Table 1: Individual Information of Patients

Characteristics		BULTT group (n = 15)	GULR group (n = 15)
Gender	Male	6	7
	Female	9	8
Age (y)		61.53 ± 8.81	62.00 ± 8.13
MMSE-K		27.60 ± 1.06	27.80 ± 1.37
Height(cm)		165.67 ± 7.19	166.00 ± 7.42
Weight(kg)		67.40 ± 12.35	66.87 ± 11.32
Onset of stroke months		3.60 ± 1.30	3.20 ± 1.37
Side of hemiplegia	right	11	9
	Left	4	6

M ± SD: mean ± standard deviation.

BULTT: bilateral upper limb training task, GULR: general upper limb rehabilitation

Materials - Fugl-Meyer Motor Function Assessment(FMA): Upper limb Subtest: FMA is used to classify hemiplegic patients with stroke as a Brunnstrom recovery stage and to assess the recovery of function[17]. Fugl-Meyer et al. developed an assessment tool by defining 50 detailed movements according to the six stages of recovery of Brunnstrom's hemiplegic patients. 0 ~ 2 points are given depending on the performance of the evaluation item. 0 point is not performed, 1 point is performed partially, and 2 points are divided into complete execution. The overall score ranges from 0 to 100, including upper and lower limbs. There are 33 items in the upper part of the test, which is 66 points. The details of upper limb examination are 18 items for shoulder/elbow/forearm, 5 items for wrist, 7 items for hand (finger), and 3 items for upper limb coordination ability[18]. Sanford et al. reported an inter-rater reliability of 0.96 for upper limb examination [19]. In this study, only upper limb test items were used for upper limb function evaluation.

Methods-Bilateral Upper Limb Training Task: Subjects were divided into BULTT group (15 patients) and GULR group (15 patients). The experiment was conducted for 5 weeks each week for 30 minutes for 4 weeks. The BULTT group performed the bilateral upper limb training task and the GULR group performed general upper limb rehabilitation.

The posture for bilateral upper limb activity is to sit on the backrest chair and place both upper limbs on the table, and the hip, knee, and ankle joints are flexed 90 degrees. And the patient is allowed to maintain the correct posture by inducing the patient to use the backrest or the footrest according to the physical condition so that the same weight is applied to both legs from the center of the chair.

Table 2 summarizes the results of the bilateral upper limb training task with reference to the programs of Desrosiers et al. and Lewis & Byblow[20,21].

Table 2: Bilateral Upper Limb Training Task

Program	Method
Wipping table with towel	The patient wipes the table by placing both hands with the fingers together locked or both hands without the fingers together locked in parallel on a towel, pushing and pulling the table forward, left and right. Elbow joints move with flexion and extension, and shoulder joints move with horizontal adduction and horizontal abduction. As the elbow joint moves, the scapular of the affected upper limb is not retracted.
Mimiceing the drinking	The patient mimics the action of drinking a cylindrical plastic cup with finger togerht locked to the mouth. Shoulder and elbow joints move with flexion.
Moving blocks to boxes	The patient should hold the block (4cm × 4cm × 4cm) placed in front of the table with finger together locked and move it into a box located at eye level of 30 cm. Keep your finger locked and move the elbows in the flexion direction. The block is picked up mainly with the less affected fingers. When placed in the box, the shoulder joint moves in the flexion direction and the elbow joint moves in the extension direction.

Analysis Methods

The results of the collected data were analyzed using SPSS (ver. 12.0) statistical program. The general characteristics of the subjects were descriptive statistics and chi-squared test was used for the homogeneity test between the BULTT group and the GULR group. Shapiro Wilk test was used to confirm normality, and the paired t-test was used to compare FMA before and after intervention. The independent t-test was also conducted to compare groups after intervention. The statistical significance level was 0.05.

Results and Discussion

Comparison of Results (Fma Score) Before and After The Intervention: Upper limb motor function in both groups before and after treatment is shown in Table 3.

The changes of FMA before and after the application of bilateral upper limb training task were significantly improved from 17.00 to 21.27 ($p < 0.001$). In addition, the change of FMA from general upper limb rehabilitation was improved from 17.27 to 19.07 ($p < 0.01$).

Table 3: Comparison of Results (FMA Score) Before and After the Intervention

	BULTT group (n = 15)		GULR group (n = 15)	
	Pre-test	**Post-test**	**Pre-test**	**Post-test**
FMA	17.00 (3.74)	21.27 (4.62)	17.27 (4.59)	19.07 (5.31)
P	.000***		.002**	

The values are mean (standard deviation), *p<0.05, **p<0.01, ***p<0.001 by paired t-test

FMA: Fugl-Meyer Assessment

BULTT: bilateral upper limb training task, GULR: general upper limb rehabilitation

Comparison of Results Between the BULTT Group and GULR Groups: The mean changes in upper limb motor function scores in the 2 groups are compared in Table 4.

The mean change in FMA was 4.27 ± 2.09 in the BULTT group and 1.08 ± 1.78 in the GULT group, showing a statistically significant difference. Mean change in the FMA was significantly greater in the BULTT group.

Table 4: Comparison of Results Between the BULTT Group and GULR Groups

	Mean Change	
	BULTT group (n = 15)	**GULR group (n = 15)**
FMA	4.27(2.09)	1.80(1.78)
P	.002**	

The values are mean (standard deviation), *p<0.05, **p<0.01, ***p<0.001 by independent t-test

FMA: Fugl-Meyer Assessment

BULTT: bilateral upper limb training task, GULR: general upper limb rehabilitation

Discussion

In this study, we investigated the effect of bilateral upper limb training on upper limb function in acute stroke patients. In the selection of the subjects, the MMSE-K revealed that the cognitive impairment was considered as a result of 24 out of 30 total score, or visual perception ability including neglect and homonymous hemianopsia in the line by section were excluded from this study. We also excluded patients with musculoskeletal disorders such as contracture of joints or limitation of range of motion, and patients with complete voluntary movement of the affected upper limb without assistance. The subjects selected for the study were less than 6 months in the stroke diagnosis. In addition, the subject is a patient with Brunnstrom recovery of upper limb stagy 3 or less who needs active assistance because of the voluntary movement of the affected upper limb and the difficulty of one hand moving of the affected limb without assistance. There were no cognitive impairment, visual perception disabilities, or musculoskeletal disorders.

Bilateral upper limb training was consisted of supplementing and modifying the less affected upper limb so as to lead to various movements of the affected upper limb, referring to the previous studies[20,21]. During the application of the program, the subjects crossed the fingers of both hands and performed activities with their hands clipped. The fingers together locked may prevent the associated reaction by reducing the spasticity of the flexion pattern of the affected upper limb by abduction of the affected fingers and also increasing the sensation and perception of the affected side since the fingers together locked are held in the midline of the body[22].

In this study, BULTT improved the upper limb function more than GULT, and there was a significant difference between the two groups before and after the intervention. When any activity begins on both sides, the motor cortex of both hemispheres simultaneously activates and inhibits the functions of the other side. Previous studies on stroke patients have emphasized the importance of simultaneous exercises on the bilateral upper limb and reported that normal movement of the upper limb through coordination of both hands plays an important role in the quality of performance in daily life[7]. Fey et al. reported improved upper limb function when repeated bilateral upper limb training was applied to stroke patients[12]. Lewis & Byblow also suggested using the affected and less affected upper limb simultaneously to improve the function of the upper limb.

Recovery of upper limb function has a direct impact on performing independent activities and activities of daily living. The results of this study show that BULTT performance in acute stroke patients is effective in improving the function of the affected upper limb in stroke patients.

In this study, generalized interpretation of all stroke patients is limited because only limited patients who meet the selection criteria were studied. Further evaluation of factors that may have an additional effect on upper limb function was not considered and further evaluation should be performed to further clarify the relationship between bilateral tasks and upper limb function. Therefore, additional studies should be conducted to investigate the effect of bilateral upper limb activity on patients' rehabilitation process in various aspects.

Conclusion

The purpose of this study was to investigate the effect of bilateral upper limb activity on upper extremity function into acute stroke patients. Thirty patients were selected based on the selection criteria, and 15 subjects were divided into two groups, one was an experimental group applying bilateral upper limb training task and the other was a general upper limb rehabilitation group. FMA was used to compare upper limb functions before and after intervention for 4 weeks. The results were as follows.

First, there was a significant change in upper limb function before and after intervention in BULTT and GULR, but it was more effective in BULTT (p<0.001)

Second, there was significant improvement in bilateral upper limb activities after intervention ($p<0.05$).

Second, the comparison between the two groups showed significant improvement in the BULTT group ($p<0.05$).

These results suggest that the upper limb function area of acute stroke patients with BULTT is improved. Therefore, it seems that BULTT can be used as a therapeutic method for the recovery of upper limb function in stroke patients, and further study on the effect of the patient on rehabilitation should be handled together.

Ethical Clearance: Not required

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The Effect of Awareness Toward Dementia on Dementia Education Program of Adolescents

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ABSTRACT

Background/Objectives: As the elderly population increases, dementia patients are rapidly increasing as well and dementia causes various social problems such as burden and cost of care. These social problems will be affected by the present adolescents who will become responsible for dementia patients and aged generation. The purpose of this study was to survey the effect of awareness toward dementia on Dementia Education Program(DEP) of adolescents. Throughout the program, 32 subjects were educated and received tasks related to dementia.

Method/Statistical Analysis: Subjects were recruited online and DEP was processed for 2 days with 9 educational topics. By providing volunteer work hours accepted in high school when the tasks were completed, we increased the participation. To evaluation the awareness toward dementia, we used the dementia awareness questionnaire used on nationwide study on the prevalence of dementia in Korean elders by the Ministry of Health and Welfare. To analyze the subject's general characteristics, descriptive analysis was used. Conducted paired T-test to analyze the change of awareness toward dementia before and after DEP in the group.

Findings: Dementia awareness questionnaire's perfect score is 15. Higher the score is, greater the awareness toward dementia. Before DEP, the score was. After DEP, the score was. Comparing the before and after scores, the score increased. The result showed statistical significant difference.

Improvements/Applications: The study showed that the effect of awareness toward dementia on DEP of adolescents was positive. This result can be used as a background data announcing the need for early education through school health education, starting from the present adolescence that will directly support the elderly generation in future.

Keywords: *Dementia, Awareness toward dementia, Adolescents, Dementia education program, School health education, Early education*

Introduction

Our elderly population, over 65 years old, is rapidly expanding every year. It is estimated to be 7.06million people in 2017, 12.31million people in year 2024 and 22.90million in year 2041. As the elderly population rapidly expands every year, it caused number of social problems. Among them, dementia is the representative problem of the aged. As with the increasing aging population, dementia patients are rapidly increasing as well. It is estimated to be 0.7million people in year 2017, 1million in year 2024 and over 2million in year 2041[1,2].

As dementia symptom progresses the ability to live by oneself decrease. Eventually the patient's quality of life decreases and caregiver's burden and stress increases[3]. But because ordinary people see symptoms

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of dementia as a part of aging, it makes them not able to get a proper service[4,5,6].

In modern days, social advancement of women, nuclear family made traditional support system get weak. Increased primary caregiver's caring time made caregiver's social participation decrease and giving up their personal needs. Also increase in economic cost made conflict issues among caregivers and their family[7,8]. The results supporting that the dementia patient makes quality of the life of their family low have been verified in many previous studies. These burdens of care make people two to three times more likely to be depressed than the normal people. About one-third of the patient's family show major symptoms of depression and more than half of them suffer from chronic depression[9,10,11,12].

These social problems will be affected by the present adolescents who will become working age population and become responsible for dementia patients and aged generation. Adolescence is a sensitive period in which growth is vigorous and the awareness of oneself grows and that means what they learn at this time is very important. Initiating early education on dementia since adolescence can decrease negative awareness toward dementia. Also spreading these positive side to homes and communities will be very effective on creating dementia friendlily society[7,8,13].

Therefore, this study seeks to find out what kind of influence does DEP, which provides correct information on dementia, has on adolescents. Furthermore, it intends to be provided as a background data to inform the necessity of early education on dementia since adolescence.

Materials and Method

Subjects: The subjects that were recruited through online were total 32 people. These subjects met the selection criteria and gave voluntary knowledgeable consent to take part in the study. The specific selection criteria were as follow: (1) person who understood the study's aim, method, period and agreed to participate (2) person who is currently attending high school (3) person who never had dementia education before (4) person who don't have any mental and physical deficits.

Materials: To evaluate the awareness toward dementia, we used the dementia awareness questionnaire used on nationwide study on the prevalence of dementia in korean elders by the Ministry of Health and Welfare. Dementia awareness questionnaire has total 15 questions, consisted of 5 questions on the causes of dementia, 3 questions on epidemiology and institution of dementia, 4 questions on symptoms and diagnosis of dementia and 3 questions on treatment and prevention of dementia. Each question is evaluated as 'yes' if the explanation is correct and 'no' if it is incorrect. 1point if the answer is right, 0 point if it's not. The total score can be 0 to 15 points. Higher the score is, greater the awareness toward dementia[14]. The data were analyzed by SPSS version 18.0 program. To analyze the subject's general characteristics, descriptive analysis was used. Conducted paired t-test to analyze the change of awareness toward dementia before and after DEP in the group. All statistical significance levels in the data were.

Methods: Before DEP, subjects went through pre-evaluation on awareness of dementia using dementia awareness questionnaire. After DEP, post-evaluation was conducted using the same questionnaire. Subjects got DEP, consist of 9 kinds of education subjects for 4 hours a day, 2 days in total. After the first day, assignments related to dementia were given to be completed. We increased participation by giving certificate and approval of volunteer work hours. In this study the dementia information of the National Institute of Dementia, which was established to carry out dementia management duties from the Ministry of Health and welfare, was used to provide the right information about dementia. Education topic and contents are as shown in table 1

Table 1: Contents of Dementia Education Program

Education Topic	Contents
1. Orientation	Introducing program, schedule and assignments
2. Understanding of dementia	Definition of dementia
3. Dementia prevention exercise	Rules and exercise method for dementia prevention Assignment: submit the video after following the dementia prevention exercise
4.Service information using 'Dementia Check' application	Dementia risk test and function for prevention of disappearance etc Assignment: using the 'Dementia Check' application

Conted…

5. Dementia support service	Introducing national dementia support service contents
6. Education on improving dementia awareness	Cause, symptom and treatment of dementia
7. Cognitive training on dementia	Cognitive training method to improve attention, memory etc
8.Introducing National Dementia Helpline	Roles and function of National Dementia Helpline
9. Finishing activity	Impressions about the program, checking assignment's result, awarding certificate

Results and Discussion

General Characteristics of Subjects: Numbers of subjects were total 32 and analysis results for general characteristics are as shown in table 2. Subjects gender were male 21people(65.6%) and female 11people(34.4%). Age were 'age 17' 14people(43.8%), 'age18' 12people(37.5%) and 'age19' 6people(18.8%). High school grade were first grader 11people(34.4%), second grader 15people (46.9%) and third grader 6people (18.8%). Subjects who have religion were 10people(31.3%), who don't were 22people (68.8%). Subjects who had experience in volunteer work were 7people(21.9%), who didn't were 25people(78.1%). Subjects who have experience in living together with the dementia patient were 8people(25%), who don't were 24people(75%).

Table 2: General Characteristics of Subjects (N = 32)

Variables	Categories	n(%)
Gender	Male	21(65.6%)
	Female	11(34.4%)
Age	17	14(43.8%)
	18	12(37.5%)
	19	6(18.8%)
High School Grade	First Grader	11(34.4%)
	Second Grader	15(46.9%)
	Third Grader	6(18.8%)
Religion	Yes	10(31.3%)
	None	22(68.8%)
Experience in volunteer	Yes	7(21.9%)
	None	25(78.1%)
Experience in living together	Yes	8(25%)
	None	24(75%)

Comparison of Result Before and After DEP in the Group: Dementia awareness questionnaire's perfect score is 15. The analysis result of the change in awareness toward dementia is as shown in Table3. Before DEP, the score was10.15 ± 1.52. After DEP, the score was12.37 ± 1.75. Comparing before and after scores, the score increased. The result showed statistical significance ($\rho < 0.01$).

Table 3: Comparison of Results Before and After DEP in Group (N=32)

Variables	Pre-evaluation	Post-evaluation	ρ
Awareness toward dementia	10.15 ± 1.52	12.37 ± 1.75	0.00*

Mean ± standard deviation,*$\rho < 0.01$ by paired t-test.

Discussion

This study showed that due to DEP, awareness toward dementia of adolescents has significantly increased. When converting the average score of each question to 100 points, before DEP, 'Early treatment can slow the progress of dementia' and 'Regular exercise helps prevent dementia' questions marked the highest by scoring 90points. 3 questions that got the most wrong answers were 'Drinking too much alcohol is prone to dementia', scored 6points, 'Women are more likely to have dementia than men', scored 25points, and 'One in 100 elderly people can have dementia', scored 37points. The questions that had the most improvements on the scores for awareness toward dementia were 'Drinking too much alcohol is prone to dementia' and 'One in 100 elderly people can have dementia' and the score of the cause and epidemiology toward dementia improved the most. The result is similar to the study on 226 Incheon people's, who were over 19 years old, awareness toward dementia. The study on old-old elderly's awareness toward dementia also had low awareness in cause and epidemiology toward dementia. These results are

considered like this, due to low in awareness toward dementia and lack of education. Misunderstanding toward dementia causes delays early diagnosis and making judgement that treatment is impossible. This will have a huge influence on preventing and managing dementia. Having positive attitude toward dementia by providing correct awareness will help preventing dementia and early diagnosis[15,16].

For the adolescents who will become adult and support the elderly generation, consciousness of supporting and attitude toward elderly will be very important. Correct awareness toward dementia help ease the anxiety of dementia by having influence on attitude toward dementia. If the attitude is more positive, caregiver's burden of care will decrease. Also the quality of life and consciousness of supporting the elderly will increase[17,18,19].

In this study adolescents were given DEP and it showed positive increase in awareness toward dementia. This result will have a positive effect on adolescents' important attitude and consciousness of supporting the elderly. Therefore it can be said that adolescents' education on dementia is important. Also early education on dementia through school health education starting from adolescence should be carried out[20].

The limitations of this study is that it did not set the control group and because the study only went through few high school students, there is a limit in generalizing to all adolescents. But as with other previous studies' results, DEP showed that it has a positive effect on awareness toward dementia of adolescents[21]. Furthermore, the study could be used as a background data to inform the necessity of early education on dementia starting from adolescence.

Conclusion

The purpose of this study was to survey the effect of awareness toward dementia on DEP of adolescents. Comparing before and after DEP, the score increased. The result showed that due to DEP, awareness toward dementia of adolescents has significantly increased. Throughout the results, we could know that providing DEP to adolescents has a positive effect on having correct awareness toward dementia.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Oral Health-Related Factors and Stress from Cultural Adaptation among Vietnamese Students in Korea

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Abstract

Although the recent rise in the number of foreign students in Korea may have positive cultural and economic effects, the negative effects of stress from cultural adaptation cannot be overlooked. This study investigates the relationship between oral health and stress from cultural adaptation in university life.

In this study, 100 copies of the survey were distributed to Korean and Vietnamese university students each, with response failure rates considered. The survey took place in October 2017 and lasted for 9 days. Excluding the incomplete responses, 80 and 99 survey responses were selected from Vietnamese and Korean students respectively. The results indicated similar levels of satisfaction for oral health care, which were 3.06 ± .959 for Vietnamese students and 3.09 ± .771 for Korean students. The satisfaction rates for their own oral health were 2.85 ± .956 for Vietnamese students and 3.07 ± .961 for Korean students. There was no statistically significant difference, but Korean students had about 1.425 times higher satisfaction rate for their own oral health than Vietnamese students. The statistics for oral health knowledge were 8.28 ± 1.091 for Vietnamese students and 9.18 ± .774 for Korean students. There was a statistically significant difference ($p < 0.00$), with the figure for Korean students being 3.488 times higher than Vietnamese students. The most stressful factor among Vietnamese students in the process of cultural adaptation was 'Feel the need to learn Korean' with 3.46 ± 1.31 and the least was 'Do not feel accepted by Koreans' with 1.95 ± 0.82. Cultural adaptation stress scores were significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$).

The results of this study suggest that it is important to give training on oral health to help Vietnamese students experience oral care services and be informed about it. The administrative support from students' respective universities will be needed as well.

Keywords: *Vietnamese students, cultural adaptation stress, oral health factors, oral health-related characteristics, Oral health behavior*

Introduction

Korea has paid closed attention to attracting foreign students, through adopting measures based on the 'Comprehensive plan for growth in the number of foreign students' in 2001, to open up its education market and increase the international reputation of its home universities [1]. According to Statistics Korea, the rates of increase in the number of Vietnamese students and Chinese students are 91% and 12% respectively.

If the trend was to continue, our society could benefit from this inflow of foreign students not only economically but also through domestic students being able to learn the language, history, culture, arts, society and economics of foreign countries, which will pave a path for domestic students to become global citizens. Korea can build for itself a support through these foreign students developing an in-depth understanding of Korea as a nation [2].

However, this increasing number of foreign students faces problems such as language barriers, tuition fees as well as other financial difficulties, homesickness,

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personal problems and difficulties in carrying out daily activities[3].

A cultural adaptation stress refers to such distress, confusion and negative behaviors that arise when one goes through the process of adapting to another culture[4].

Its definition includes a source of tension or stress that one experiences when encountered with the values of the mainstream society accompanied with the resulting stress which is a series of physical, psychological and societal issues like mental health conditions - anxiety, depression, a sense of alienation and physical symptoms[5].

Thus, it calls for a solution to the cultural adaptation stress of foreign students, of which the first is expanding the scope of social relations. Oberg identifies four stages of overcoming the cultural adaptation stressthat a foreign student goes through [6].

Social relations involve any activities that an individual does to fulfill his physical, emotional and instrumentalneeds through the relationships he maintains. They are defined as aninstrumental, emotional, informational and appraisal support – assistance, advice, guidance, compliments, availability of comfort, help,and information [7].

The concept of social relations attracted a lot of attention for its ability to strengthen problem-solving skills and has been used in a wide variety of contexts. It is obtained through meaningful interactions with other people, assisting the psychological adaptation of an individual [8].

Cohen and Hoberma stated that the level of social relations can be the main cause of illness as well as an elementthat buffers stress and boosts health.In addition, it was found that people with higher level of education and occupational status participate in more social activities, which in turn has positive effects on the health [9].

There would be another societal issue if foreign students were to hold back the sufferings they experience in Korea, a country that uses different language and has a different cultureto its own [10]. Their mental and physical health conditions should be prioritized so that they can concentrate on their studies. Implementing measures to solve this issue will necessitate investigating such conditions. Since a precedent study consisted of analysis of the entire body, this study investigatesthe oral health-related factors.

Oral health knowledge is necessary for oral hygiene and healthy oral conditions. It includes understanding the prevention, cure,and maintenance of oral health. It is generally gained through oral health education and is expected to have a correlation with the cultural adaptation stress, as it affects the oral health.

Cultural adaptation stress of foreign students is a type of stress caused by encounteringa culture that is different from their own. The cultural adaptation stress can be defined as an accumulation of various types of problems in a day-to-day life. For this reason, we examine the relationship between cultural adaptation stress and oral health-related factors.

Materials and Methodology

Subjects of Experiments: The study was conducted after the participants had been informed of the objectives, anonymity,and confidentiality of the experiment and that the results would be used for the sole purpose of research. After receiving a written consent from the participants on this matter, the Vietnamese translated self-administered questionnaire was distributed. The recommended sample size was 67 which was obtained using the G * power3.14 program, with an effect size of 0.05 and power of 0.05 and 0.8. 100 copies of the survey were distributed to Korean and Vietnamese university students each, with response failure rates considered. The survey took place in October 2017 and lasted for 9 days. Excluding the incomplete responses, 80 and 99 survey responses were selected from Vietnamese and Korean students respectively.

Methodology: The survey consisted of 4 general, 12 oral health-related and 11 cultural adaptation stress questions. The survey given to Korean students excluded the cultural adaptation stress questions.

Statistical Analysis

The samples were analyzed using SPSS 23.0 (SPSS Inc, Chicago, IL, USA) with the statistical significance level of $p < 0.05$. Frequency and comparative analysis were used for country-specific characteristics and difference between the respondents. A t-test was used for country-specific oral hygiene-related characteristics. The cultural adaptation stress of Vietnamese students was examined by looking at the average and standard deviation. Oral health behaviorfrequency analysis and the relevant cultural adaptation stress was tested with t-test and ANOVA test.

Results and Discussion

Differences in the Country-specific General Background of Respondents: There were 42 male Vietnamese students (52.5%) and 70 female Korean students (70.7%) as shown in table 1.The number of respondents who did have a religion was 61 (76.3%) for Vietnamese group and 63 (63.4%) for Korean group.52 Vietnamese students had monthly spending average higher than 250,000 won while 79(79.8%) Korean students belonged to this category. 33 Vietnamese students received an oral treatment in the home country while 92 Korean students received the same (p <0.00).

Table 1: Differences in the Country-Specific General Background of Respondents

Characterization	Division	Vietnam		Korea		x^2	p
		N	%	N	%		
Gender	Male	42	52.5	29	29.3	9.957	0.002*
	Female	38	47.5	70	70.7		
Religious	No	61	76.3	63	63.4	3.307	0.067
	Yes	19	23.8	36	63.4		
Monthly spending	<25	28	35.0	20	20.2	4.937	0.020*
	25≦	52	65.0	79	79.8		
Whether or not received an oral treatment in the home country	Yes	33	41.3	92	92.9	56.093	0.000**
	No	47	58.8	7	7.1		

Differences in Country-Specific Oral Health-Related Characteristics: The results of the difference between oral health-related characteristics are as follows in table 2. The satisfaction score for oral treatment of home country was 3.06 ± .959 for Vietnamese students and 3.09 ± .771 for Korean students, with no statistically significant difference. The satisfaction scores for their own oral health was 2.85 ± .956 and 3.07 ± .961 for Vietnamese and Korean students each. Although the results showed no statistically significant difference between the two groups, Korean students had 1.424 times higher score than Vietnamese students. The oral health knowledge score was 8.28 ± 1.091 for Vietnamese students and 9.18 ± .774 for Korean students. There was a statistically significant difference (p <0.00) with the score for Korean students being 3.488 times higher than Vietnamese students.

Table 2: Differences in Country-Specific Oral Health-Related Characteristics

Characterization	Vietnam		Korea		OR	95%	t	p
	Mean	SD	Mean	SD				
Home country oral treatment satisfaction rate	.06	± 0.959	3.09	± 0.771	0.718	0.425-1.203	-0.220	0.826
Ownoral health satisfaction rate	.85	± 0.956	3.07	± 0.961	1.425	0.922-2.200	-1.531	0.127
oral health knowledge score	.28	± 1.091	9.18	± 0.774	3.488	1.977-6.152	-6.495	0.000**

Cultural Adaptation Stress of Vietnamese Students: The responses of Vietnamese students to cultural adaptation stress questionnaire are as follows in table 3. Theproblems with the language barrierappeared to have the strongest influence on the cultural adaptation stress. The most stressful factor was 'I feel like I need to learn Korean' with a scoreof 3.46 ± 1.31, followed by 'I do not speak Korean fluently' with 3.36 ± 0.983. The least stressful factor, marked 1.95 ± 0.82, was 'I do not feel accepted by Koreans'.

Table 3: Score on the Cultural Adaptation Stress Factors of Vietnamese Students

Questionnaire			
1. I am not fluent in Korean	3.36	± 0.983	2
2. I feel uncomfortable around people who can speak only Korean	2.93	± 1.05	5

Conted…

3. I feel like I need to learn Korean	3.46	± 1.31	1
4. I find it difficult to understand if it is in Korean	3.26	± 1.25	3
5. People treat me unfairly or disrespectfully because I do not speak fluent Korean	2.58	± 1.27	8
6. I feel irritated when people think that I will naturally speak fluent Korean	2.46	± 1.01	10
7. I have been discriminated because I do not speak Korean fluently	2.86	± 1.30	6
8. I find it difficult to understand when people speak in Korean	3.20	± 1.15	4
9. I feel irritated when people ask me to follow the Korean way	2.58	± 1.18	8
10. It's difficult to socialize with Koreans because of cultural background	2.85	± 1.15	7
11. I do not feel accepted by Koreans	1.95	± 0.82	11
Total	2.86	± 0.67	

Cultural Adaptation Stress According to Oral Health Behavior Characteristics of Vietnamese Students: According to the result in table 4, 63 Vietnamese students (78.8%) brushed 1-2 times and 11 of them (13.8%) did not brush at all. In terms of the amount of toothpaste usage per brushing, 50 students answered that they use an amount equal to the 2/3 of the toothbrush head and 24 students said they use length equal to the full toothbrush head. Furthermore, 38 Vietnamese students responded that they change toothbrush every 3 months and 31 responded that they change every month. 25 students (31.3%) answered that they do carry portable oral products and 55 students (68.8%) answered they do not. In the question about the opinion on the necessity of carrying oral hygiene products, 41 respondents (51.3%) answered that it is necessary while 39 (48.8%) answered it is unnecessary. Among Vietnamese students, the cultural adaptation stress score was significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$).

Table 4: Cultural Adaptation Stress According to the Oral Health Behavior Characteristics of Vietnamese Students

Characterization	Division	N	%	Mean	SD	F/t	p
Number of brushings per day	0	11	13.8	3.16	± 0.58	3.138 a>c	0.049*
	1-2	63	78.8	2.86	± 0.60		
	3-4	6	7.5	2.33	± 1.17		
Toothpaste usage (per each brushing)	toothbrush head 1/3	6	7.5	3.34	± 0.78	1.730	0.184
	2/3	50	62.5	2.81	± 0.53		
	full head	24	30.0	2.85	± 0.86		
Frequency of toothbrush replacement	1 month	31	38.8	2.73	± 0.69	0.901	0.411
	3 months	38	47.5	2.94	± 0.70		
	6 months	11	13.8	2.95	± 0.46		
Carries portable oral products	Yes	25	31.3	2.72	± 0.76	-1.28	0.204
	No	55	68.8	2.93	± 0.62		
Portable oral products necessity	Necessary	39	48.8	2.79	± 0.73	-0.891	0.376
	Not necessary	41	51.3	2.93	± 0.60		

Conclusion

This study was conducted to investigate the cultural adaptation stress that foreign students go through and the factors affecting oral health of both Korean and foreign students.

According to the results, the satisfaction score for oral treatment of home country was 3.06 ± .959 for Vietnamese students and 3.09 ± .771 for Korean students, with no statistically significant difference. It is considered that the higher satisfaction score for Korean students comes Korean students having a better

understanding of oral health. The satisfaction score for one's own oral health was2.85 ± .956 and 3.07 ± .961 for Vietnamese and Korean students each. Although the results showed no statistically significant difference between two groups, Korean students had 1.424 times higher score than Vietnamese students. The oral health knowledge score was 8.28 ± 1.091 for Vietnamese students and 9.18 ± .774 for Korean students. There was a statistically significant difference ($p < 0.00$), with the score for Korean students being 3.488 times higher than Vietnamese students.

The statement describing the most stressful factor among Vietnamese students in the process of cultural adaptation was 'I feel the need to learn Korean' with 3.46 ± 1.31 and the least was 'I do not feel accepted by Koreans' with 1.95 ± 0.82. Cultural adaptation stress scores were significantly lower in the group who brushed 3 times daily than in the group who did not. This was statistically significant ($p < .05$).The cultural adaptation stress of Vietnamese students indicated a low correlation with oral health-related factors. The results of this study suggest that it is important to educateVietnamese students to raise oral health awareness. There is also a need for multi-perspective efforts to solve the oral health problem of foreign students and to smoothen the cultural adaptation process relating to oral health.The administrative support from students' universities will be required as well.

This study emphasizes the importance of researching the oral health behavior characteristics of foreign students in Korea before taking the measures to improve the oral health problems of such students. In addition, the oral health behavior of domestic students should be analyzed along with that of foreign students to compare and observe the difference between these behaviors and factors causing such differences. This also demands administrative support from oral health care services for foreign students.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Implementation of Glove-Type Wearable Healthcare System for Heartrate Measurement During Daily Life

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ABSTRACT

Background/Objectives: In recently, U-Healthcare has evolved into Smart-Healthcare due to growth of IoT technology and entry into an aging society; it is able to provide variety of medical service technologies. Wearable technology for health monitoring in everyday life is provided with a variety of medical service models through linkage with existing ICT infrastructures.

Method/Statistical Analysis: In the proposed system is first to filter and amp the data measured thought the PPG sensor in the measurement section, and then to perform the ADC conversion in the control section. Then, heart rate was detected from the filtered data by the IBI method after remove the motion noise using the adaptive filter. Finally, heart rate display is possible on the LCD in the control section and transmitted to the monitoring section through Bluetooth communication.

Findings: To evaluate overall performance of implemented system, experiment was conducted to comparative evaluation with commercial system, adaptive filter evaluation and performance evaluation in daily life. For a reliable system evaluation, we conducted a comparative experiment with the commercial system (PSL-iPPG2) of Physio lab company and confirmed the similarity of 98.44%. Evaluated the adaptive filtering implemented by adding artificial noise to the original signal, and it was confirmed that the motion noise remove performance is excellent. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter.

Improvements/Applications: The implemented system designed an adaptive filter for motion noise remove for precise heart rate measurement in daily life. In addition, confirmed that the system implemented in this paper can be applied to everyday life through experiments. In future research, it is aimed to implement a heart rate monitoring system optimized for motion noise for measuring heart rate with various activity states and psychological changes.

Keywords: *PPG, Wearable, Healthcare, Inter beat Interval, Beer-Lambert law, Adaptive filter.*

Introduction

In recently, U-Healthcare has evolved into Smart-Healthcare due to growth of IoT technology and entry into an aging society, it is able to provide variety of medical service technologies[1]. Wearable technology for health monitoring in everyday life is provided with a variety of medical service models through linkage with existing ICT infrastructures[2]. The wearable device is currently used most in Activity device field and Healthcare

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device field. Activity devices[3,4] can monitor motion and physical activity information, and healthcare devices[5,6] can monitor bio-signals such as blood pressure, ECG, EMG, EEG and etc. and transmit to users or external agencies. In particular, ECG and PPG are bio-signals that reflect the activity state of heart, and serve as the important criteria signal when diagnosing heart disease and vascular diseases. The heart rate that represents the activity cycle of heart is the overall rhythm determined by count of contraction and relaxation activities of the SA-node[7]. Blood released from the left ventricle during systole moves to the peripheral blood vessels and increases arterial dimensions. Thereafter, pulse generated at a portion where blood is drawn into the heart from peripheral blood vessels during diastole. At this time, analyzing the penetrance and the reflectance using the light to the pulse generated can measure the PPG signal moving according to the heartrate. Although it is common to use contact-type measurement methods that attach to the body to measure heart activity state, there are many problems such as cost and wearing limitations to use in daily life. To solve this problem, PPG and heart rate measurement systems using non-contact type measurement have been studied [8-10]. This paper proposes a glove-type wearable healthcare system that heart rate monitoring according to heart activity state and minimizes noise due to external light or user movement. The system implemented reflection type PPG probe using infrared led (IR) and red led(R) as the light source, enabling non-invasive measurement for a long term with simple operation method without specialization. In addition, adaptive filter is designed for remove to noise caused by ambient bio-signal and user motion when measuring the PPG. The implemented system can monitor the heart rate information according to the activity state as well as the physical information, and it can transmit the current location information and health information to the surrounding people in case of emergency.

Materials and Method

In the proposed system is first to filter and amp the data measured thought the PPG sensor in the measurement section, and then to perform the ADC conversion in the control section. Then, heart rate was detected from the filtered data by the IBI method after remove the motion noise using the adaptive filter. Finally, heart rate display is possible on the LCD in the control section and transmitted to the monitoring section through Bluetooth communication. Monitoring section can precise heart rate monitoring as well as transmit the current location information and health information to the surrounding people in case of emergency. Figure 1 shows the flow chart of glove-type wearable health management system.

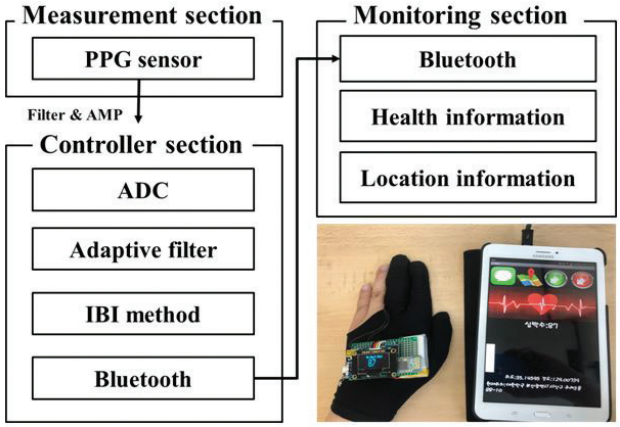


Figure 1: Flow chart of the glove-type wearable healthcare system

Beer-Lambert Law for PPG Measurement: The Beer-Lambert law built in the measurement sensor was used for PPG measurement. Beer-Lambert law detects the heart rate from changes in blood flow using optical feature. Figure 2 shows the flowchart of Beer-Lambert law.

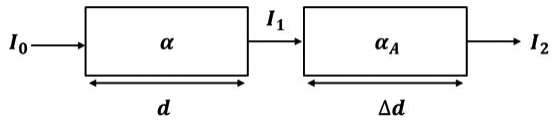


Figure 2: Flowchart of the Beer-Lambert Law

Light generating from light source (I_0) is partially absorbed in the process of penetrating skin tissue. This can be seen as a DC component since the penetration length of light (d) and absorption of light (α) are not changed. In addition, penetration light (I_1) after passing through the DC component can be represented by the light of the AC component (I_2) if it is influenced by relative absorption (α_A) of arterial blood and penetration length (Δd) due to changes arterial blood dimensions. The AC component shows the effect of changes in light penetration length and relative absorption of arterial blood. Equation 1 shows the calculated equations of (I_1) and (I_2).

$$I_0 \exp - (\alpha d + \alpha \delta d) \quad \ldots(1)$$

Adaptive Filter Design for Motion Noise Remove: Since the PPG signal is measured using an optical method, it is highly affected by noise. There are not only

light sources analyzed when light penetrance skin tissue, but also ambient light noise, noise caused by physical combining errors in measuring sensors and measuring parts, electromagnetic noise of the measuring equipment itself, etc. Using PPG signals that are affected by these noises will cause distortion of waveforms and changes in amplitude it is making accurate measurements impossible. Therefore, while the PPG signal measures the heartrate cycle, is also necessary to remove motion noise because the signal related to breathing is also measured. In this paper, we implemented an adaptive filter using LMS(least mean square) algorithm based on the steepest descent method to remove the motion noise generated when PPG measurement. The adaptive filter iteratively adjusts the filter coefficients with the least mean square algorithm based on a given filter coefficient to estimate remove noise or features of the desired signal. Figure 3 shows a diagram of the implemented adaptive filter. Equation 2-4 shows the equations of the implemented adaptive filter.

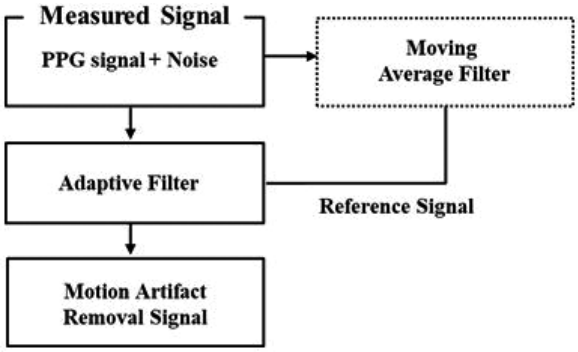


Figure 3: Diagram of the implemented adaptive filter

$$E(n) = P(n) + N(n) - eN(n) \quad \ldots(2)$$

$$eN(n) = \sum_{k=0}^{L} h_k N_R (n-k) \quad \ldots(3)$$

$$h_k(n+1) = h_k(n) + 2\mu E(n) N_R(n-k) \quad \ldots(4)$$

P_n is the original signal, L is the degree, $N_{(n)}$ is the noise component signal, $N_R(n)$ is the reference noise signal extracted from the low frequency band by applying the moving average filter, eN(n) is the estimated noise signal, $h_k(n)$ is the filter coefficient, and μ is the convergence constant.

IBI Method for Heart Rate Analysis: To reliably measure the IBI(Inter beat Interval) between PPG bits, an 8-bit hardware timer timer2 was set in the ATmega128-based control section to generate an interrupt every millisecond. This allows a sampling rate of 500 Hz and a bit timing of 2ms. After calculating the maximum and minimum points from the measured data every 2ms, measure the first beat and second beat if the 10 IBIs become one function. By calculating the average IBI using the two measured functions and dividing by 60000, the BPM can be obtained. Finally, if the range of data transmitted to the monitoring system is 0 or more than, the range of BPM is given and it is judged whether there is an abnormal or normal. If there is no input data, check for connection again. When an abnormal bpm is detected, BPM, latitude, longitude, and location address information are sending to surrounding people. Android studio program based application has been implemented to monitoring precise heartrate graphs. Figure 4 shows the flow chart of the IBI method and Application

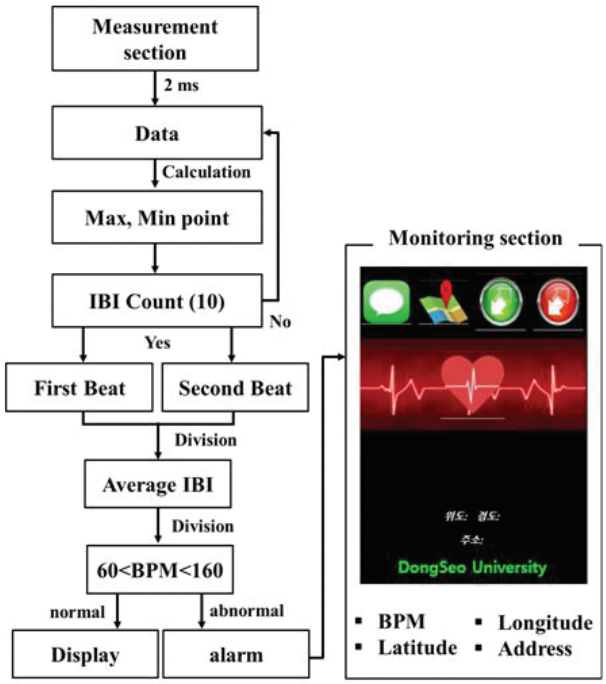


Figure 4: Flowchart of the IBI Method and Application

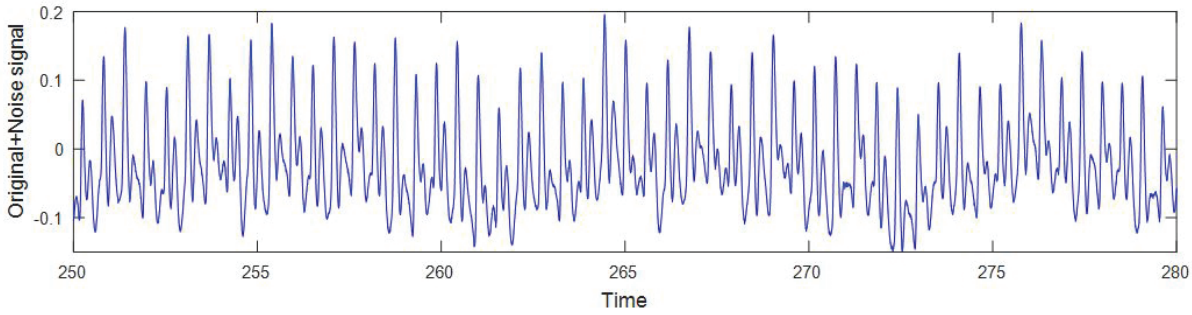
Results and Discussion

Comparison Evaluation with Commercial Systems: An experiment was conducted with Physio lab company PPG measurement system (PSL-iPPG2) for comparative evaluation with commercial systems. The experiment was progress for 5 minutes with 5 subjects. Experimental results showed that the similarity of heart rate detection between the implemented system and commercial system was 98.44%, which is an excellent detection performance. Table 1 shows the heart rate comparison results between the implemented system and the commercial system.

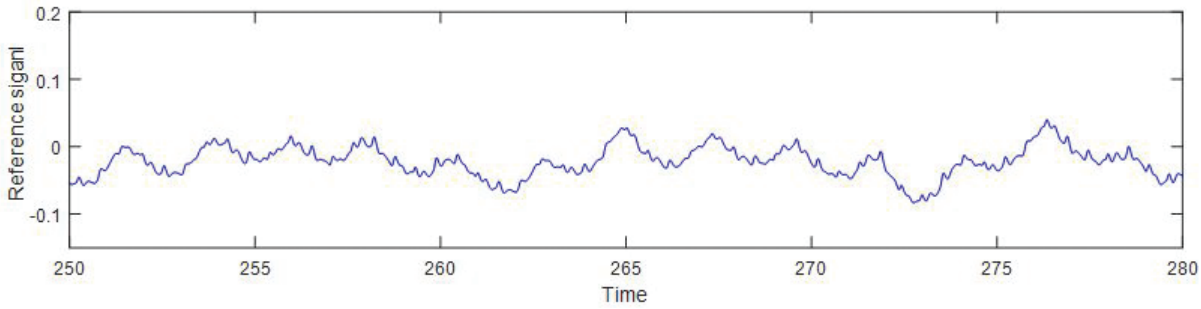
Table 1: Comparison Results Between the Implemented System and the Commercial System

	Detection Heart Rate		
	Implement system	**Commercial system**	**Similarity [%]**
Subject 1	348	354	98.30
Subject 2	379	382	99.21
Subject 3	366	372	98.38
Subject 4	388	396	97.97
Subject 5	359	365	98.35
Avg.			98.44

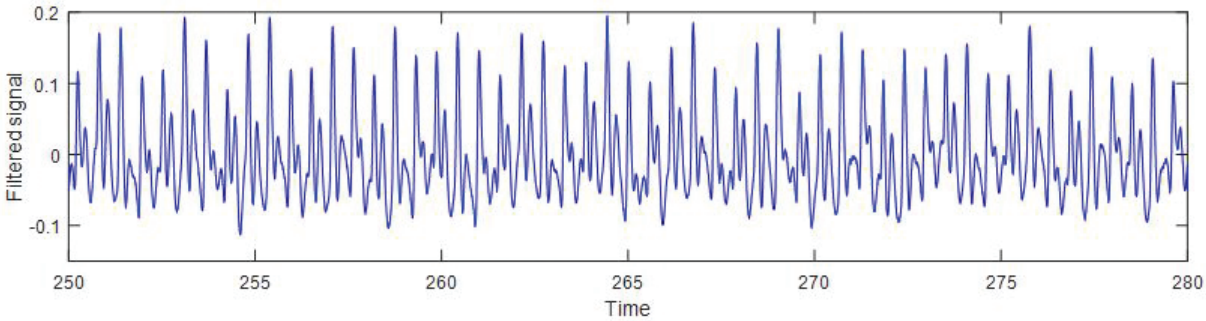
Adaptive Filter Performance Evaluation: In order to evaluate the performance of the adaptive filter, artificial noise signal and motion noise signal were added to the original signal to remove the noise using the proposed adaptive filter. First, in order to evaluate the features of motion noise components, we analyzed PPG signal measured after a 10 - minute rest and PPG signals measured at walking and running. As a result, it was possible to identify a specific frequency component which appears only in the activity state such as walking and running, unlike the frequency component in the sitting static state. Therefore, the frequency of 3Hz, 2.7Hz, and 4.1Hz was determined as a specific frequency, and an artificial motion noise signal was generated by mixing the noise signal of the specific frequency band with the white noise. Experimental results show that the proposed adaptive filter has superior motion noise removal performance. Figure 5 shows the results of the adaptive filter performance evaluation.



(a) Original + Noise signal



(b) Reference signal



(c) Processing with adaptive filter

Figure 5: Results of the adaptive filter performance evaluation

Performance Evaluation in Everyday Life: To evaluate overall performance of measuring heart rate in everyday life, an experiment was conducted to measure heart rate during the activity state for 10 minutes with 5 subjects wearing implemented system. The experimental environment established different sections of moving path as shown in figure 6 (a: downhill, b: flatland, c: uphill) on the campus and took a 30-second break before moving by section. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. In order to determine the heart rate detection of the two methods, MATLAB was used to visually count the heart rate recorded in the heart rate recording papers and set them as reference heart rate. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter.

Table 2 shows the heart rate detection results of the two methods. Figure 7 shows result of remove motion noise in daily life.

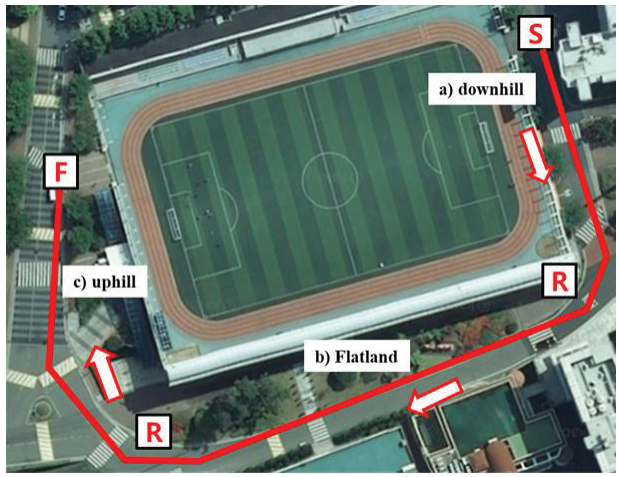


Figure 6: Moving path

Table 2: Heart Rate Detection Results of the Two Methods

	a section			b section			c section		
	RS	**WF**	**NF**	**RS**	**WF**	**NF**	**RS**	**WF**	**NF**
Subject 1	234	228	206	213	207	203	249	243	207
Subject 2	246	243	217	222	216	213	261	255	218
Subject 3	261	255	214	237	233	227	279	273	242
Subject 4	296	291	267	228	225	221	301	293	246
Subject 5	267	261	233	224	220	218	283	279	243
Detection [%]		98.30	87.13		97.95	96.25		97.81	84.19
	[RS]Reference signal, [WF]with adaptive filter, [NF]not adaptive filter WF=98.02% NF=89.19%								

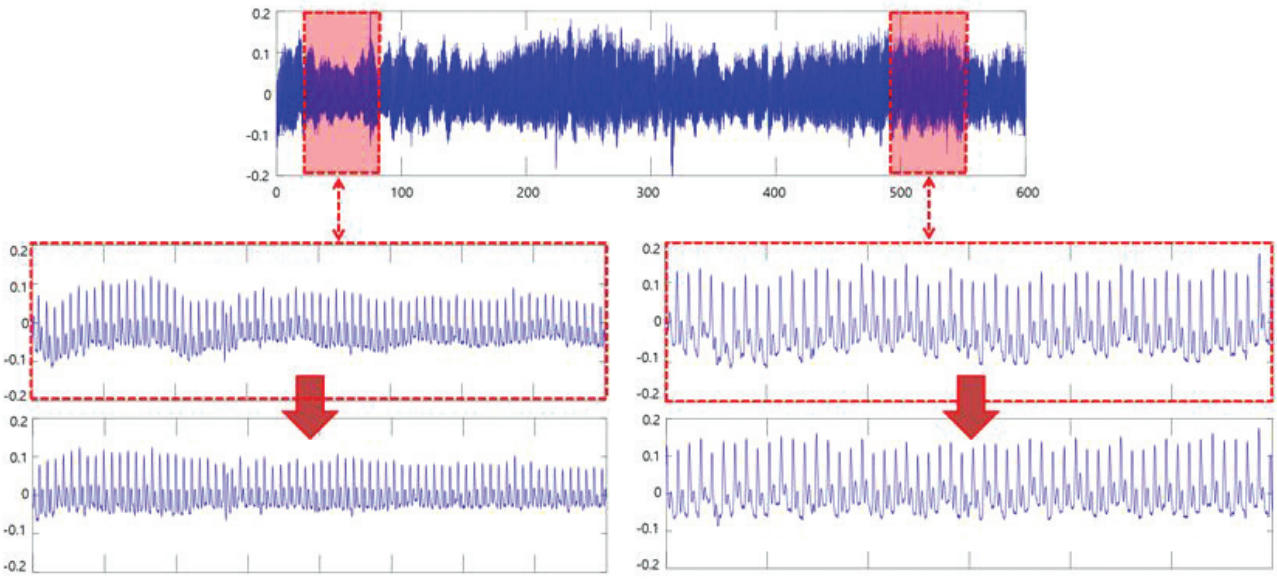


Figure 7: Result of remove motion noise in daily life

Conclusion

This paper has implemented a glove-type wearable healthcare system for measuring heart rate in daily life. The implemented system measured PPG using Beer-Lambert law for PPG sensor. Also, in this paper implemented an Android-based monitoring section for real-time monitoring. Monitoring section can precise heart rate monitoring as well as transmit the current location information and health information to the surrounding people in case of emergency. To evaluate overall performance of implemented system, experiment was conducted to comparative evaluation with commercial system, adaptive filter evaluation and performance evaluation in daily life. For a reliable system evaluation, we conducted a comparative experiment with the commercial system(PSL-iPPG2) of Physiolab company and confirmed the similarity of 98.44%.Evaluated the adaptive filtering implemented by adding artificial noise to the original signal, and it was confirmed that the motion noise remove performance is excellent. In addition, heart rate detection precise of the detection system using the general detection method and the adaptive filter was evaluated. As a result, heart rate detection of 89.19% was found to be low in the case of the general detection method and 98.02% in the case of the heart rate detection method using the adaptive filter. Therefore, it is confirmed that the system implemented in this paper is applicable to everyday life. In future research, it is aimed to implement a heart rate monitoring system optimized for motion noise for measuring heart rate with various activity states and psychological changes.

Acknowledgment

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Women's Quality of Life and Their Health Awareness by Age at the First Childbirth and Age at the Last Childbirth

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ABSTRACT

Background/Objectives: The aim of this study was to prove how factors associated with childbirth related variables affect women's quality of life (QoL) and their health awareness.

Method/Statistical Analysis: This study is a secondary analysis that uses the raw data collected through the KNHANES between 2013 and 2015.A total of 5,698 subjects were selected for this study among 22,948 participants who completed the KNHANES between 2013 and 2015. This study used the SPSS win 19 program to analyze data and a complex sample- general linear model was used to analyze quality of life by examining childbirth related variables.

Findings: While childbirth affected women's QoL and their health awareness when their first childbirth occurred prior to 20 years of age, it did not affect women's QoL and their perceived health conditions when the first childbirth occurred after age 20.

Improvements/Applications: Study results can be used to alter women's perceptions of childbirth if they avoiding giving birth due to an assumption that it will have a negative influence on their QoL and health.

Keywords: *Quality of life (QoL), Subjective health status, Childbirth age, Birth interval, KNHANES.*

Introduction

Continuing low birth rates and delays in the parturition of the first child due to women's avoidance of childbirth have resulted in numerous demographically issues[1-3].

Korea's total fertility rate has been decreasing since 1983 and it dropped below 1.5 in 2000[4]. The total fertility rate in 2013 was 1.19, which was too low to even maintain the current demographic structure and accordingly, population policy interventions are required to prevent destabilization of the demographic structure.

Society's stress for higher education is one of factors that has affected women's desire to start a family. Women have obtained more roles in labor market by participating as an economic population. Additionally, birth culture has been changed due to changes in values such as gender equality and marriage. In modern society generally, women are expected to be juggle work with family life, and the tension between these roles plays a primary factor in women's avoidance of child birth.This is because modern women consider their individual QoL, pursuing their personal satisfaction and meeting their desires as more important than participating in childbirth[5-9].

An individual's QoL is a multi-dimensional concept that is related to physical, mental, social, emotional, and individual functioning [10]. Women in modern society view taking a break in their career to give birth and rear their children as decreasing their quality of life. This causes an increase of married couples who give up having a child and Korea's demographic structure has been jeopardized due to the decrease in fertility rate. Thus women's efforts to keep up their QoL and increase their social roles have brought about the avoidance of childbirth.

Therefore, it is necessary to positively change perceptions of childbirth by implementing policies that can make it easier for women to carry out their work and

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rear their children instead of encouraging them avoid childbirth.The study seeks to investigate how factors associated with childbirth such as the age at first birthing, number of children, age at last birth, and birth interval affect women's QoL and their health awareness stste.

Method

Study Design: This paper is a secondary analysis examining raw data from the Korean National Health and Nutrition Examination Survey VI (KNHANES VI) prosecuted between 2013 and 2015.

Study Population: A total of 5698 women were finally selected as this study subjects from a total of 22,948 participants who completed the Korean National Health and Nutritional Examination Survey between 2013 and 2015. The subjects were married, lived with their partners, had no ongoing illness, and answered in the survey about their age at first and last birth.

Study Variables: This paper used health survey data including demographic characteristics, socio-economic characteristics,disease incidence and prevalence, age of the first birth, age of the last birth, recognition of stress, and perceived health condition in the KNHANES raw data.

The participants' age at the first birth was divided into the following groups: below 20s, between 20 and 29, between 30 and 39, and over 40s. Subjects who had the same age of the first and last birth were indicated as "1" and subjects who reported that theyhad a different age between the first and last birth were indicated as "2." The birth interval was specified as follows; 1 child when subjects had the same age of the first and last birth and gaps in the mother's age ranging from 1 year ~5 years, 6 years ~10 years, 11 years ~15 years, and over 16 years.

Awareness of level of stress was interpreted as follows; 1 point- hardly/never, 2 points- a little, 3 points- high, and 4 points- extremely high, with higher point values being indicative of higher levels of stress. A subjective health condition was specified as follows; 1 point (very bad), 2 points (bad), 3 points (mediocre), 4 points (good), and 5 points (very good), with higher point values showing better health.

EQ-5D materials were employed to study QoL. EQ-5D is a standard instrument that assesses the QoL related to health conditions which is composed of five areas including mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. It uses a three-point scale wherein 1 point-no problem, 2 points- some problems, 3 points- serious problems. Subject's quality of life was determined by converting each question into weight values ranging between 1 (excellent) and -1 (worst; worse than dying).

Statistical Analysis

SPSS win 19 was used for analysis, and statistical errors were below 0.05. Statistical analysis was conducted by using complex standard design through applying weight values. Subjects' general characteristics were calculated through frequency and percentage. Differences in the age at the first birthing, number of children, age at the last birth, QoL based on birth interval, recognition of stress, and subjective level of health were analyzed by using a complex sample general linear model (CSGLM).

Ethical Considerations: The Korea National Health and Nutrition Examination Survey was conducted with the approval of the institutional review board of the KCDC and the raw data can be downloaded from the website of the KNHANES for academic research use.

Results and Discussion

The Socioeconomic Related Characteristics of Subjects

Table 1 presents the socioeconomic related characteristics of subjects.

Subjects' age was investigated as follows;20~29 (3.8%), 30~39 (22.5%), 40~49 (27.7%), 50~59 (25.8%), 60~69 (13.2%), and over 70 (6.9%).

18.8% of subjects had one child and 81.2% had two or more children. 95% of subjects' age at first birth was between 25.74~26.01 and 0.4% of subjects first gave birth when they were over 40. 95% of subjects' age at last birth was between 29.47~29.73 and this indicated that subjects stopped giving birth at a relatively young age. 95% of subjects' birth interval was 3.61~3.83 years and 58.80% of subjects had the birth interval of 1 to 5 years. Regarding subjects' recognition of stress level, 95% CI was 2.14~2.18 points, indicating that majority of subjects experience a low level of stress. In regard to subjects' perceived health, 95% CI was 3.07~3.12 points which indicates subjects feel they have mediocre health.

Table 1: Socioeconomic related characteristics of study participants (N = 5698)

Characteristics	Categories	N[a]	Estimated value (%) [b]	SE (%) [b]
Age (years)	20~29	138	3.80	0.40
	30~39	1115	22.50	0.80
	40~49	1369	27.70	0.80
	50~59	1459	25.80	0.70
	60~69	1046	13.20	0.50
	≥70	571	6.90	0.30
Residential area	Capital (Seoul)	1075	19.60	0.60
	Urban, Metropolitan area	1498	26.30	1.10
	Province	3125	54.20	1.20
Personal income level	Lower class (1st quartile)	1196	21.70	0.70
	Lower-middle class (2nd quartile)	1415	25.40	0.80
	Upper-middle class (3rd quartile)	1567	26.90	0.80
	Upper class (4th quartile)	1499	26.00	1.00
Household income level	Lower class (1st quartile)	829	11.70	0.60
	Lower-middle class (2nd quartile)	1441	25.50	0.80
	Upper-middle class (3rd quartile)	1666	31.00	0.90
	Upper class (4th quartile)	1741	31.80	1.10
Education	⩽Elementary school	1378	19.10	0.70
	Middle school	675	11.30	0.50
	High school	1974	37.80	0.80
	⩾College	1666	31.80	0.90
Occupation	Professional occupations	578	10.80	0.50
	Other occupations	2179	38.10	0.80
	Unemployed (housewives and students)	2937	51.20	0.80
Basic living allowance (n=5695)	Yes, received	256	4.30	0.30
	No, never received	5439	95.70	0.30
Home ownership (n=5697)	No home ownership	1560	30.00	1.00
	1 household	3312	56.80	0.90
	2 or more household	825	13.20	0.60
Number of children	One person	954	18.80	0.60
	More than two	4744	81.20	0.60
Age of first birth	95% CI: 25.74~26.01 Min.~ Max.: 15~50	5698	25.88	0.069
	Below 19	244	3.80	0.30
	20~29	4618	80.20	0.70
	30~39	814	15.60	0.60
	Over 40	22	0.40	0.10
Age of last birth	95% CI: 29.47~29.73 Min.~ Max.: 16~50	5698	29.60	0.065
	Below 19	13	0.30	0.10
	20~29	2947	51.60	0.80
	30~39	2639	46.60	0.80
	Over 40	99	1.60	0.20

Conted…

Interval between births	95% CI: 3.61~3.83 Min.~ Max.: 0~30	5698	3.72	0.056
	One child	954	18.80	0.60
	1~5 years	3307	58.80	0.80
	6~10 years	1040	16.60	0.50
	11~15 years	282	4.20	0.30
	Over 16 years	115	1.60	0.20
Recognition of stress (n=5656)	95% CI: 2.14~2.18	5656	2.16	0.010
	Barely/never	820	13.50	0.50
	A little	3462	60.80	0.80
	High	1127	21.10	0.70
	Extremely high	247	4.60	0.30
Perceived health status (n=5696)	95% CI: 3.07~3.12 Min.~ Max.: 1~5	5696	3.09	0.013
	Very bad	224	3.20	0.30
	Bad	905	15.60	0.50
	Mediocre	3002	53.20	0.80
	Good	1359	24.50	0.70
	Excellent	206	3.60	0.30

a: Unweighted value, b: Weighted value

Women's QoL and their health awareness state by age of the first birth.

Korean women's QoL and their health awareness state by age of the first birth was indicated in table 2.

There were significant differences in subjects' QoL by age of the first birth (Wald F=15.49, p<0.001) and in the sub-categories of quality of life including mobility (Wald F=17.00, p<0.001), self-care(Wald F=11.17, p<0.001), usual activities (Wald F=9.70, p<0.001), and pain/discomfort (Wald F=3.46, p=0.016. Additionally, there was significant difference in participants' health awareness state by age of the first birth (Wald F=8.58, p<0.001).

Subjects' QoL (5EQ point) showed that women who first gave birth in their 20~29 and 30~39 age range were higher than participants who first became a mother in their teenage years(Wald F=22.72, p<0.001; Wald F=38.42, p<0.001,respectively). The sub-categories of QoL including 5EQ (mobility) and 5EQ (usual activities) showed significant differences(Wald F=20.54, p<0.001; Wald F=20.19, p<0.001, respectively), as women who were 20~29 and 30~39 displayed higher point values of 5EQ compared to participants who were below 20 years of age(Wald F=37.55, p<0.00; Wald F=27.00, p<0.001, respectively).

In the area of health awareness state, participants who had their first birth in their 20~29 and 30~39age range felt healthier compared to women who had the first child birth before age 20(Wald F=14.10, p<0.001; Wald F=23.79, p<0.001, respectively).

Table 2: EQ-5D and their health awareness state according to age at the first childbirth in Korean women (N = 5698)

Categories	Age at the first childbirth (years)	% [a]	Mean	SE	Estimated value	SE	Wald F	*p*
5 EQ-Total							15.49	<0.001
	<20	3.80	0.90	0.01	Ref			
	20~29	80.20	0.94	0.01	0.04	0.01	22.72	<0.001
	30~39	15.60	0.96	0.01	0.05	0.01	38.42	<0.001
	>40	0.40	0.93	0.02	0.02	0.02	0.76	0.382

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5 EQ: mobility							17.00	<0.001
	<20	3.80	1.28	0.03	Ref			
	20~29	80.20	1.13	0.01	-0.15	0.03	20.54	<0.001
	30~39	15.60	1.06	0.01	-0.21	0.03	37.55	<0.001
	>40	0.40	1.19	8.79	-0.09	0.09	1.00	0.316
5 EQ: self-care							11.17	<0.001
	<20	3.80	1.05	0.01	Ref			
	20~29	80.20	1.02	0.01	-0.02	0.01	2.89	0.089
	30~39	15.60	1.00	0.31	-0.04	0.01	10.38	0.001
	>40	0.40	1.09	6.76	0.04	0.06	0.43	0.508
5 EQ: usual activities							9.70	<0.001
	<20	3.80	1.21	0.02	Ref			
	20~29	80.20	1.08	0.01	-0.13	0.03	20.19	<0.001
	30~39	15.60	1.04	0.01	-0.16	0.03	27.00	<0.001
	>40	0.40	1.09	0.06	-0.11	0.07	2.42	0.120
5 EQ: pain/ discomfort							3.46	0.016
	<20	3.80	1.34	0.03	Ref			
	20~29	80.20	1.28	0.01	-0.06	0.03	2.91	0.088
	30~39	15.60	1.22	0.01	-0.11	0.04	7.74	0.006
	≥ 40	0.40	1.26	0.11	-0.07	0.11	0.42	0.513
5 EQ: anxiety/ depression							1.98	0.116
	<20	3.80	1.17	0.03	Ref			
	20~29	80.20	1.12	0.01	-0.04	0.03	1.74	0.187
	30~39	15.60	1.11	0.01	-0.06	0.03	3.35	0.068
	≥40	0.40	1.27	0.10	0.09	0.11	0.76	0.381
Recognition of stress (n=5656)							2.48	0.060
	<20	3.80	2.20	0.05	Ref			
	20~29	80.20	2.15	0.01	-0.04	0.05	0.62	0.429
	30~39	15.70	2.20	0.02	0.01	0.06	0.01	0.890
	≥40	0.30	2.51	0.18	0.31	0.19	2.63	0.105
Perceived health status (n=5696)							8.58	<0.001
	<20	3.80	2.82	0.06				
	20~29	80.20	3.08	0.01	0.26	0.06	14.10	<0.001
	30~39	15.60	3.20	0.03	0.37	0.07	23.79	<0.001
	≥40	0.40	3.00	0.16	0.17	0.18	0.89	0.345

a: Weighted value

Women's QoL and their health awareness state by number of children.

Korean women's quality of life and their health awareness state by number of children was indicated in table 3.

There was significant differences in women's QoL by number of children (Wald F=23.28, p<0.001) and in the sub-categories of quality of life including mobility (Wald F=33.04, p<0.001), self-care (Wald F=14.41, p<0.001), and usual activities (Wald F=7.52, p<0.001).

5EQ point (quality of life) appeared higher among women who had two or more children compared to who had one child (Wald F=23.28, p<0.001). Women who had two or more children showed higher quality of life rather

than women who had one child in the sub-categories of QoL including 5EQ-mobility, 5EQ-self-care, and 5EQ-usual activities which displayed significant differences.

Subjects' number of children did not affect women's health awareness state as it did not show any significant difference. This finding is contradicting to findings in Payne's research [11], that is, women perceived their health bad and men perceived their health good in case of having higher number of children. It is analyzed that the subjects of this study had one or two children and consequently the number of children did not affect participants' perceived health status.

Table 3: EQ-5D and their health awareness state according to number of children in Korean women (N = 5698)

Categories	Number of children	% [a]	Mean	SE	Estimated value	SE	Wald F	*p*
5 EQ-Total	One child	18.80	0.96	0.01	Ref			
	More than two children	81.20	0.94	0.01	-0.01	0.01	23.28	<0.001
5 EQ: mobility	One child	18.80	1.07	0.01	Ref			
	More than two children	81.20	1.14	0.01	0.06	0.01	33.04	<0.001
5 EQ: self-care	One child	18.80	1.01	0.01	Ref			
	More than two children	81.20	1.03	0.01	0.01	0.01	14.41	<0.001
5 EQ: usual activities	One child	18.80	1.05	0.01	Ref			
	More than two children	81.20	1.08	0.01	0.02	0.01	7.52	0.006
5 EQ: pain/ discomfort	One child	18.80	1.25	0.01	Ref			
	More than two children	81.20	1.28	0.01	0.02	0.01	2.69	0.101
5 EQ: anxiety/ depression	One child	18.80	1.12	0.01	Ref			
	More than two children	81.20	1.13	0.01	0.01	0.01	0.66	0.417
Recognition of stress (n=5656)	One child	18.80	2.19	0.02	Ref			
	More than two children	81.20	2.16	0.01	-0.03	0.02	1.41	0.235
Perceived health status (n=5696)	One child	18.80	3.12	0.02	Ref			
	More than two children	81.20	3.08	0.01	-0.04	0.03	1.59	0.208

a: Weighted value

Women's QoL and their health awareness state by age of the last birth.

Korean women's QoL and their health awareness state by age of the last birth is shown in table 4.

There were no significant differences in women's QoL and their health awareness state by age of the last birth. This indicated that age of the first birth affects women's health while age of the last birth did not significantly impact on women's QoL and their health awareness state. This study indicated that 95% of subjects' last birth age was before 30 years old and the variables of the last birth age did not show any significant differences in their QoL and their health awareness state. Therefore, it is necessary to have a comparison study that examines more diverse age groups according to the age of the last birth such as in 20s, 30s, and 40s.

Table 4: EQ-5D and their health awareness state according to age at the last childbirth in Korean women (N = 5698)

Categories	Age at the last childbirth (years)	% [a]	Mean	SE	Estimated value	SE	Wald F	*p*
5 EQ-Total							2.13	0.095
	<20	0.30	0.94	0.03	Ref.			
	20~29	51.60	0.94	0.01	0.01	0.03	0.08	0.773
	30~39	46.60	0.95	0.01	0.01	0.03	0.11	0.735
	≥40	1.60	0.91	0.01	-0.02	0.03	0.39	0.529

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5 EQ: mobility							1.88	0.131
	<20	0.30	1.08	0.06	Ref.			
	20~29	51.60	1.13	0.01	0.04	0.06	0.50	0.478
	30~39	46.60	1.12	0.01	0.03	0.06	0.37	0.541
	≥40	1.60	1.22	0.04	0.13	0.07	3.37	0.067
5 EQ: self-care							0.75	0.522
	<20	0.30	1.08	0.06	Ref.			
	20~29	51.60	1.02	0.01	-0.06	0.06	0.92	0.337
	30~39	46.60	1.02	0.01	-0.06	0.06	0.94	0.331
	≥40	1.60	1.05	0.02	-0.03	0.06	0.23	0.632
5 EQ: usual activities							1.23	0.296
	<20	0.30	1.28	0.18	Ref.			
	20~29	51.60	1.08	0.01	-0.19	0.18	1.13	0.287
	30~39	46.60	1.07	0.01	-0.20	0.18	1.21	0.271
	>40	1.60	1.12	0.03	-0.15	0.19	0.68	0.409
5 EQ: pain/ discomfort							2.07	0.103
	<20	0.30	1.19	0.091	Ref.			
	20~29	51.60	1.27	0.01	0.08	0.09	0.77	0.379
	30~39	46.60	1.26	0.01	0.07	0.09	0.55	0.459
	≥40	1.60	1.41	0.061	0.22	0.11	3.60	0.058
5 EQ: anxiety/ depression							1.82	0.141
	<20	0.30	1.05	0.05	Ref.			
	20~29	51.60	1.12	0.01	0.07	0.05	1.62	0.203
	30~39	46.60	1.12	0.01	0.07	0.05	1.50	0.220
	≥40	1.60	1.22	0.04	0.16	0.07	5.06	0.025
Recognition of stress (n=5656)							1.91	0.126
	<20	0.30	1.96	0.22	Ref.			
	20~29	51.50	2.15	0.01	0.18	0.22	0.71	0.400
	30~39	46.70	2.17	0.01	0.21	0.22	0.89	0.344
	≥40	1.50	2.32	0.07	0.35	0.23	2.30	0.130
Perceived health status (n=5696)							2.46	0.062
	<20	0.30	3.16	0.30	Ref.			
	20~29	51.60	3.07	0.01	-0.09	0.30	0.09	0.757
	30~39	46.60	3.12	0.01	-0.03	0.30	0.01	0.900
	≥40	1.60	2.97	0.08	-0.19	0.31	0.36	0.544

a: Weighted value

Women's QoL and their health awareness state by the interval between births.

Korean women's QoL and their health awareness state by birth interval is shown in table 5.

This study found that there were significant differences in women's QoL (Wald F=19.71, p<0.001) and sub-categories of QoL including mobility (Wald F=27.31, p<0.001), self-care (Wald F=6.27, p<0.001), usual activities (Wald F=10.79, p<0.001), and pain/ discomfort (Wald F=7.73, p<0.001). And there were significant difference in their health awareness state by the interval between births (Wald F=8.50, p<0.001).

Women who had one child and women who had their second child within 5 years after the first one did not show any significant differences in 5EQ point (quality of life). However, women's QoL decreased among those who had birth intervals of 6~10,11~15, and over 16 years compared to women who had only one child(Wald F=41.31, p<0.001; Wald F=39.85, p<0.001; Wald F=21.05, p<0.001, respectively).

Women who had one child and women who had their second child within 5 years after the first one did not show any significant differences in their health awareness state. However, women's health awareness state diminished among those who had a birth interval of 6~10,11~15, and over 16 years compared to women who had one child (Wald F=9.20, p=0.003; Wald F=10.34, p=0.001; Wald F=12.57, p<0.001, respectively).

Table 5: EQ-5D and their health awareness state according to birth interval in Korean women (N = 5698)

Categories	Birth interval (years)	% [a]	Mean	SE	Estimated value	SE	Wald F	*p*
5 EQ-Total							19.71	<0.001
	One child	18.80	0.96	0.01	Ref.			
	1~5	58.80	0.95	0.01	-0.01	0.01	2.98	0.085
	6~10	16.60	0.93	0.01	-0.03	0.01	41.31	<0.001
	11~15	4.20	0.90	0.01	-0.06	0.01	39.85	<0.001
	≥16	1.60	0.87	0.01	-0.08	0.01	21.05	<0.001
5 EQ: mobility							27.31	<0.001
	One child	18.80	1.07	0.01	Ref.			
	1~5	58.80	1.10	0.01	0.02	0.01	6.59	0.010
	6~10	16.60	1.20	0.01	0.12	0.01	51.97	<0.001
	11~15	4.20	1.31	0.03	0.24	0.03	51.12	<0.001
	≥16	1.60	1.38	0.05	0.31	0.05	34.80	<0.001
5 EQ: self-care							6.27	<0.001
	One child	18.80	1.01	0.01	Ref.			
	1~5	58.80	1.02	0.01	0.01	0.01	3.78	0.052
	6~10	16.60	1.04	0.01	0.03	0.01	16.79	<0.001
	11~15	4.20	1.07	0.01	0.05	0.01	11.59	0.001
	≥16	1.60	1.09	0.02	0.08	0.03	7.33	0.007
5 EQ: usual activities							10.79	<0.001
	One child	18.80	1.05	0.01	Ref.			
	1~5	58.80	1.06	0.01	0.01	0.01	0.50	0.478
	6~10	16.60	1.12	0.01	0.06	0.01	18.47	<0.001
	11~15	4.20	1.17	0.02	0.11	0.02	18.40	<0.001
	≥16	1.60	1.21	0.04	0.15	0.04	11.65	0.001
5 EQ: pain/ discomfort							7.73	<0.001
	One child	18.80	1.25	0.01	Ref.			
	1~5	58.80	1.25	0.01	0.01	0.01	0.01	0.965
	6~10	16.60	1.32	0.01	0.07	0.02	9.89	0.002
	11~15	4.20	1.40	0.03	0.15	0.04	12.99	<0.001
	≥16	1.60	1.45	0.07	0.19	0.07	7.56	0.006
5 EQ: anxiety/ depression							2.04	0.087
	One child	18.80	1.12	0.01	Ref.			
	1~5	58.80	1.12	0.01	0.01	0.01	0.01	0.909
	6~10	16.60	1.15	0.01	0.03	0.01	2.68	0.102
	11~15	4.20	1.15	0.02	0.03	0.02	1.05	0.305
	≥16	1.60	1.22	0.04	0.10	0.05	3.97	0.047

Conted…

Recognition of stress (n=5656)							1.44	0.217
	One child	18.80	2.19	0.02	Ref.			
	1~5	58.90	2.16	0.01	-0.03	0.03	1.10	0.295
	6~10	16.50	2.16	0.02	-0.03	0.03	0.65	0.418
	11~15	4.10	2.07	0.04	-0.12	0.05	4.73	0.030
	≥16	1.60	2.22	0.07	0.03	0.08	0.16	0.684
Perceived health status (n=5696)							8.50	<0.001
	One child	18.80	3.12	0.02	Ref.			
	1~5	58.80	3.13	0.01	0.01	0.03	0.03	0.858
	6~10	16.60	3.00	0.03	-0.12	0.04	9.20	0.003
	11~15	4.20	2.91	0.06	-0.21	0.06	10.34	0.001
	≥16	1.60	2.77	0.09	-0.35	0.10	12.57	<0.001

a: Weighted value

Conclusion

One of the factors for continuing low fertility rates is due to women's perception that the childbirth process would reduce their quality of life and negatively impact their health. This research sought to examine how childbirth affects women's quality of life and their perceived health conditions retrospectively and the findings indicate that if the first birth occurred before 20 years of age, childbirth affected women's quality of life and their perceived health. However, if the first birth occurred after age 20, childbirth did not impact women's quality of life and their perceived health conditions. Therefore, this study confirmed that childbirth does not necessarily have a negative impact on women's quality of life and their health and the results of this study should be used to change women's negative perception on childbirth.

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A Study on Reduction of Exposure Dose According to Use of Cone in Radiologic Examination of Paranasal Sinus

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ABSTRACT

It aimed to seek the measures to decrease the exposure dose of radiation for the patients as well as the guardians during the paranasal radiography upon the survey on the usage of cone, which is the radiation shielding material in the paranasal radiography in the medical institutions, to measure the exposure dose to the patients depending on the usage of cone. The cone, diagnostic radiator, Ion Chamber, and Skull Phantom were used. The mean value was obtained measuring the points of 5° intervals of 0°, 45°, 90°, 135°, 180°, 225°, and 315° at 15cm from the center of the phantom five times each. In addition, the space dose was measured up to 200cm while increasing the distance with a radius of 50 cm from the center of the phantom. The spatial scattering dose distribution was measured five times at 50cm, 100cm, 150cm, and 200cm intervals in the directions of 0°, 45°, 135°, and 180° based on the phantom.60% of medical institutions did not have the radiation shielding device of a cone and74.4% did not use the cone in paranasal sinus examination. In the comparison of doses between the use and non-use of a cone, the dose decreased by 50.8% at 0°, 47.3% at 45°, 35.7%at 90°,59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315° when the cone was used. The spatial dosimetry according to the distance was highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at135°, and 0.94mR/h at 180°. In addition, spatial scattering rays were reduced to 92.7% when thecone was used as compared to when no cone was used. Therefore, a cone should be used in the radiologic examinatio of paranasal sinuses, and radiation workers and the family protector should also ensure that they are a safe distance away in order to prevent exposure by secondary radiation.

Keywords: *Cone, Spatial Dosimetry, Paranasal sinus, Dosimetry according, Nasosinusitis*

Introduction

Pediatric nasosinusitis is a disease that is associated with expensive socio-economic costs. It is known that upper airway infections are caused by the virus, that is, cold is the leading cause of nasosinusitis in children. An average of six toeight viral upper airway infections attacks each child every year, and 0.5 to 5.0% of such colds develop to acute bacterial nasosinusitis. In addition, allergic rhinitis, asthma, immunodeficiency, cystic fibrosis, primary ciliary dyskinesia, and gastroesophageal reflux are known to be leading causes of or diseases related to pediatric nasosinusitis[1,2]. Pediatric patients are known to be more susceptible to nasosinusitis than adults, but clinical progress varies from person to person. As the immune system develops, the possibility of natural healing increases. Therefore it is necessary that the choices of antibiotics, adjuvant agents, and surgical treatment are necessary are made in consideration of individual circumstances[3]. Children are highly susceptible to radiation and need to be examined using a radiation shielding device in order to optimize the exposure dose during general radiography[4,5]. Radiologic examination of the paranasal sinus using a beam regulator (Cone), which is a radiation shielding device, can reduce the exposure dose and improve the penumbra removal and sharpness[6]. However, many medical institutions often use diagnostic radiation generators without a cone, which is a radiation shielding device, while using the Crop function to automatically

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cut the image with a Digital Radiography (DR) system. If a cone is not used, the patient's exposure dose will increase and penumbra will occur. In addition, pediatric patients are often accompanied by a radiologist, so the exposure dose of the caregiver should be considered in addition to that of the patient[7, 8].The purpose of this study is to investigate the use of a cone as a radiation shielding device in the radiologic examination of paranasal sinus and to evaluate the exposure dose of patients according to the presence or absence of a cone in radiologic examination of paranasal sinus, and to provide basic data for ensuring radiation safety management.

Dosimetric Instrument and Method

Dosimetric Instrument: A cone, a beam shielding device, was used to compare doses according to the presence or absence of the cone. The cone (beam-shielding device), diagnostic radiator (TE82F, R-150-650, Dong Kang Medical, Korea), Ion Chamber(Radical Corporation, Electrometer ion Chamber, U.S.A), and Skull Phantom were used to measure the spatial dose. G power program(Version 3.1.9.2, University of Kiel, Kiel, Germany) was used to select the number of subjects.

Survey Measurement: The structured questionnaire consisted of two questions about the presence or absence of the cone and whether or not to use the cone, as well as four more general questions. The four general questions involved hospital size, gender, age, and hospital experience. The questionnaire was certified by the Bioethics Committee of the Ministry of Health and Welfare of the Republic of Korea. The number of radiographer subjects in this questionnaire was analyzed by the G power program. In the F-test, the number of specimens required to maintain a median magnitude of 0.25 and maintain a power of 0.8 at a significance level of 0.05 was 102, but 120 radiographers were selected by convenience extraction in anticipation of a10% dropout rate(IRB:P01-201812-22-001).

Dosimetry Method: The paranasal sinus radiation dose was measured in the case using the radiation shielding device cone and the case not using the cone. The conditions used for the measurement were the recommended conditions for head testing according to the Diagnostic Reference Level (DRL) of the Republic of Korea Ministry of Food and Drug Safety, which is FID 100cm. The test conditions were 76kVp and 25mAs. The mean value was obtained measuring the points of 5° intervals of 0°, 45°, 90°, 135°, 180°, 225°, and 315° at 15 cm from the center of the phantom five times each. In addition, the space dose was measured up to 200 cm while increasing the distance with a radius of 50 cm from the center of the phantom. The spatial scattering dose distribution was measured five times at 50cm, 100cm, 150cm, and 200cm intervals in the directions of 0°, 45°, 135°, and 180° based on the phantom(Fig. 1), (Fig. 2).

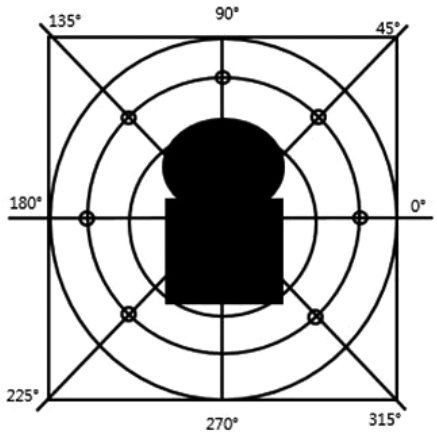

Figure 1: Dosimetry Methodpoint

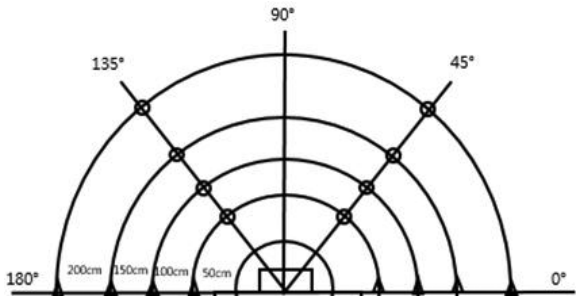

Figure 2: Spatial Dosimetry

Statistical Analysis

The dose according to the measured location was calculated by SPSS(statiscal package for the social sciences) Ver. 24.0, the descriptive statistics were used to measure the Komogorov-smimov fitness test, mean and standard deviation. The paired t-test was used to compare the mean dose difference prior to and after cone use. The results were considered to be statistically significant if the p-value was less than 0.05.

Results

Analysis of Survey According to Use of Cone

General Characteristics of Subjects

The most common characteristics according to the use of the cone were male 86 persons, and female 39 persons, the most common age was30s 52 persons,

age of 20s 33 persons, and age of 40s 25 persons. The most common size of the hospital where one workswasa university hospital size 53 persons, a general hospital size 39 persons, and normal hospital and clinic size 17 persons. The most common length of hospital career was seven years or more with 76 persons (Table. 1).

Table 1: General Characteristics of Subjects (N = 120)

Division		N	%
Sex	Male	86	68.8
	Female	39	31.2
Age	20's	33	26.4
	30's	52	41.6
	40's	25	20.0
	50's	15	12.0
Size Of The Hospital	University Hospital	53	42.4
	General Hospital	39	31.2
	Specialized Hospital	16	12.8
	Private Hospital(clinic)	17	13.6
Hospital Career	1 year below	4	3.2
	1 and below3years group	18	14.4
	3 and below 5years group	14	11.2
	5 and below 7years group	13	10.4
	7years group	76	60.8
N= Number of persons, %=Percent			

Display and Use of Cone: In the question about whether or not one has a cone, 75 persons, answered that they did not have a cone at their medical institution, and 49 persons,answered that they did have a cone.In the paranasal sinus test, 93 persons answered that they did not use the cone in either pediatric or adult tests, 23 persons answered that they always used it in both pediatric and adult tests, 4 persons answered that they used it only with adults, and 3 persons responded that they used it only for children, so most of the medical institutions did not use a cone for paranasal sinus examination (Table. 2).

Table 2: Display and Use of Cone (N = 120)

Division		N	%
Whether to have or not	We have cone	49	39.2
	We don't have cone	75	60.0
	No answer	1	0.8
Whether to use or not	Both adult and child always use cone	23	18.4
	Only child uses cone	3	2.4
	Only adult uses cone	4	3.2
	Neither child nor adult uses cone	93	74.4
	No answer	2	1.6
N= Number of persons, %=Percent			

Dosimetry According to Use of Cone

Detector Dosimetry According to Use of Cone: As a result of measuring the descriptive statistics and paired t-test in order to analyze the dosage difference according to the use of the cone, the researcher obtained the following results: The dose was 50.12 μR/h when not using a cone at 0°, 24.64 μR/h when using a cone, indicating a50.8% decrease when using the cone. At 45°, the dose decreased by 47.3% when using the cone, and decreased by 35.7% when used at 90°. At 135°, the dose decreased by 59.2% when the cone was used and decreased by 39.8% when used at 180°. At 225°, the dose decreased by 27.3% when using the cone and decreased by 46.4% when using the cone at 315°.According to the paired t-test, the t-values were 14.59 at 0°, 27.64 at 45°, 7.81 at 90°, 69.64 at 135°, 22.78 at 180°, 12.54 at 225°, and 48.28 at 315°. The differences in dosages were statistically significant (p <0.000), (Table 3).

Table 3: Detector dosimetry according to Use of Cone (N = 120)

Measuring Direction	Using Cone	Min	Max	Aver	S.D	T-Value
0°	No	50.10	50.20	50.12	0.05	14.59***
	YES	20.00	29.00	24.64	3.93	
45°	No	52.30	53.20	52.86	0.39	27.64***
	YES	27.00	31.00	28.40	1.67	
90°	No	53.20	53.90	53.52	0.31	7.81***
	YES	26.00	40.10	34.42	5.23	
135°	No	54.80	55.40	55.12	0.39	69.64***
	YES	22.00	24.00	22.50	1.67	

Conted…

180°	No	52.80	53.90	53.36	0.05	22.78***
	YES	30.10	35.10	32.14	3.93	
225°	No	41.30	41.90	41.54	0.11	12.54***
	YES	28.10	33.00	30.20	0.82	
315°	No	34.00	34.30	34.16	0.11	48.28***
	YES	17.10	19.10	18.32	0.82	
Min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001						

Spatial Dosimetry According to Distance: Spatial dosimetry showed the following results. The dose was 11.56mR/h when not using the cone and 0.84mR/h when using the cone at 50cm in the direction of 0 °, indicating that the dose decreased by 92.7% when using the cone. The dose decreased by 22.7% when using the cone at 100cm. At 150cm and 200cm, the mean was 0.1mR/h, which was the same before and after using the cone. The dose was 0.91mR/h when not using the cone and 0.30mR/h when using the cone at 50cm in the direction of 180 °, and the dose decreased by 68.1% when using the cone. At 100 cm, the dose decreased by 57.7% when using the cone. At 150cm, the dose decreased by 57.1% when using the cone. At 200cm, the mean value was 0.1mR/h, which was the same before and after using the cone. In the paired t-test, the t-value in the 0° direction was 64.76 at 50 cm and 1.82 at 100 cm, with a statistically significant difference only at 50 cm. The direction of 180° was 16.0 at 50cm, 5.47 at 100cm, and 6.53 at 150cm, which showed a statistically significant difference (Table 4).

Table 4: Spatial Dosimetry according to Distance (N = 120)

Measuring Direction		Using Cone	Min	Max	Aver	S.D	T-Value
0°	50cm	No	11.00	11.80	11.56	0.32	64.76***
		YES	0.80	0.90	0.84	5.23	
	100cm	No	0.30	0.50	0.44	0.09	1.82
		YES	0.20	0.40	0.34	0.09	
	150cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
	200cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
180°	50cm	No	0.90	1.00	0.94	0.11	16.0***
		YES	0.20	0.40	0.30	0.07	
	100cm	No	0.40	0.60	0.52	0.08	5.47***
		YES	0.20	0.30	0.22	0.04	
	150cm	No	0.20	0.30	0.28	0.04	6.53***
		YES	0.10	0.20	0.12	0.04	
	200cm	No	0.10	0.10	0.10a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001, p>0.5							

Spatial Dose in 45º Angle from Center Line: The result of the space dose measurement at the 45° angle from the center line is as follows. The dose was 1.08mR/h when the cone was not used and 0.28mR/h when the cone was used at 50cm in the direction of 45°, indicating that the dose decreased by 74.1% when the cone was used. The dose decreased by 53.3% when the cone was used at 100 cm and the dose decreased by 66.7% when the cone was used at 150 cm. At 200 cm, the dose decreased by 50.0% when the cone was used.The dose was 1.59mR/h when the cone was not used and 0.38mR/h when the cone was used. The dose decreased by 76.1% when the cone was

used. At 100cm, the dose decreased by 65.8% when the cone was used and the dose decreased by 56.2% when the cone was used at 150cm. In the case of 200 cm, the dose decreased by 44.4% when the cone was used. The paired t-test showed a t-value of 45.9° in 50cm with a mean of 8.94 and a mean of 3.16 in 200cm, with a statistically significant difference only in 50cm (p <0.000). The 135° direction showed statistically significant differences from each of 33.07 at 50cm, 9.12 at 100cm, 5.09 at 150cm, and 4.00 at 200cm (Table 5).

Table 5: Spatial Dose in 45º Angle from Center Line (N = 120)

Measuring Direction		Using Cone	Min	Max	Aver	S.D	T-Value
45°	50cm	No	0.80	1.20	1.08	0.39	8.94***
		YES	0.20	0.30	0.28	1.67	
	100cm	No	0.60	0.60	0.60	0.00	-
		YES	0.20	0.30	0.28	0.05	
	150cm	No	0.30	0.30	0.30a	0.00	-
		YES	0.10	0.10	0.10a	0.00	
	200cm	No	0.10	0.30	0.20	0.07	3.16
		YES	0.10	0.10	0.10	0.00	
135°	50cm	No	1.50	1.63	1.59	0.045	33.07***
		YES	0.30	0.40	0.38	3.93	
	100cm	No	0.70	0.80	0.76	0.06	9.12***
		YES	0.20	0.50	0.26	0.13	
	150cm	No	0.30	0.50	0.46	0.09	5.09***
		YES	0.10	0.30	0.20	0.07	
	200cm	No	0.10	0.20	0.18	0.05	4.00***
		YES	0.10	0.10	0.10	0.00	
min: Minimum, max: maximum, S.D: Standard Deviation, ***p<0.001, p>0.5							

Considerations

The use of radiation in medical institutions has led to significant advances in the detection of patients' illnesses. However, there is a loss of radiation exposure caused by medical radiation, while the benefits and harms of radiation have always coexisted. Medical radiation is the most important cause of radiation exposure, and from the viewpoint of radiation protection, the management of medical radiation is crucial[9]. Although the three principles of time, distance, and shielding are specified as methods for reducing the radiation exposure, if the principles of time and distance cannot be fulfilled, radiation shielding should be provided to the patient and the radiation workers with appropriate shielding. These shields are intended to prevent scattering rays, while preventing exposure by a single lane[10]. According to Kim Bum Hee's previous research, doctors and specialists who work in operating rooms are not able to find lead glasses, shields, or thyroid shields, and these are not available at medical institutions either[11]. In this study, 60% of participants answered that the radiation shielding device of acone was not used in their work settings, and only 39% of the users answered that they had a cone. In addition, 74.4% answered that they did not use the cone in paranasal sinus tests, and only 18.4% answered that they used it all the time. These shielding devices play an important role in radiation protection. In this study, the researcher measured the dose according to each angle when using the cone in the paranasal sinuses test. As a result, when the dose was measured using a cone at 0 °, the dose decreased by 50.8%. In addition, the dose reduction was 47.3% at 45°, 35.7% at 90°, 59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315°. The difference in the dose between the use and non-use of a cone was statistically significant (p <0.000). These results show how important shielding devices are in reducing radiation exposure. Radiation involves electromagnetic waves that have no charge or mass, and when they collide with a subject, transmission, absorption, and scattering occur. In addition, the

«distance reciprocity law» is applied [12], in which the dose intensity at a distance from the source is halved. In a previous study by Jeon Min Cheol, a phantom was placed on the radiological examination table, and when the distance was doubled, the results were 23.09% and 10.43%, respectively, and 100% when the distance was 42.5cm. In a previous study by Park, Chang-hee, the dose of 5.51μSv/h at a 50cm distance from the patient during abdominal examination in a mobile X-ray generator was less than the natural radiation dose and an average of 219cm away from the patient[13]. According to the report of Huh Yeji et al., scattering rays around the table in the shooting room were 3.3 ~ 7.76μSv when measured horizontally and 8.02 ~ 19.18μSv when measured vertically[14, 15]. In this study, the spatial scattering rays along the distance were measured at 50, 100, 150, and 200 cm at 0°, 45°, 135°, and 180 ° with respect to the center of the phantom. The doses were the highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at 135°, and 0.94mR/h at 180°. In addition, the scattering rays due to the use of the cone were reduced by up to 92.7% compared to when the cone was not used.When a patient undergoes a radiological examination at a medical institution, they are examined even if there will be radiation exposure, because it is more important to find and treat the disease than to avoid damage by radiation. However, scattering rays generated by the radiation when the test is performed cause spatial scattering rays, which cause indirect exposure without benefit to the patient›s protector or radiation worker. Therefore, the amount of surveillance is increasing due to pollution in the environment. In the case of paranasal sinuses, which are frequently examined in pediatric patients, a cone, a radiation shielding device, should be used. If shielding devices are used, it will be helpful to reduce the amount of radiation experienced by radiation workers from two - dimensional space scattering rays.

Conclusion

In this study, the spatial dose according to the use of the cone was studied and the following conclusions were obtained.

1. 60% of medical institutions did not have the radiation shielding device of acone and 74.4% did not use the cone in paranasal sinus examination.
2. In the comparison of doses between the use and non-use of a cone, the dose decreased by 50.8% at 0°, 47.3% at 45°, 35.7% at 90°, 59.2% at 135°, 39.8% at 180°, 27.3% at 225°, and 46.4% at 315° when the cone was used.
3. The spatial dosimetry according to the distance was highest at 11.56mR/h at 0°, 1.08mR/h at 45°, 1.59mR/h at 135°, and 0.94mR/h at 180°. In addition, spatial scattering rays were reduced to 92.7% when the cone was used as compared to when no cone was used.

Therefore, a cone should be used in the radiologic examination of paranasal sinuses, and radiation workers and the family protector should also ensure that they are a safe distance away in order to prevent exposure by secondary radiation.

Ethical Clearance: Not required

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Conflict of Interest: Nil

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The Relationship between Mental Health and Drug-use among Nepali Adolescents

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ABSTRACT

The purpose of this study is to identify the mental health status of Nepali adolescents and understand the factors that trigger the risk of drug-use. Survey has been conducted in the capital city of Kathmandu and Bhaktapur with 463 Nepali adolescents age group 13 to 19 using the scales of anxiety, depression, stress, cognitive-emotion regulation, self-esteem, potential drug-use. The results of this study are as follows. First, the level of anxiety, depression, and stress are within the scope of 'mild to moderate,' 'mild,' 'moderate' respectively. The level of self-esteem is within the range of 'normal,' and potential of drug-use is also within the scope of 'non-potential drug-use.' Second, the mental health-related variables selected in this study is accounted for about 23.4% of potential drug-use. Depression, self-esteem, and less adaptive cognitive emotional regulation has a significant impact on potential drug-use, while other variables do not. This study is worthwhile to provide basic data for the development of a mental health program and addiction prevention programs for Nepali adolescents.

Keywords: *Nepali adolescents, mental health, potential drug-use, anxiety, depression, stress, self-esteem*

Introduction

Drug abuse is one of the diseases that make human life unhappy and interfere with functioning as a healthy society, causing severe personal and social problems [1]. Also, it can lead to somatic symptoms (such as headache, insomnia, digestive, cardiovascular and immune system problems), cause mental health problems (such as anxiety, depression, and antisocial), and increase the risk of suicide. Besides, drug abuse is also associated with crime and may cause social harm.

Adolescence is a time of significant growth and development in the brain and may have various adverse effects by drug-use in a wide variety of areas such as learning, interpersonal, cognitive and language, and emotional development. And adolescent drug abuse is also known as a risk factor that increases the possibility of addiction in adulthood [2]. In particular, the use of medication before the age of 14 increases the likelihood of experiencing depression, suicidal thoughts, attempts and psychopathology.

Nepal is a multi-ethnic, cultural, religious, bi-lingual society and has diverse customs, the caste system. Sometimes, substances use such as alcohol and marijuana is socially accepted according to those various customs and traditions. As a result, the production, sale and consumption of alcohol are increasing in Nepal [3], which caused high rate (17.4%) of alcohol use among adolescents [4]. The prevalence of drug-use and abuse among Nepali adolescents is 10%, and more than three quarters (81.2%) of illegal substance users responded that they had started before 20 years old. Despite the high risk of drug-use, there are fewer numbers of rehabilitation centers that also may lack specialized adolescent treatment programs in Nepal.

In order to develop prevention programs for drug abuse, it is necessary to identify drug-use status and influential factors. So far there have been many studies on the relationship between drug-use and psychosocial factors, such as ethnic and culture, family relationships, peer relationships, and a history of family drug-use. Moreover, many pieces of research have shown a

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strong association in mental health with drug-use [5-6]. In particular, depression has a direct effect on adolescents' drug abuse. Anxiety is also a factor that increases the risk of drug-use because adolescents try to consume drugs to reduce tension or attempt at self-medication. However, the self-medicating individual may be at high risk for mood disorders, substance use disorders, and suicidal behavior. Moreover, stress also increases the likelihood of drug-use. In particular, social stress and economic stress are found to be a trigger of adolescent drug-use. In the case of Nepal, many people have posttraumatic stress disorder due to an earthquake in 2015, which is expected to increase the likelihood of drug-use among adolescents in Nepal.

Recently, studies on protective factors among mental health factors such as self-esteem and cognitive-emotional regulation ability have been actively conducted. Self-esteem is the subjective assessment of one's worth as a person. Concerning drug-use, it has a significant relationship with self-esteem. Self-esteem itself is considered to be a critical factor in preventing adolescent drug-use. While some researchers reported a strong relationship between self-esteem and drug abuse, some others reported a weak relationship. Another important protective factor is Cognitive Emotion Regulation (CER). It is a cognitive way of managing the intake of emotionally arousing information. CER was found to play an essential role in the relationships between the negative experiences of life and the reporting of symptoms of depression and anxiety [7]. In recent years; research is underway to clarify which CER strategies are protecting the drug-use.

Prevention in addiction is crucial before it reaches the level of addiction. For this reason, in many countries, drug abuse prevention education for young people is mandatory. However, Nepal is still behind and there is few professional preventive educational treatment programs that exist for an adolescent who suffers from drug-use. Especially, research on the relationship between adolescent drug abuse potential and mental health has not been conducted yet. In order to develop drug abuse preventive treatment programs for adolescents, it is necessary to identify adolescent drug abuse inducement factors and their protective factors, and to identify the relationship between those factors. Therefore, this study aims to investigate the mental health status and drug-use risk factors of adolescents in Nepal. Research problems are as follows. First, what are the potential drug-use and mental health of adolescents in Nepal? Second, what are the relationship between mental health and drug-use among Nepali adolescents?

Materials and Method

Participants: Four hundred sixty-three adolescents in Nepal participated during the Survey. Amongst, 233 are men and 230 are women. The participants' age was 13 to 19 years. The criteria for youth age can be defined variously by each nation, and this study follows the criteria provided by WHO, ages 13 to 19. The age group is 14 years (22.9%) higher, respectively, 15 years (18.6%), 17 years old (16.8%), 13 years old (13.8%), 18 years old (13.6%) and 16 years old (12.5%).

Procedure: The survey conducted by two trained Nepali students who are currently studying master degree and each questionnaire was conducted by face to face method. If students did not understand the questionnaire items, an additional explanation was provided. A total of six questionnaires (133 items) were translated into Nepali. In the translation process, two international students from Nepal who are fluent in Nepali and English translated English to Nepali. Also, the translation results were compared and revised. Then, the translation into Nepali was translated into English and compared with the English text. Then a professor from Nepal edited and confirmed the results.

Tools

Anxiety (Beck Anxiety Inventory, BAI): BAI is a multiple-choice self-report inventory that is used for measuring the severity of anxiety [8]. The standardized cutoffs are: 0–9(normal to minimal), 10–18(mild to moderate), 19–29(moderate to severe), 30–63(severe). In this study, BAI's Cronbach's α was .85.

Depression (Beck Depression Inventory, BDI): BDI is a multiple-choice self-report inventory for measuring the severity of depression [9]. In this study, Cronbach's α of BDI was .83. The standard cut-off scores were as follows: 0–9(minimal), 10–18(mild), 19–29(moderate), 30–63(severe).

Stress (Perceived Stress Scale, PSS): The Perceived Stress Scale (PSS) is the most widely used psychological instrument for measuring the perception of stress [10]. Cronbach's α was .70 or higher in several studies using this scale, but it was .54 in this study. The standard cut-off scores were as follows: 0-13 (low), 14-26 (moderate), 27-40 (high).

Cognitive Emotion Regulation (Cognitive Emotion Regulation Questionnaire, CERQ): CERQ is a multidimensional questionnaire constructed in order to identify the cognitive coping strategies someone uses after having experienced adverse events or situations [11]. The CERQ is a self-report questionnaire consisting of 18 items. The Cronbach's α of CERQ was .88 at the end of the study. In this study, Cronbach's α of CERQ was .88.

Self-esteem (Rosenberg Self-Esteem Scale, SES): SES consists of a total of 10 questions [12]. The cut-off point for problematic self-esteem is 15 points. The Cronbach's α of SES was .61.

Potential Drug-use (Screening Scale for Potential Drug-use Adolescents, SPDA): SPDA was designed to screen potential drug-users [13]. A total of 35 items consist of a 4-point scale. Potential drug-use cut-off point for adolescent screening is 73 points. The potential group is 73 points or more, and the non-potential group is 73 points or less. Cronbach's α of the SPDA was .90.

Statistical Analysis

Descriptive analysis was employed to determine the level of mental health in the study group. And a Pearson *r* correlation coefficient was calculated to test whether potential drug-use is associated with mental health variables. A multiple regression analysis was calculated for each outcome of interest. A significance level of $p<.05$ was applied. All data were analyzed using SPSS.

Ethical Considerations: Ethical approval was obtained from the Nepal government (NHRC No. 2485) and Namseoul University Research Ethics Committee in South Korea (No. NSUIRB-201807-001).

Results and Discussion

Mental Status: Table 1 shows that the mean of anxiety ($M = 15.94$) of Nepali adolescents was within the range of 'mild to moderate'. And there was a significant difference between male and female adolescents ($t = -2.86$, $p = .004$) and among school levels ($F = 3.51$, $p = .031$).

The mean of depression ($M = 14.89$) of Nepali adolescents was within the range of 'mild' level (19-29 points). There was a significant difference between male and female adolescents ($t = -3.78$, $p = .001$) and among school levels ($F = 4.27$, $p = .015$).

The mean of stress ($M = 18.54$) of Nepali adolescents was also within the range of 'moderate' (14-26 points). Results showed the stress level of female students was significantly higher than male students ($t = -3.12$, $p = .002$) and the higher secondary adolescents was significantly higher ($F = 4.26$, $p = .015$).

The mean of self-esteem ($M = 17.15$) of Nepali adolescents belonged to the normal level (over 15 points). However, problematic low self-esteem was 32.2%. There was no significant difference between male and female, and among school levels ($F = 2.34$, $p = .098$).

The mean of potential drug-use ($M = 65.46$) of Nepali adolescents indicates it is not within the range of potential drug-use group (greater than 73). However, 29.2% of the students were within the potential drug-use group. There was a significant difference between male and female adolescents ($t = 3.39$, $p = .001$) and among school levels ($F = 32.02$, $p = .001$).

Table 1: Descriptive Statistics of Mental Health Factors

	Sex	Male				Female				Total			
Var.	School Level	M	LS	HS	Sum	M	LS	HS	Sum	M	LS	HS	Sum
	n	69	66	98	233	68	63	99	230	137	129	197	463
Anxiety	M	14.52	13.56	16.00	14.87	15.43	16.92	18.20	17.03	14.97	15.20	17.11	15.94
	SE	9.18	6.82	7.98	8.09	8.82	7.39	8.10	8.18	8.98	7.27	8.10	8.20
Depression	M	12.71	11.65	15.08	13.41	14.82	16.54	17.37	16.39	13.76	14.04	16.23	14.89
	SE	6.60	7.67	8.54	7.87	9.40	8.91	8.88	9.07	8.15	8.62	8.77	8.61
Stress	M	17.41	17.74	18.23	17.85	17.82	19.41	20.11	19.24	17.61	18.56	19.18	18.54
	SE	4.12	4.85	4.51	4.49	4.94	5.40	4.86	5.11	4.53	5.18	4.77	4.85
Self-esteem	M	17.57	18.06	16.84	17.40	17.43	16.96	16.49	16.90	17.50	17.52	16.66	17.15
	SE	3.50	3.74	3.77	3.71	5.00	4.98	4.09	4.62	4.30	4.41	3.93	4.19
Potential Drug-use	M	60.49	64.48	74.73	67.61	62.87	57.08	67.49	63.27	61.67	60.87	71.10	65.46
	SE	12.61	12.28	14.71	14.78	12.57	10.10	12.61	12.66	12.60	11.82	14.14	13.92

Note. M=Middle School, LS=Lower Secondary School, HS=Higher Secondary School

The Relationships among Mental Status Variables: Table 3 shows the correlation between mental health variables and potential drug-use. While potential drug-use is correlated positively but weakly with anxiety and stress, moderately with depression. On the other hand, self-esteem is weakly but negatively correlated. Among CERQ adaptive strategies, potential drug-use is correlated with 'Positive Reappraisal' negatively, and 'Putting into Perspective' positively. Among CERQ less adaptive strategies, potential drug-use is correlated with 'Acceptance,' 'Rumination,' 'Catastrophizing,' 'Other-blame,' and 'Self-blame' positively

Table 2: Correlation Matrix Among Mental Health Variables

Variables	Dep	Str	SE	PDU	CERQ adaptive regulation strategies				CERQ less adaptive regulation strategies				
					PR	ReP	PoR	PP	AC	RU	CA	OB	SB
Anx	.505**	.421**	-.295**	.303**	.118*	.099*	.018	.166**	.264**	.289**	.326**	.212**	.372**
Dep		.593**	-.547**	.423**	-.023	-.012	-.103*	.218**	.263**	.246**	.500**	.294**	.470**
Str			-.525**	.292**	-.013	-.022	-.081	.240**	.253**	.219**	.387**	.251**	.409**
SE				-.346**	.108*	.132**	.225**	-.133**	-.177**	-.165**	-.341**	-.156**	-.374**
PDU					.003	-.022	-.096*	.203**	.175**	.156**	.324**	.320**	.258**

Note: Anx=Anxiety, Dep=Depression, Str=Stress, SE=Self-esteem, PDU=Potential Drug-use, PR=Positive Refocusing, ReP=Refocus on planning, PoR=Positive reappraisal, PP= Putting into Perspective, AC=Acceptance, RU=Rumination, CA=Catastrophizing, OB=Other-Blame, SB=Self-blame

The Effects of Mental Health Variables on Potential Drug-use: Table 3 presents the results of the multiple regression analyses on potential drug-use with mental health variables. The total model explained 23.6% of the variance of drug-use (F = 11.97,df = 13,449, p = .001). Anxiety, depression, self-esteem significantly predicted potential drug-use, but not the stress score was identified as significant predictors. Besides, the other-blame strategy was a predictor of potential drug-use. All CERQ adaptive strategies were not predictive of potential drug-use.

Table 3: Summary of Multiple regression Analysis on Potential Drug-use With Mental Health Variables

Predictors		*B*	SE	β	t	p	R^2	corrected R^2	F
	(Constant)	60.20	5.50		10.95	.000			
	Anxiety	0.19	0.08	.11	2.24	.026	.257	.236	11.97***
	Depression	0.35	0.10	.22	3.58	.000			
	Stress	-0.13	0.16	-.04	-0.82	.413			
	Self-esteem	-0.50	0.18	-.15	-2.84	.005			
CERQ – ARS	Po_Refocus [a]	0.12	0.25	.03	0.49	.626			
	Re_Plan [b]	-0.16	0.27	-.04	-0.58	.565			
	Po_Reapprais [c]	-0.32	0.26	-.07	-1.26	.210			
	Put_Perspect [d]	0.30	0.22	.07	1.39	.164			
CERQ - LARS	Acceptance	0.13	0.25	.03	0.51	.610			
	Rumination	-0.12	0.22	-.03	-0.55	.580			
	Catasrophizing	0.18	0.22	.05	0.82	.412			
	Other-Blame	0.87	0.23	.18	3.73	.000			
	Self-blame	-0.05	0.24	-.01	-0.19	.846			

Note: Po_Refocus [a]=Positive Refocusing, Re_Plan [b]=Refocus on planning, Po_Reapprais [c]=Positive reappraisal, Put_Perspect [d]= Putting into Perspective

Discussion

This study reveals that the level of anxiety, depression, and stress of Nepali adolescents was within the range of mild and moderate level. However, adolescents feel 'moderate to severe' anxiety (30.2%) and 'severe' anxiety (6.7%), 'moderate' and 'severe' depression (28.3%), moderate stress (80.8%). This result shows that Nepalese teenagers feel depressed, anxious, and stressful enough to feel uncomfortable with their adaptation although they do not experience any pathological levels of anxiety, depression, and stress. Especially, anxiety, depression, and stress were found to be higher in female than male adolescents. Moreover, in this study, the higher the school level, the more anxiety, depression, and stress indicate that middle-to-late adolescence (ages 15-18) may be more vulnerable time. Therefore, female adolescents in Nepal are at a higher risk of anxiety, depression, and stress.

The prevalence of problematic self-esteem of Nepali adolescents is 32.2%. The mean score of Nepali adolescents' self-esteem is relatively lower than that of other countries adolescents [14-15]. Also, in the comparison analysis according to the school level, there was no significant difference. The results of the previous studies on the change of self-esteem according to the age of adolescents showed various variations. This result shows that there might be a slight difference according to cultures and countries.

Nepali adolescents use adaptive regulation strategies mainly such as 'Refocus of Planning,' 'Positive Reappraisal,' 'Positive Refocusing.' However, considering the results on the relationships with PDU, anxiety, depression, stress, only 'Positive reappraisal' had a week negative association with them. 'Putting into Perspective' had even positive association. This means that adaptive regulation strategies of CERQ are not effective in coping stress events, and teaching and reinforcing regulation strategies such as 'Putting into Perspective' may result in negative effects on mental health. One more thing to consider is that though 'Acceptance' was classified as an adaptive strategy in one study [16], this study is consistent with the study that it is a less adaptive strategy [17] and is positively correlated with depressive symptoms.

The mean of SPDA among Nepali adolescents was under the cut-point, but 29.2% of the adolescents were at risk for potential drug-use. This result can be compared with the study [18] in which the mean of the SPDA was 57.11 and 18.6% of the Korean middle school students were a potential drug-use group. In addition, this study reveals that potential drug-use is higher in male adolescents and increases according to age and grade. This result may be due to the Nepali environment where men are easy to get addictive substances and to the culture that substance use such as alcohol and marijuana are allowed to have socially. It suggests that the need of the education and programs to be provided.

Significant predictors among mental health variables on PDU were anxiety, depression, self-esteem, other-blame regulation strategy. This result is consistent with the previous studies in that depression and anxiety have a significant effect on substance abuse, that self-esteem affects substance abuse, and that less adaptive regulation strategies increase the possibility of drug-use. However, it is different from the previous studies in that stress does not appear to be a significant predictor. In the future, it is necessary to examine the effects of social stress on the drug-use in Nepali settings.

Conclusion

The anxiety, depression and stress level of adolescents in Nepal was in the range of 'mild and moderate,' and self-esteem was 'moderate,' and cognitive-emotional regulation strategies mainly used in stress situation were adaptive strategies. Mental health factors that have the most significant effect on potential drug-use were anxiety, depression, self-esteem, and other-blame regulation strategies. In the end, efforts to change the anxiety and depression and less adaptive regulation strategies of adolescents in Nepal are required to reduce the possibility of drug-use.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Detection of HGG and LGG Brain Tumors using U-Net

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ABSTRACT

Background/Objectives: Advancement in medical equipment has enabled accurate and quick diagnosis in medical field. However, an increase in the number of medical staff is slower than the rate of medical equipment development. It has resulted in increased risk of diagnostic misinterpretation. The purpose of this paper is to help diagnosis of medical staff through artificial neural network (ANN).

Method/Statistical Analysis: We selected U-Net among artificial neural networks. U-Net is highly accurate in medical imaging. The dataset for learning the network was obtained from the Brain Tumor Segmentation Challenge (BraTS). This dataset contains four classes of brain tumor data and it is suitable for learning variety of brain tumors. We used F-Score to measure the accuracy of the learned network.

Findings: In this paper, we compare the performance of the network by conducting two experiments. First, we checked the learning progress of the network. Second, we compared the results of learning with mixed and single datasets. In the first experiment, when allowing the network to learn for a total of 200 generations, it was confirmed that the results of 100 generations were the most accurate. In the second experiment, the network learned by three groups of datasets. The first group consisted of HGG data only, and the second group was composed of LGG data only, and the last group was made up of mixing HGG and LGG data. When comparing the results of the first group with the third group, the accuracy of HGG patient was 0.6696 and 0.6222, respectively. Subsequently, the results of the second and the third group were 0.6315 and 0.6228, respectively.

Improvements/Applications: In this experiment, we compared the results obtained when the datasets were mixed and when they were used singly. The results show similar accuracy. However, when using a mixture of datasets, the accuracy is lower, which is enough to assist the diagnosis of the medical staff. It is expected that this will help the development of the medical image processing field by confirming the position and size of the brain tumor accurately regardless of the data of any grade for brain tumor.

Keywords: *Artificial Neural Network (ANN), U-Net, Brain Tumor Segmentation Challenge (BraTS), Brain Tumor, HGG, LGG*

Introduction

Artificial neural networks (ANN) are applied in various fields. The medical field also shows a lot of activities using artificial neural networks. They are trying to prevent the occurrence of patients by collecting biometric information such as patient's life pattern, blood pressure, and body temperature [1]. In the field of medical imaging, there is an active movement for application of artificial neural network to various medical equipments. Ultrasound, computed tomography (CT), magnetic resonance imaging (MRI) and other devices have helped medical staff to make a diagnosis. However, with the development of these devices, the number of patients using them is increasing. In comparison, the number of medical staffs is limited. The possibility of misdiagnosis due to inaccurate reading caused by these issues has emerged as a serious problem. To solve these problems, there have been many attempts by introducing a medical image reading system through artificial neural network[2].

In this paper, we apply artificial neural network to brain tumor detection to help more accurate diagnosis in

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MRI image. We selected U-Net [3], which is widely used in medical imaging field. The learning of the network was set to use the dataset provided by the Brain Tumor Detection Challenge (BraTS) [4]. This dataset provides two main classes of brain tumors. Learning will proceed with the configuration of the dataset in two ways. The first one learns only a single grade of brain tumor and the second one learns regardless of the brain tumor grade.

In Chapter 2, we describe the network and dataset used in learning, the overall method of experiment, and the evaluation method to analyze the results. In Chapter 3, we will identify the performance and results of the network and analyze the results. Finally, in Chapter 4, we will present the expected effects and future directions when using this paper.

Materials and Method

U-Net: Common CNN (Convolutional Neural Network) is used for classification. In this case, the label for the class is output as a result of the input image. However, localization results are required in image processing such as medical imaging. The reason we selected U-Net is as follow. First, this network is localizable and can detect tumor location and size. Second, to solve the problem caused by a small amount of training data, the learning is performed by dividing the image into patches [3].

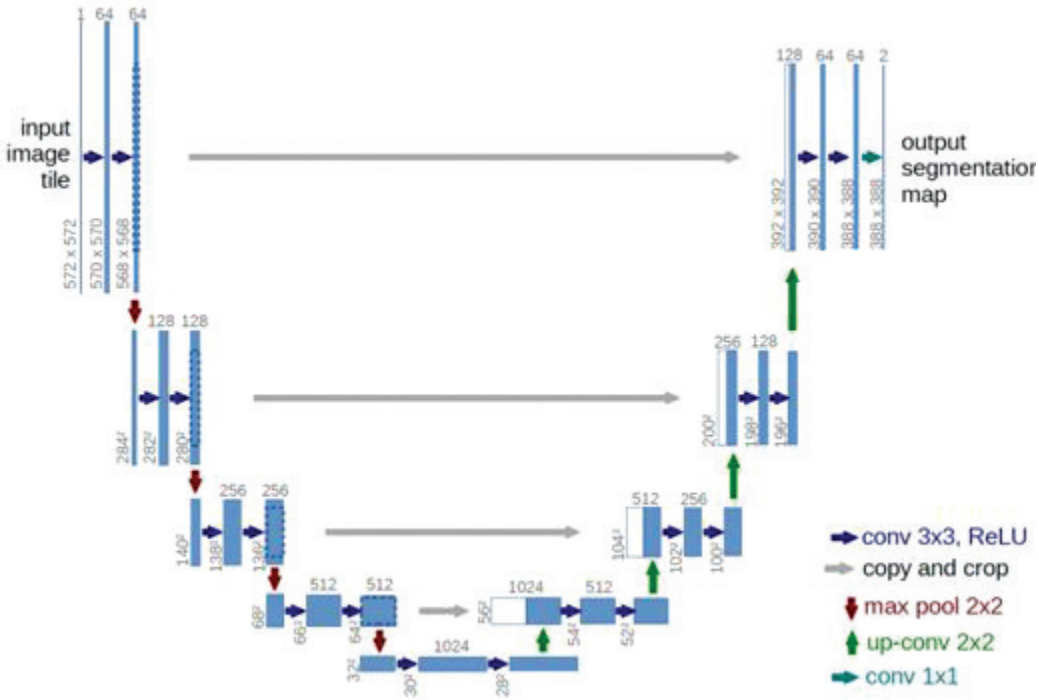

Figure 1: U-Net architecture

Network Architecture: Figure 1 shows the overall architecture of U-Net. It consists of a contracting path in left side and an expansive path in right side of Figure 1. The contracting path corresponding to down-sampling proceeds by repeating two convolution layer and max pooling operation. The feature channel doubles when down-sampling is performed. The expansive path corresponding to up-sampling is like the contracting path, but there are two differences. First, up-convolution is performed instead of max pooling. This reduces the feature channel in half and doubles the feature map. Second, when up-sampling is performed, the feature map is copied and cropped in the contracting path to connect. Crop is required because the size of the corresponding feature map is smaller in the expansive path. This structure allows more accurate localization. This part was added in CNN, allowing U-Net to enable semantic segmentation. Finally, one by one convolution is performed to map the feature vector to the desired class.

Datasets for Training: The MRI image datasets used for training was a dataset provided by Brain Tumor Segmentation Challenge (BraTS) [4]. These datasets consist of 220 sets of HGG data and 54 sets of LGG data. Each MRI set consists of four sets of images with different contrast: T1, T2, FLAIR and T1c. This image set consists of 150 brain tomographic images.

HGG and LGG: Gliomas are characterized by subtypes and by a numerical grading system. HGG and LGG are subtypes of glioma. The grade of a tumor means how the cancer cells appear under a microscope. Grade I tumors grow slowly and can sometimes be totally removed by surgery, while grade IV tumors are fast-growing, aggressive and difficult to treat [5,6,7].

According to the current World Health Organization (WHO) scheme, malignant astrocytomas are classified and graded as shown in Table 1.

Table 1: Grade chart of glioma

	Grade	Comments
LGG	I	Benign, slow-growing tumor Usually associated with long term survival Least likely to recur
	II	Increased hypercellularity No mitosis No vascular proliferation No necrosis Can recur as a higher-grade tumor
HGG	III	High rate of hypercellularity High rate of mitosis No vascular proliferation No necrosis High rate of tumor recurrence
	IV	Very high rate of hypercellularity Very high rate of mitosis Presence of vascular proliferation Presence of necrosis

For four grades of glioma, it can classify grade I and II as LGG and grade III and IV as HGG. Figure 2 shows MRI images of the brain corresponding to HGG and LGG, which are included in the dataset used for training.

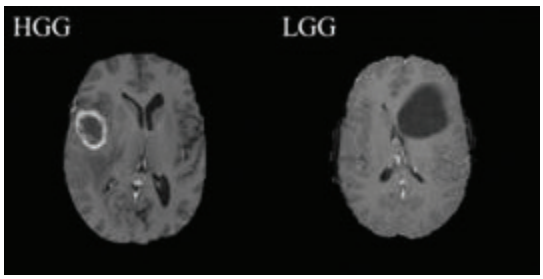

Figure 2: Brain MRI of patients with HGG and LGG

T1, T2, FLAIR and T1c: MRI images can acquire images of different contrasts according to different techniques or acquisition parameters. It is possible to emphasize the desired area by adjusting the value of the weight or adjusting the shooting direction [8,9]. The dataset provided by BraTS consists of the following four images as shown in Table 2.

Table 2: Type of MRI images

Type	Feature
T1	T1-weighted MRI Measure T1 (longitudinal) relaxation time of tissue Tissue with short relaxation times are brighter
T2	T2-weighted MRI Measure T2 (transverse) relaxation time of tissue Tissue with long relaxation times are brighter
T1c	T1-weighted MRI after administration of contrast agent The signal for tumor increase
FLAIR	Fluid Attenuated Inversion Recovery MRI Bright signal of CSF (Cerebrospinal Fluid) is suppressed Can detect small hyperintense lesions better

The purpose of this paper is to detect tumors. For this reason, the training was performed using T1c-weighted MRI, which administration a contrast agent that enhances the signal of the tumor. Figure 3 shows MRI images of each type [11,12,13].

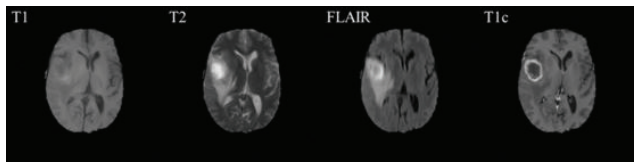

Figure 3: Brain MRI of patients with T1, T2, FLAIR and T1c

Experimental Methods: In this paper, the network will learn dataset of all three configurations. The first network will only have the HGG data, the second will only the LGG data, and finally the HGG and LGG will be learned and the results will be compared. Table 3 shows the number of datasets to be used for learning

Table 3: Amount of Training and Test

	a. HGG only	b. LGG only	c. HGG and LGG
Training	200 sets	50 sets	250 sets
Test	20 sets	4 sets	24 sets

At the same time, experiments were conducted to confirm learning progress of the network. This experiment trained the network over a total of 200 generations and confirmed the change in accuracy. The generations to be used for comparison are 10, 50, 100 and 200 generations of learning data.

F-Score: In this paper, F-Score was chosen to measure the accuracy of the results. For other methods, such as PSNR, which compares image differences, the entire region is compared, and the result is measured. However, in this paper, which is aimed at the detection of brain tumor, the size of non-tumor parts is relatively large when the image of the result is confirmed. Therefore, even if the result does not come out well, there is a problem that the score becomes large. The F-Score can be used to calculate more precisely because it only uses information about the part to be found and the parts that are not correctly found. F-Score can be measured by Equation (1) [10].

$$F = \left(\frac{recall^{-1} + precesion^{-1}}{2} \right)^{-1} = 2 \times \frac{precesion \times recall}{precesion + recall} \quad \ldots(1)$$

In Equation (1), precision and recall are defined by Equation (2).

$$precision = \frac{TP}{TP + FP}, \; recall = \frac{TP}{TP + FN} \quad \ldots(2)$$

Each element of Equation (2) follows the definition of the confusion matrix in Table 4.

Table 4: Confusion Matrix

		True condition	
		Condition Positive	**Condition Negative**
Predicted Condition	Predicted Condition Positive	True Positive (TP)	False Positive (FP)
	Predicted Condition Negative	False Negative (FN)	True Negative (TN)

Results and Discussion

First, we compared the F-Score of each generation to confirm the progress of the network learning. Figure 4 is a chart showing F-Score for each generation of MRI test images. The MRI images used for the test are for HGG patients.

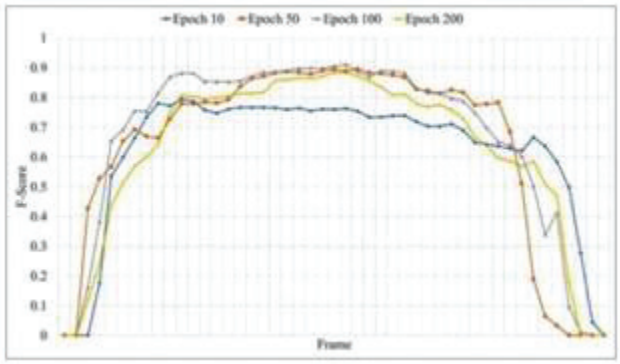

Figure 4: F-score for each epoch

Table 5 shows the average F-Score for each generation.

Table 5: Average of F-score for each epoch

Epoch	10	50	100	200
Average	0.613759	0.637009	0.669652	0.62122
Recall	0.824101	0.701977	0.720442	0.765566
Precision	0.488958	0.583047	0.625551	0.522671

From Figure 4 and Table 5, we can see that the overall network accuracy improves. However, the results of the 200th generation are lower than those of the 50th generation.

The next experiment compares the accuracy of the network with the different configuration of the dataset. The learning was proceeded with the configuration of Table 3. Based on above result, the network learning was carried out over 100 generation. Results were compared between group (a) and group (c) in Table 3, and between group (b) and group (c). MRI images of the patients to be used for test are those corresponding to HGG and LGG brain tumors, respectively. Table 6 shows the result of the comparison.

Table 6: Comparison of three training sets

	HGG Patient			**LGG Patient**		
Trained sets	**F-Score**	**Recall**	**Precision**	**F-Score**	**Recall**	**Precision**
HGG only	0.669652	0.720442	0.625551	-	-	-
LGG only	-	-	-	0.631513	0.757418	0.5415
HGG and LGG	0.622251	0.701455	0.559118	0.622863	0.638845	0.607661

From the results in Table 6, the results of group (c) shows lower accuracy than group (a) and (b). The difference is 0.047401 for HGG patient and 0.00865 for LGG patient.

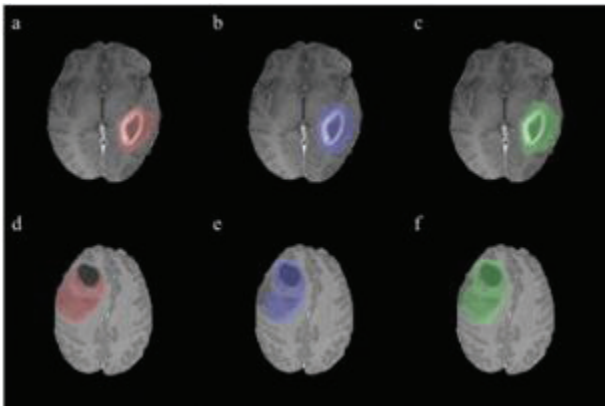

Figure 5: Brain Tumor Detection Result

Figure 5 shows the MRI images of two patients used as testsets in the experiment. The above three images are from HGG patient and the below three images from LGG patient. From left to right, ground truth, the result of learning a single grade of dataset, and the result of learning a mixture of datasets.

Conclusion

In this paper, we compare the learning progress of the network and the accuracy according to the dataset configuration. In first experiment, when the learning was conducted over a total 200 generations, it was confirmed that the accuracy was lowered after 100 generation. This may be due to overfitting or local minima. Indeed, the average of the results of the training set has an F-Score value of 0.7 to 0.8, which is significantly higher than the test results. It is expected that better results will be obtained by adding Dropout to prevent network overfitting.

The following experiment is a comparison of the accuracy according to the configuration of the dataset. The results show that group (c) is 0.02 to 0.04 less accurate than group (a) and (b). This difference can be confirmed in Figure 5. As shown in Figure 5, both networks accurately detect the location of the tumor. However, an error occurred in detecting the size. The difference in results was due to tumor size error. Another problem is that non-tumors are detected as tumors in the results of LGG patients. This problem is due to the similar parts and features of the tumors they exist in the MRI image. Another reason is that overfitting is easily caused by lack of data for LGG patients used for learning.

In conclusion, it is possible to accurately detect the location of the brain tumor and it is expected to be of great help in the diagnosis of the medical staff. Furthermore, it is expected to be useful in various field such as diagnosis of pulmonary tuberculosis by x-ray image and diagnosis of cancer by CT image.

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Study of Relationships between Personal Information Protection perception, Electronic Medical Records (EMRs) Awareness and Job Engagement of Medical Staff

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ABSTRACT

Background/Objectives: Life and knowledge levels have improved and access to information has become more convenient. A system of a medical institution for prompt processing, therefore, was required. The purpose of this study was to examine relationships between perception of personal information protection, EMR awareness and job engagement of medical staff.

Method/Statistical Analysis: The cross-sectional descriptive design was used. A total of 243 nurses completed a questionnaire on personal information protection perception, EMR awareness and job engagement. The collected data were analyzed using SPSS/win 18.0 program. The general characteristics of the subjects resided in high frequency, percentage, mean and standard deviation. Data were analyzed with independent t-test, ANOVA and Pearson's correlation coefficients.

Findings: The personal information protection perception was 3.09 ± 0.42, with the minimum value of 1.00, and the maximum value of 4.00. EMR awareness was 3.79 ± 0.50, with the minimum value of 1.71, and the maximum value of 5.00. The mean occupational commitment was 3.54 ± 0.46, with the minimum value of 2.00, and the maximum value of 4.89. The mean score of personal information protection perception was 3.09 out of 5.00, EMR awareness was 3.79 out of 5.00 and job engagement was 3.54 out of 5.00. There were statistically positive correlations between EMR awareness and job engagement (r=.50, p<.001). EMR awareness and job engagement were positively correlated with each other. Therefore, in order to improve the efficiency of nursing work, it is necessary to teach information ethics according to EMR awareness. Statistically significant results of job engagement were age (F = 6.61, p <.001), working years (F = 5.51, p <.001) and income (F = 8.27, p <.001). In summary, there was a significant relationship between job satisfaction (t = -4.09, p <.001), EMR related ethical education (F = 4.31, p <.001), and hospital job satisfaction (F= 25.09, p <.001).

Improvements/Applications: It is necessary to develop educational and manageable program to improve EMR awareness and job engagement of nurses. Further research is necessary to analyze the factors affecting the job commitment of nurses.

Keywords: *EMR awareness, Job Engagement, Medical Staff, Nurse, Personal Information Protection*

Introduction

As the wave of informationization spreads rapidly, living and knowledge levels were improving. A hospital information system was required which enables medical staff to manage medical institutions efficiently, conveniently and promptly. In the early 2000s, as medical information became available, many hospitals introduced an electronic medical record (EMR) system,

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which allows the entry, storage and exchange of patient information. The reason for this guideline was that the social demands for patient's privacy protection have increased. First, the medical institutions should be provided with the public health status, physical characteristics, unique identification information such as social security number, resident registration number, and other credit card number, including, various personal information such as passbook account number, work information, personal image information. Second, infringement of patient's personal information and self-determination rights prevents secondary damage, such as damage to medical institutions and workers.

As medical information was digitized, video information storage and recording, and computerization of hospital work, the medical information of patients were exchanged electronically, and the system can be accessed through various routes[1].

The EMR information system is convenient. However, the personal information and medical information of the patient were continuously stored in the EMR information system of the medical institution, and the possibility of information leakage increases gradually[2]. There was also a problem of sharing information between medical staff and medical institutions. Therefore, in March 2012, we established 'Personal Information Protection Guidelines' for medical institutions. However, sensitive personal information such as disease information can be easily leaked to the outside[3].

Personal health information could not be used for purposes other than health care, administrative or economic purposes, and must be provided after receiving patient consent if used for purposes other than health care. In Korea, various issues related to the protection of personal information have become of interest[4]. Efficiency of nurse's job was important for hospital management. There is a problem that nursing job immersion could not be performed by the electronic medical record system. The 69.2% of nurses perceive their information literacy as below average, and there is a need to improve nursing information utilization ability for job involvement[5].

In order to improve business performance, it was necessary to raise the level of awareness and satisfaction of electronic medical records (EMR)[6]. Nurses were more likely to provide better nursing care to their subjects because they were able to maximize their abilities by engaging in nursing with their own duties[7,8]. In this study, the relationship between the perception of personal information protection of nurses, the EMR awareness, and job involvement variables were studied. The purpose of this study was to provide a basic data for the efficiency of work and personal information protection management by finding ways to increase job commitment.

Materials and Method

Paricipants & Data Collection: This study was to investigate the relationship between nurses personal information protection awareness and job commitment according to EMR awareness. The subjects were 243 nurses. The data collection period was from August 1, 2017 to September 30, 2017.

Instrument

General Characteristics: The general characteristics are 12 items including age, sex, education, working period, income, job title, working department, computer certification, EMR moral education, paper nursing record experience, and hospital working satisfaction.

Perception of Personal Information Protection: The existing measurement tools were used [9]. A total of 13 items were scored with a 5 points scoring, 'strongly disagree = 1 point', 'disagree = 2 points', 'normal = 3 points', 'agree = 4 points', and 'strongly agree = 5 points' scale. Reliability analysis showed that Cronbach's α coefficient was .65.

Awareness of Electronic Medical Records (EMRs): The existing measurement tools were used [10]. The 28 items were scored with a 5 points scoring, 'strongly disagree = 1 point', 'disagree = 2 points', 'normal = 3 points', 'agree = 4 points', and 'strongly agree = 5 points' scale. The higher the score the higher the perception. Reliability analysis showed that Cronbach's α coefficient was .97.

Job Engagement: The existing measurement tools were used [11]. The tools used in the references were adapted to the situation of the medical facility nurse by modifying the vocabulary in this study. The nine items were evaluated with a five points scoring: 'strongly disagree = 1', 'disagree = 2', 'normal = 3', 'agree = 4', and 'strongly agree = 5'. Reliability analysis showed that Cronbach's α coefficient was .80.

Results and Discussion

As personal information was changed with age, technology, and people's perception. The subject and range also changed. Among them, personal medical information that was used and managed as information technology. However, information technology has improved as the access route and mobility increase. And the information dysfunctions such as personal information infringement have become important social problems.

In order to protect the privacy of patients, we have focused on protection technologies for enhancing personal information protection in websites and internal business systems. However, such a security system could not protect the patient's personal information[12]. The use of various content and methods of training for confidentiality of patients was recommended[13,14]. If medical personnel carelessly deal with the medical information of the patient who came across learned during the work process, the patient's medical information could not be protected.

All healthcare practitioners who deal with patient medical information must be aware of the importance of protecting medical information. It is necessary to know and practice the guidelines, security methods and procedures for this [15].

The percentage of average age of the subjects was 47.4% for those under 30 years old, 32.5% for those aged 30 to 39 years, and 12.4% for those aged 40 to 49 years, with an average of 32.15 ± 8.75 years. The percentage of education was 20.9% for professional college graduates and 79.1% of university graduates. That of work duration was 45.7% for less than 5 years, 24.8% for more than 5 years, less than 10 years, 9.8% for more than 10 years, and 19.7% for more than 15 years. Income was 33.8% less than 30 million won, 48.3% for less than 40 million won, 40.4 million won, 9.4% for less than 50 million won, 8.5% for more than 50 million won. Positions percentage was 87.6% for general nurses and 12.4% for responsible nurses. 64.5% worked in wards, 10.7% in ICUs, 9.8% in emergency rooms(ER), and 15.0% in OPD & Special part. 49.6%had computer skills qualification and 50.4% did not. 51.3% had EMR moral education experience and 48.7% did not. 53.8% had the paper nursing record experience did not. For hospital working satisfaction, 36.8% were in satisfaction, 57.3% in middle, and 6.0% in dissatisfaction, as shown in Table 1.

Table 1: General Characteristics

Characteristics	Category	n	%	M ± SD
Age (yr)	<30	111	47.4	32.15 ± 8.75 (yr)
	30-39	76	32.5	
	40-49	29	12.4	
	≥50	18	7.7	
Gender	M	8	3.4	
	F	226	96.6	
Education	= College graduate	49	20.9	
	≥ University graduate	185	79.1	
Duration of work (yr)	<5	107	45.7	
	≥5, <10	58	24.8	
	≥10, <15	23	9.8	
	≥15	46	19.7	
Income (Year, 10,000won)	<3,000	79	33.8	
	≥3,000, <4,000	113	48.3	
	≥4,000, <5,000	22	9.4	
	≥5,000	20	8.5	
Position	General nurse	205	87.6	
	≥Charge nurse (Manager level)	29	12.4	
Working department	Ward	151	64.5	
	ICU	25	10.7	
	ER	23	9.8	
	OPD & Special part	35	15.0	
Computer certification	Yes	116	49.6	
	No	118	50.4	
EMR moral education	Yes	120	51.3	
	No	114	48.7	
Paper nurse record experience	Yes	126	53.8	
	No	108	46.2	
Hospital working satisfaction	Satisfaction	86	36.8	
	Middle	134	57.3	
	Dissatisfaction	14	6.0	

The perception of personal information protection of the subjects was age (F = 2.83, p = .039), years worked (F = 4.34, p = .005), income (F = 4.48, p = .004) (T = 2.85, p = .005), and there was a statistically

significant difference in the experience of paper nursing record (t = 2.85, p = .005). As a result of the Scheffe' test, significant increase in personal information protection perception was found in the group with 15 years or more working years than the group with less than 5 years. In the income, the group of over 50 million won was more aware of personal information protection than the group of less than 30 million won and the group of less than 30 million won and less than 40 million won as shown in Table 2.

Table 2: Difference of Personal Information Protection Perception, EMR Awareness and Job Engagement by General Characteristics (N = 243)

Characteristics	Personal Information Protection Perception			EMR Awareness			Job Engagement		
	M ± SD	t or F	p	M ± SD	t or F	p	M ± SD	t or F	p
Age (yr)	39.33 ± 4.25	2.83	.039	105.14 ± 14.42	.83	.476	31.22 ± 3.69[a]	6.61	<.001
	40.12 ± 6.98			106.61 ± 15.18			31.62 ± 4.86[b]		
	42.24 ± 4.74			105.55 ± 11.69			32.45 ± 2.92[c]	a<d, b<d	
	41.67 ± 4.23			110.61 ± 10.15			35.76 ± 3.35[d]		
Gender	40.50 ± 4.69	.20	.844	107.13 ± 12.74	.21	.832	33.00 ± 4.81	.81	.420
	40.42 ± 5.44			106.05 ± 14.16			31.79 ± 4.14		
Religion	39.68 ± 6.04	-1.04	.301	106.65 ± 13.03	.51	.614	32.39 ± 4.09	1.67	.098
	40.43 ± 4.95			105.72 ± 14.77			31.47 ± 4.17		
Education	40.04 ± 5.46	-.13	.900	105.04 ± 13.97	-.58	.560	31.96 ± 3.61	.24	.81
	40.15 ± 5.41			106.36 ± 14.14			31.80 ± 4.30		
Duration of work (yr)	39.23 ± 5.39[a]	4.34	.005	106.07 ± 13.88	.20	.900	31.62 ± 4.03[a]	5.51	.001
	39.81 ± 5.72[b]			105.64 ± 16.91			30.64 ± 4.34[b]		
	40.22 ± 4.37[c]	a<d 106.09 ± 14.09		104.83 ± 12.02	33.84 ± 3.46[d]		31.91 ± 4.38[c]	a<d, b<d	
	40.13 ± 5.41[d]								
Income (Year, 10,000won)	39.13 ± 6.00[a]	4.48	.004	103.56 ± 16.46	1.72	.163	30.65 ± 4.41[a]	8.27	<.001
	39.93 ± 4.82[b]			106.98 ± 13.15			31.80 ± 3.74[b]		
	41.55 ± 5.32[c]	a<d, b<d 110.65 ± 11.77		106.41 ± 9.95	35.37 ± 2.93[d]		33.23 ± 4.26[c]	a<d, b<d	
	43.65 ± 4.82[d]								
Position	39.94 ± 5.44	-1.44	.150	105.98 ± 14.28	-.32	.752	31.43 ± 4.03	-4.09	<.001
	41.48 ± 5.05			106.86 ± 12.84			34.75 ± 3.98		
Working department	39.94 ± 6.07	.25	.863	104.05 ± 13.09	3.21	.024	31.42 ± 4.15	2.21	.087
	40.04 ± 4.26			111.44 ± 12.88			32.36 ± 3.77		
	40.57 ± 4.21			109.26 ± 15.32			33.70 ± 3.55		
	40.13 ± 5.41			108.94 ± 16.76			32.00 ± 4.58		
Computer certification	39.28 ± 5.50	-2.39	.018	106.65 ± 14.79	.60	.547	31.62 ± 4.32	-.77	.440
	40.96 ± 5.21			105.53 ± 13.40			32.04 ± 4.00		
EMR moral education	40.68 ± 5.83	1.62	.107	109.74 ± 11.95	4.19	<.001	32.94 ± 3.80	4.31	<.001
	39.54 ± 4.89			102.24 ± 15.15			30.68 ± 4.22		
Paper nurse record experience	41.05 ± 5.10	2.85	.005	105.93 ± 12.49	-.18	.86	32.55 ± 3.99	2.89	.004
	39.06 ± 5.58			106.27 ± 15.80			31.00 ± 4.21		
Hospital working satisfaction	39.48 ± 6.43	1.43	.241	110.94 ± 12.91[a]	16.42	<.001	33.62 ± 3.86[a]	25.09	<.001
	40.64 ± 4.49			104.60 ± 12.31[b]			31.24 ± 3.66[b]		
	39.21 ± 6.44			90.43 ± 21.76[c]	a>b, a>c, b>c		26.50 ± 4.40[c]	a>b, a>c, b>c	

The results of this study were as follows: First, the EMR awareness of the subjects was statistically significant at the departments of work (F = 3.21, p = .024), EMR moral education (t = 4.19, p<.001), and hospital working satisfaction (F=16.42, p<.001). There was a significant difference. The results of the Scheffe' test were higher than those of 'middle' and 'dissatisfactory' in 'satisfaction' of hospital working satisfaction.

The subjects' job involvement was age (F = 6.61, p <.001), duration of work (yr) (F = 5.51, p <.001) and income (F = 8.27, p <.001). The results of this study are as follows: First, there was a significant relationship between job satisfaction (t = -4.09, p <.001), EMR moral education (F = 4.31, p <.001), and Hospital working satisfaction (F= 25.09, p <.001) as shown in Table 2.

The results of the Scheffe' test were higher than those in the age of 30 and those in the age group of 30 to 39. More than 15 years of duration of work were less than 5 years and more than 5 years and less than 10 years. More than 50 million won in income was more than 30 million won and more than 30 million won in less than 40 million won. 'satisfaction' was higher than 'middle' and 'dissatisfaction' in hospital working satisfaction.

The personal information protection perception was 3.09 ± 0.42, the minimum value was 1.00, and the maximum value was 4.00. EMR awareness was 3.79 ± 0.50, the minimum value was 1.71, and the maximum value was 5.00. The mean occupational commitment was 3.54 ± 0.46, the minimum value was 2.00, and the maximum value was 4.89 as shown in Table 3.

Table 3: Degree of Personal Information Protection Perception, EMR Awareness and Job Engagement

Variables	M ± SD	Minimum	Maximum	Range
Personal Information Protection Perception	3.09 ± 0.42	1.00	4.00	1~5
	40.13 ± 5.41	13.00	52.00	13~65
EMR Awareness	3.79 ± 0.50	1.71	5.00	1~5
	106.09 ± 14.09	48.00	140.00	28~140
Job Engagement	3.54 ± 0.46	2.00	4.89	1~5
	31.83 ± 4.16	18.00	44.00	9~45

Personal information Protection Perception, EMR awareness, and job engagement were not statistically significant. EMR awareness and job engagement showed a significant positive correlation. In other words, the higher the EMR awareness, the higher the job engagement as shown in Table 4.

Table 4: Correlation among Personal Information Protection Perception, EMR Awareness and Job Engagement

	Personal Information Protection Perception	EMR Awareness	Job Engagement
	r (p)		
Personal Information Protection Perception	1	.11(<.108)	.09(.162)
EMR Awareness		1	.50(<.001)
Job Engagement			1

Attitudes and subjective norms should be considered as measures to improve the performance of patient medical information protection. It is necessary to prepare a patient information protection education or ethics education program that incorporates various cases to have experience of medical information protection[16].

Satisfaction with utilization should be easy to use standardized terminology, use necessary information, provide medical information, and access information. It should also be convenient to share data between departments. Medical information sharing and satisfaction with communication were the most important. High utilization satisfaction has the advantage of data management, quick calculation of statistics, and quick record of medical records. And the satisfaction of the uniformity of the data processing[17].

Paper or electronic medical records were communication tools that support clinical decision

making, service coordination, quality and efficacy assessment. Communication tools were research, legal protection, education, accreditation and regulatory processes. Records of a documented health care system refer to normal health care processes[18,19].Generally, health-related privacy and confidentiality should be maintained. Protecting personal information in the field of rights will be very important in the future.

Conclusion

The purpose of this study was to identify the relationship between nurses personal information protection perception, EMR awareness and job engagement, and to utilize it as a basic data to improve the job commitment. It is difficult to generalize the results of this study because it is based on a limited sample of nurses in one area. As a result of this study, personal information protection perception was 3.09 (out of 5), EMR awareness was 3.79 (out of 5), and job engagement was 3.54 (out of 5). In order to maintain human dignity, it is necessary to develop an education program that can raise awareness of EMR in order to increase information moral education and nurse's job engagement.

Ethical Clearance: Not required

Source of Funding: Gwangju University

Conflict of Interest: Nil

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Anger Expression, Depression and Interpersonal ability of University Students Majoring in Nursing in Accordance with their Childhood Emotional Trauma

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ABSTRACT

Background/Objectives: This study is a descriptive study conducted to identify the association between the childhood emotional trauma of nursing students and their depression, anger expression and interpersonal ability.

Method/Statistical Analysis: Data were collected from freshman and sophomore students majoring in nursing studies at three universities in the C region. A total of 205 copies of the questionnaire were analyzed.

Finding: An analysis of the difference according to whether the subject had emotional abuse showed no statistically significant difference in anger expression or interpersonal ability, but there was statistically significant difference in depression. An analysis of the difference according to whether they had experienced emotional neglect showed no statistically significant difference in anger expression, depression or interpersonal ability, but when subjects had experienced emotional neglect, their interpersonal ability had decreased.

Improvements/Applications: This study will help identify the degree of emotional trauma, depression, anger expression and interpersonal ability in university students to provide for more interest in and programs for emotional stability.

Keywords: *Anger Expression, Depression, Interpersonal Ability, Childhood Emotional Trauma Experiences, Nursing Students*

Introduction

While there is awareness of the seriousness of physical or sexual abuse during childhood, there is less awareness of the scope of emotional abuse. Despite the share of incidence of emotional abuse being higher than other forms of abuse, it is not being addressed seriously [1]. Emotional trauma affects the development of children more than physical trauma [2]. University students who are in early adulthood are required to establish their self-identity and intimacy. Only when development tasks are achieved can intimacy be acquired, too. Interpersonal issues can lead to distrust in others and hinder a positive life. This, in turn can have a negative impact on interpersonal relations and development of university students. Interpersonal relations and experience of childhood trauma are said to be highly correlated. Children who experienced abuse have more sensitive emotional responses, are more hostile and oppressed in interpersonal relations and can experience depression [3].

Anger occurs when one's internal border has been invaded or needs have not been met. It is a goal-oriented function but when it is unconditionally suppressed or expressed in extreme ways, it can lead to counter-productive behaviors of anger expression. Interest in anger has been increasing in recent years [4].

As such, this study seeks to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in

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nursing and identify the association between these factors to provide a basic set of data on how these students can grow into healthy members of society.

The study seeks to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of nursing students in university. Specific objectives are as follows.

1. The degree of childhood emotional trauma, depression, anger expression and interpersonal ability will be identified.
2. The difference in general characteristics, depression, anger expression and interpersonal ability according to whether the nursing student experienced childhood emotional trauma will be reviewed.
3. The correlation between childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in nursing will be reviewed.

Materials and Method

Design of the Study: This This is a descriptive study conducted to review the degree of childhood emotional trauma, depression, anger expression and interpersonal ability of university students majoring in nursing and identify any correlation between these factors.

Study Subjects: Convenience sampling was used on university students majoring in nursing studies and enrolled in their freshman and sophomore years at three universities in the C region. The number of samples used was calculated based on Cohen's formula which is the G*Power 3.1.9.2 program [5]. When the significance level (α) of 0.05, power (1-β) of 95% and effect size (f) of 0.15 were set, the minimum number of samples was calculated to be 135. A total of 220 copies of the questionnaire were distributed given the drop-out rate. Among the retrieved 207 copies (94%), 205 copies (93%) were used for final analysis after excluding those with insufficient responses.

Research Tools

Experience of Emotional Trauma During Childhood: The CTQ (Childhood trauma Questionnaire) by[6] which was translated and revised by [7] was used as a basis to measure emotional trauma during childhood. This tool consists of five categories of emotional abuse, emotional neglect, physical abuse, physical neglect and sexual abuse, with each category having five questions. In this study, the revised version of this tool by [8] which has 10 questions for emotional abuse and emotional neglect in the emotional trauma category was used. A 4 point Likert scale was used to measure emotional abuse or neglect experienced from parents or family members before age 18. A higher score indicates more exposure to abuse or neglect. In the study by [8], the overall Cronbach's a was .84, while Cronbach's a for emotional neglect was .73 and Cronbach's a for emotional abuse was .90. In this study, the overall Cronbach's a was .88, Cronbach's a for emotional abuse was .77 and Cronbach's a for emotional neglect was .93.

Depression: To measure depression, the revised tool of BDI (Beck Depression Inventory) by [9] which was translate by [10] was used. This tool consists of 21 questions on the emotional, cognitive, motivational and physiological symptoms of depression. Each response is scored one to four points to make the total score range from one to 84 points. A higher score indicates a greater degree of depression. In the study by [11], Cronbach's a was .89. In this study, Cronbach's a was .89.

Anger Expression: To measure anger expression, the scale of [12] which was revised to a Korean version by [13] was used. As sub-factors, anger suppression measures the psychological and behavioral process of hiding or suppressing anger. Anger expression measures the psychological and behavioral process of expressing anger towards an object or person. This tool consists of eight questions for each category, making 24 questions in total. Responses are measured on a 4 point Likert scale, with 'not at all' given one point and 'almost always so' given four points. Overall Cronbach's a for [14] was .70, while Cronbach's a for anger expression was .69, Cronbach's a for anger suppression was .76, and Cronbach's a for anger control was .79. In this study, overall Cronbach's a= .83, Cronbach's a for anger expression was .59, Cronbach's a for anger suppression was .61, and Cronbach's a for anger control was .60.

Interpersonal Ability Scale: To measure interpersonal ability, the Interpersonal Competence Questionnaire by [15] which was translated by [16] was used. This tool consists of a total of 40 questions measured on a four point Likert scale, with 'not at all' given one point and 'very much so' given four points. A higher score indicates

better interpersonal ability. At the time of development, Cronbach's α was .82, while it was .86 in [17]. In this study, Cronbach's a was .89.

Data Collection and Procedures

Data were collected from June to July, 2017 by visiting the department of nursing at three universities in province C, explaining the objective of this study and the process to the head of department and students, acquiring their consent and handing out a structured self-reported questionnaire. It took on average 15 minutes to fill out the questionnaire.

For ethical considerations, subjects were told that they can withdraw from the study at any point in time. A written consent form was acquired before proceeding with the study. It was also explained that to protect the privacy of subjects, collected data would be coded, only used for the study, and disposed of after a certain period of time. Confidentiality was also guaranteed. The advantages and disadvantages by taking part in the study were also explained. The contact information of the researcher was also given to subjects to minimize any issues.

Data Analysis

The collected data were analyzed using SPSS 20.0 (SPSS Inc, Chicago, II, USA) as follows.

1. Analysis was conducted using the real numbers, percentage, mean and standard deviation to identify the general characteristics, childhood emotional trauma, depression, anger expression and interpersonal ability of the subjects.
2. To review the difference in general characteristics, depression, anger expression and interpersonal ability according to childhood emotional trauma, x^2 and t-test were used for analysis.
3. The correlation between childhood emotional trauma, depression, anger expression and interpersonal ability was analyzed using Pearson's correlation coefficients.

Results and Discussion

General Characteristics of Study Subjects: Of the total of 205 subjects, there were 35 male (17.1%) and 170 female (82.9%). Average age was 20.9 years. There were 86 subjects (42.0%) with a religion, while 119 subjects (58.0%) did not have a religion. In terms of number of co-habitants, 83 subjects (40.5%) answered three or fewer, 94 subjects (45.9%) answered four, and 28 subjects (13.7%) answered five or more. Twenty-one subjects (10.2%) had a monthly household income of two million Won or less, 72 subjects (35.1%) had a monthly household income between 2.01 million and 4 million Won, 82 subjects (40.0%) had a monthly household income between 4 million and 6 million Won, and 30 subjects (14.6%) had a monthly household income of 6 million Won or higher. In terms of childhood emotional trauma experienced, 141 subjects (68.8%) experienced emotional abuse, 64 subjects (31.2%) did not experience any. In terms of emotional neglect, 101 subjects (49.3%) had experienced, while 104 subjects (50.7%) had not <Table 1>.

A review of the difference in childhood emotional trauma according to general characteristics of subjects <Table 1> showed that there was a difference across genders depending on whether emotional abuse had been experienced ($\chi 2$=2.66, p=.078), but this difference was not statistically significant. There was no difference according to whether emotional neglect had been experienced.

Table 1: General Characteristics (N = 205)

Characteristics	Categories	Total	Childhood Emotional Trauma					
			Emotional Abuse			Emotional Neglect		
			No	Yes	X^2 or t(p)	No	Yes	X^2 or t(p)
		n(%) or M ± SD	n(%) or M ± SD	n(%) or M ± SD		n(%) or M ± SD	n(%) or M ± SD	
			64(31.2)	141(68.8)		104(50.7)	101(49.3)	
Gender	Male	35(17.1)	15(7.3)	20(9.8)	2.66 (.078)	18(8.8)	17(8.3)	0.01 (.928)
	Female	170(82.9)	49(23.9)	121(59.0)		86(42.0)	84(41.0)	
Age(years)		20.9 ± 4.48	21.04 ± 5.12	20.85 ± 4.18	-0.28 (.773)	21.14 ± 4.85	20.67 ± 4.08	-0.75 (.454)

Conted…

Religion	Yes	86(42.0)	29(14.1)	57(27.8)	0.43 (.543)	39(19.0)	47(22.9)	0.91 (.340)
	No	119(58.0)	35(17.1)	84(41.0)		62(30.2)	57(27.8)	
Inmate (No.)	3>	83(40.5)	24(11.7)	59(28.8)	0.49 (.783)	40(19.5)	43(21.0)	0.25 (.882)
	4	94(45.9)	30(14.6)	64(31.2)		48(23.4)	46(22.4)	
	5<	28(13.7)	10(4.9)	18(8.8)		13(6.3)	15(7.3)	
Monthly income of family (10,000won))	200>	21(10.2)	7(3.4)	14(6.8)	0.45 (.958)	12(5.9)	9(4.4)	1.846 (.605)
	201~400	72(35.1)	22(10.7)	50(24.4)		32(5.6)	40(19.5)	
	401~600	82(40.0)	27(13.2)	55(26.8)		44(21.5)	38(18.5)	
	600<	30(14.6)	8(3.9)	22(10.7)		16(7.8)	14(6.8)	

Difference in Anger Expression, Depression and Interpersonal Ability According to Childhood Emotional Trauma: Anger expression of subjects scored 1.93 points which was lower than the average. In the sub-categories, anger control was the highest at 1.96 points, followed by anger suppression at 1.92 points and anger expression at 1.90 points. Depression scored 31.91 points which was higher than the average. Interpersonal ability, too was higher than average at 3.58 points <Table 2>.

The difference in anger expression, depression and interpersonal ability in subjects was as seen in Table 2. An analysis of the difference depending on whether emotional abuse had been experienced showed that there was no significant difference in anger expression but there was statistically significant difference in the sub-category of expression (t=1.69, p=.091). Depression had statistically significant difference (t=2.62, p=.009), but there was no difference in interpersonal ability. An analysis of the difference according to whether emotional neglect had been experienced showed that there was no statistically significant difference in anger expression (t=2.01, p=.046), while there was statistically significant difference in the sub-category of anger suppression (t=2.21, p=.028). Depression, too, had significant difference (t=4.37, p<.001), as did interpersonal ability (t=-2.96, p=.003), indicating that when emotional neglect is experienced, there was a decrease in interpersonal ability.

Table 2: Degree of the Variable of the Subject (N = 205)

Variables	Categories	M ± SD	Childhood Emotional Trauma					
			Emotional Abuse			Emotional Neglect		
			No (n=64)	Yes (n=141)	t(p)	No (n=104)	Yes (n=101)	t(p)
			M ± SD	M ± SD		M ± SD	M ± SD	
Anger expression	Total	1.93 ± 0.36	1.88 ± 0.32	1.95 ± 0.38	1.28(.200)	1.88 ± 0.33	1.98 ± 0.38	2.01(.046)
	Anger display	1.90 ± 0.40	0.83 ± 0.34	1.93 ± 0.42	1.69(.091)	1.85 ± 0.37	1.95 ± 0.43	1.65(.100)
	Anger adjustment	1.96 ± 0.40	1.92 ± 0.40	1.97 ± 0.40	0.93(.351)	1.92 ± 0.37	2.00 ± 0.42	1.44(.149)
	Anger suppression	1.92 ± 0.42	0.89 ± 0.36	1.94 ± 0.45	0.81(.417)	1.86 ± 0.39	1.99 ± 0.45	2.21(.028)
Depression		31.91 ± 8.06	29.75 ± 6.85	32.90 ± 8.39	2.62(.009)	29.57 ± 6.09	34.32 ± 9.10	4.37(<.001)
Interpersonal relationship		3.58 ± 0.36	3.60 ± 0.36	3.57 ± 0.36	-0.54(.584)	3.50 ± 0.36	3.50 ± 0.36	-2.96(.003)

Correlation between Childhood Emotional Trauma, Depression, Anger Expression and Interpersonal Ability: An analysis of the correlation between childhood emotional trauma, depression, anger expression and interpersonal ability showed the results as seen in <Table 3>. There was a positive correlation between childhood emotional trauma and anger expression (r=.327, p<.001), and with the sub-factors of anger expression (r=.269, p<.001), anger control (r=.281, p<.001), and anger suppression(r=.319, p<.001). While there was a positive correlation with depression (r=.482, p<.001), there was a negative correlation with interpersonal ability (r=-.185, p=.008). of childhood emotional trauma, the experience of emotional abuse had a positive correlation with anger expression (r=.337, p<.001) and its sub-factors of anger release (r=.302, p<.001), anger control (r=.293, p<.001) and anger suppression (r=.302, p<.001).

It also had a positive correlation with depression (r=.375, p<.001) but did not have any correlation with interpersonal ability. The experience of emotional neglect had a positive correlation with anger expression (r=.237, p=.001) and the sub-factors of anger release (r=.174, p=.013), anger control (r=.201, p=.004) and anger suppression (r=.253, p<.001). Depression, too had a positive correlation (r=.451, p<.001). There was a negative correlation with interpersonal ability (r=-.207, p=.003). Anger expression had a positive correlation with depression (r=.327, p<.001) but did not have any correlation with interpersonal ability. Depression had a negative correlation with interpersonal ability (r=-.222, p=.001). That is, greater childhood emotional trauma experience was correlated with a higher degree of anger expression and depression, and a lower degree of interpersonal ability.

Table 3: Correlation between childhood emotional trauma, depression, anger expression and interpersonal ability (N = 205)

Variables	1	2	3	4	5	6	7	8
1 Childhood emotional trauma	1							
2 Emotional abuse	.386**							
3 Emotional neglect	.888**	.490**						
4 Anger expression	.327**	.337**	.237**					
5 Anger display	.269**	.302**	.174*	.869**				
6 Anger adjustment	.281**	.293**	.201**	.901**	.678**			
7 Anger suppression	.319**	.302**	.253**	.894**	.643**	.728**		
8 Depression	.482**	.375**	.451**	.327**	.205**	.286**	.377**	
9 interpersonal relationship	-.185**	-.104	-.207**	.101	.120	.137	.015	-.222**

**p=.001; *p=0.05

Conclusion & Suggestions

This study sought to identify the degree of childhood emotional trauma in university students majoring in nursing, their depression, anger expression and interpersonal ability, as well as correlation between these factors. Convenience sampling was used to select subjects from firstman and sophomore year students of nursing at three universities in the C region. A total of 205 copies were analyzed.

The findings show that 68.8% (131 subjects) had experienced emotional abuse, while 31.2% (64 subjects) had not. 49.3% (101 subjects) had experienced emotional neglect, while 50.7% (104 subjects) had not. As seen in this study, about half of the subjects experienced emotional abuse or neglect. Various studies seem to be needed on the depression, anger expression and interpersonal ability of university students who had had such an experience as a child.

In terms of difference according to whether one had experienced emotional abuse, there was statistically significant difference in anger expression which is a sub-category of anger. In particular, there was significant difference in depression. In terms of difference according to whether one had experienced emotional neglect, there was statistically significant difference in anger expression, with significant difference found in the sub-categories of anger suppression, depression and interpersonal ability. As such, various programs and counseling should be considered for university students who had experienced emotional abuse or neglect.

Meanwhile, there was a positive correlation between childhood emotional trauma and anger expression, as well as with the sub-categories of anger release, anger control, and anger suppression. childhood emotional abuse had a positive correlation with anger expression and its sub-categories of anger release, anger control and anger suppression, as well as with depression. But there was no correlation with interpersonal ability. Depression had a negative correlation with interpersonal ability. That is, greater childhood emotional trauma was correlated with a higher degree of anger expression and depression and a lower degree of interpersonal ability. As such, various follow-up studies would be needed based on these findings of correlation.

This study was conducted based on data collected through convenience sampling from three nursing colleges.

As such, a more prudent approach to interpretation is needed. Follow-up studies with iteration and a wider sample are recommended. Studies are also suggested on the development and application of various programs for emotional well-being of nursing students in universities and verification of the benefits of such programs.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Low Complexity Decimator for Communication between a Basestation and a Base Station Control System of an Underwater Acoustic Network

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ABSTRACT

Background/Objectives: We designed a decimator for a basestation-basestation controller communication of an underwater acoustic sensor network. Since it cannot be supplied with power smoothly, we focused on a low-complexity decimator.

Method/Statistical Analysis: Many underwater acoustic communication systems including decimators have been implemented using a microprocessor because acoustic wave signals are typically processed at a lower operating frequency than operating frequency of microprocessors. However, we designed a specific hardware decimator that support a low-power underwater acoustic communication system based on specifications of Hoseo University research group to reduce power consumption. We used Matlab and Verilog-HDL to simulate our algorithm and architecture.

Findings: Although a CIC filter has a simple and regular structure, it has a wide transition region and a narrow passband. So it is not suitable for underwater communication where channel spacing is narrow. We added a halfband filter for fast attenuation in the transition region and a compensation filter for passband attenuation compensation. We constructed the sampling rate conversion in three stages with an individual CIC filter. Since the last CIC filter was the most influential on the signal attenuation, the compensation filter was designed for the three-stage CIC filter. The halfband filter and the compensation filter were cascaded before and after the three-stage CIC filter, respectively, to reduce power consumption. Since the transition region of the halfband filter is located at the 1/4 frequency of the sampling frequency of the input signal, the sampling down rate of the three-stage CIC filter is half. Therefore, the proposed decimator has a narrow frequency transition region and a flat passband suitable for underwater acoustic communication.

Improvements/Applications: Our proposed decimator makes it possible to realize a stable digital circuit in low frequency band signal processing such as sensor data processing as well as communication.

Keywords: *cic filter, decimator, half-band filter, underwater communication, down sampling*

Introduction

Recently, studies on the underwater network based on an acoustic communication have been actively conducted to observe and control the marine environment for marine resource development, marine disaster preparedness, military defense, etc. [1-3]. In general, since an acoustic communication uses a low frequency of several tens of KHz, a data transmission speed is slower than an electromagnetic wave communication using a band of several hundred MHz to several tens of GHz. However, since the electromagnetic wave rapidly decreases according to the distance in the water, electromagnetic wireless communication cannot be established in the water. On the other hand, acoustic communication can be performed in the water up to several tens of kilometers. Therefore, most countries such as USA, Europe, China and Japan use acoustics for underwater communication [4-6]. The WHOI Acoustic Communications Group in the

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United States has established an acoustic communication system that links a number of underwater mobile-boat-buoy-underwater probe-submersibles[4]. In the SUNRISE project supported by the EU, Underwater IoT based on Underwater WSN is studying [5]. Japan JAMSTEC is studying underwater communication network while providing and analyzing real-time ocean information using satellite tracking buoy [6]. In Korea, Hanwha, LIG NEX1, SK Telecom and Hoseo University, etc are studying underwater communication [7,8].

In this paper, we have studied digital sampling rate down converter for acoustic communication between underwater basestation controller and underwater basestation based on the underwater acoustic communication system of Hoseo University research group [8]. The underwater communication system needs a simple, low-power system because it is difficult to replace a power supply and a battery due to installation environment constraints. By the way, most of acoustic communication systems are implemented using a microprocessor based on software due to the use of acoustics that support low rate data processing. However, the Hoseo University research group uses OFDM and CDMA for the underwater acoustic communication system and has designed dedicated hardware. So, a low-complexity and low-power consumption digital down converter is required.

We designed the decimator of underwater acoustic communication system based on CIC filters [9]. The CIC filter consists of two basic blocks, an integrator and a comb. The CIC decimator connects N integrator blocks operating at F_{in} sampling rate, a 1/R down sampler and N comb blocks operating at F_{in}/R. (Fin: the sampling frequency of the input signal, R: the ratio of the sampling frequency (F_{in}) of the input signal to the sampling frequency (F_{out}) of the output signal, $R = F_{out}/F_{in}$). The following is the transfer function of the CIC filter and the magnitude response at the output of the filter.

$$H(z) = \frac{\left(1 - z^{-RM}\right)^N}{\left(1 - z^{-1}\right)^N} = \left(\sum_{k=0}^{RM-1} z^{-k}\right)^N \quad \ldots(1)$$

$$|H(f)| = \left|\frac{\sin(\pi Mf)}{\sin\left(\frac{\pi f}{R}\right)}\right|^N \quad \ldots(2)$$

where M is the differential delay. As shown in Equation (1), all coefficients of the CIC filter are '1'. So, the circuit can be constructed with only adders without storages and multiplier operators, which is efficient in terms of design complexity, size and power consumption [10]. In general, down sampling requires an anti-aliasing filter to avoid aliasing that occurs during this process.

Since the CIC filter includes the LPF function, it is not necessary to implement a separate LPF. However, as shown in Equation (2), the CIC filter has a sinc function form whose passband droop is large and transition region is wide. Particularly, since the carrier frequency is low in the underwater acoustic communication, the data link interval is narrow and a high-order filter having a narrow transition region is required. Therefore, in this paper, we propose a decimator for underwater acoustic communication that can compensate a narrow passband and a wide transition region.

In Section 2, we describe the frequency allocation of underwater acoustic communication system and then describe the hardware structure of the decimator. In Section 3, we show the results of the design simulation. Finally, Section 4 concludes the paper.

Method

Frequency Allocation: The distributed underwater acoustic sensor network consists of underwater basestation control systems, underwater basestations and underwater sensor nodes. Figure 1 shows the frequency allocation of a distributed underwater acoustic sensor network proposed by the Hoseo University research group. There are total eight communication links. Four communication links of them are defined between the underwater basestation and the underwater basestation control system as shown in the Figure 1. One downlink (DL) for transmitting data from underwater basestation control system to underwater basestation and two uplinks (UL0, UL1) for data transmission from underwater basestation to underwater basestation control system are allocated to frequencies lower than 20 KHz to allow communication up to 10 km, and one uplink (UL2) is allocated for utilization of high-speed transmission environments within 1 Km. Since uplink and downlink use different frequencies, full-duplex data transmission is possible. Table 1 shows various frequency requirements. Bandwidth of UL0 and UL1 is 4 KHz and transition region is 1 KHz. In other words, data links in underwater acoustic communication require a narrow passband and a rapidly-attenuated transition region.

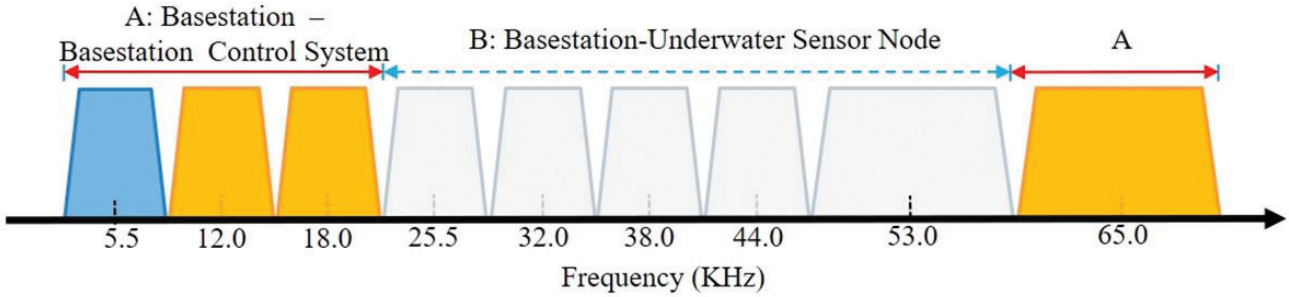


Figure 1: Frequency allocation of a distributed underwater acoustic sensor network proposed by the Hoseo University research group

Table 1: Carrier frequency F_C, bandwidth, transition region, passband signal sampling frequency(F_S), baseband data processing frequency(F_B), and sampling rate changing factor according to links ($R = F_B/F_S$)

Link	Carrier frequency (F_C, KHz)	Bandwidth (KHz)	Transition region (KHz)	Passband signal sampling frequency (F_S, KHz)	Baseband data processing frequency (F_B, KHz)	Sampling rate changing factor ($R = F_B/F_S$)
DownLink	5.5	5	1	500	5	1/100
UpLink 0	12	4	1	500	5	1/100
UpLink 1	18	4	1	500	5	1/100
UpLink 2	65	10	1	500	10	1/50

Architecture of a Decimator: As shown in Table 1, the highest carrier frequency of communication between the underwater basestation and the underwater basestation control system is 65 KHz (UL2) and the passband signals are sampled at 500 KHz (F_S), which is about 7.5 times of the highest carrier frequency. While the carrier frequency signals are converted to the baseband signals, the sampling rate is also converted. the baseband data processing frequencies are 5 KHz and 10 KHz for UL0, UL1, DL and UL2, respectively. Therefore, the sampling rate should be reduced by 1/100, 1/100, 1/100 and 1/50 for UL0, UL1, DL and UL2, respectively. In this study, the data sampling rate conversion was divided into three stages.

Previous Architecture: We designed a decimator of an underwater acoustic sensor network by cascading three CIC filters[9]. As shown in Table 2, the sampling rate was reduced to 1/5 in the first stage and in the second stage in common for all links. In the third stage, the sampling rate was reduced to 1/4 for UL0, UL1 and DL, and to 1/2 for UL2. Therefore, the total sampling rate was reduced to 1/100 and 1/50.

Table 2: Comparison of sampling rate changing factors between previous architecture and proposed architecture

	Sampling rate changing factor of previous architecture			Sampling rate changing factor of proposed architecture		
Link	the 1st stage	the 2nd stage	the 3rd stage	the 1st stage	the 2nd stage	the 3rd stage
DownLink	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 0	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 1	1/5	1/5	1/4	1/10	1/5	1/2
UpLink 2	1/5	1/5	1/2	1/5	1/5	1/2

Proposed Architecture: As mentioned above, the CIC filter has a relatively narrow passband and a wide transition region. However, since the underwater acoustic communication requires that transmission frequency band is low and a link interval is narrow, CIC filters are not suitable for that communication. So, as shown in Figure 2, we added a compensation filter and a halfband filter to flat a passband and narrow a transition region, respectively, in order to overcome the problems of CIC filters.

Figure 3 shows the frequency response when only three CIC decimators are connected in series to change the sampling rate to 1/100 times in UL. Figure 3(a) shows the frequency responses for each of the three decimators and the three cascaded connection in 250 KHz and Figure 3(b) shows them in 5 KHz. As shown in Figure 3(b), the magnitude of the frequency response is -3.75 dB at 2.45 KHz and -3.92 dB at 2.5 KHz. That is, passband droop and aliasing occur.

As shown in Figure 3(b), the first and second stage CIC decimators seems like all-pass filters in 2.5KHz band and the third stage one has the greatest effect on the final frequency response of the decimator. Therefore, it is necessary to add a compensation filter for the third CIC decimator to compensate the attenuation of the passband region, and a LPF with a narrow frequency transition region to prevent aliasing.

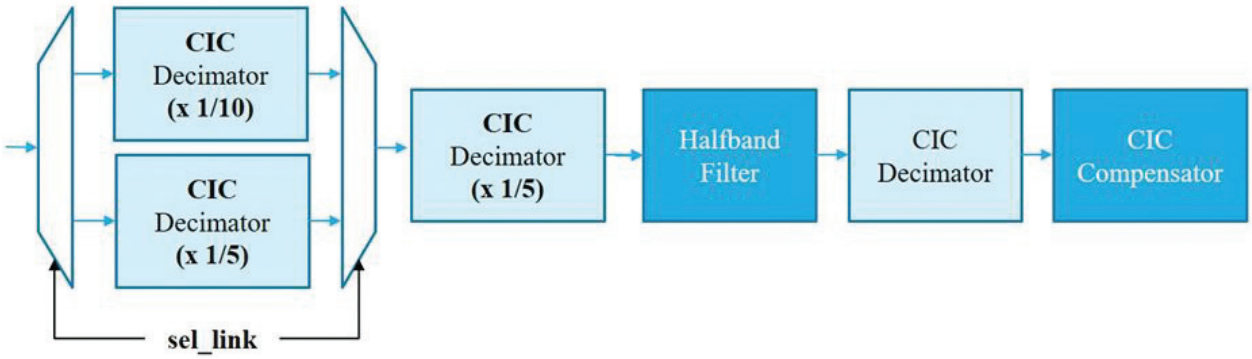
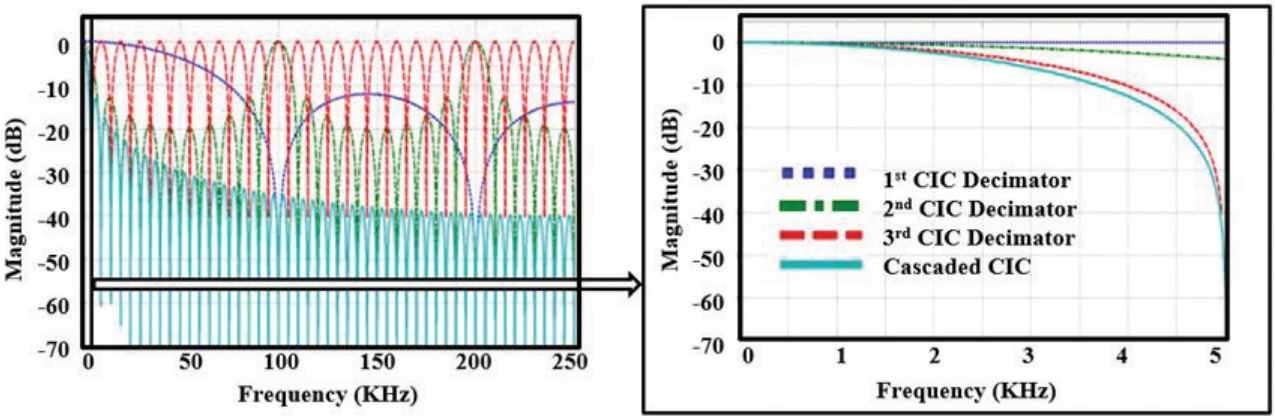


Figure 2: Blockdiagram of the proposed decimator



(a) **(b)**

Figure 3: Frequency responses for each of the three decimators and the three cascaded connection (a) in 250 KHz and (b) in 5 KHz.

As shown in Figure 2, the sampling rate is highest at the first CIC filter input, and goes lower toward the backend. Therefore, placing a compensation circuit at the last stage of the circuit is preferable in terms of area and power consumption, so the compensator is connected behind the third CIC filter as shown in Figure 2. The compensation filter was implemented to have an inversed magnitude response of the third CIC filter as shown in the following equation[11].

$$|G(f)| = \left|\frac{\sin\left(\frac{\pi f}{R}\right)}{\sin(\pi Mf)}\right|^{N} \approx \left|\frac{\pi Mf}{\sin(\pi Mf)}\right|^{N} = |\text{sinc}^{-1}(Mf)|^{N} \quad \ldots(3)$$

A halfband filter is a LPF that is often used to reduce the data bandwidth by a factor of 2 and its transition region is located at the1/4 of the sampling frequency of the input signal. All even (or odd) coefficients of it are '0', and the other coefficients are symmetrical[12]. We added this halfband filter before the third decimator. The third decimator reduces the sampling rate by half for all links. Sampling rate changing factor of proposed architecture is summarized in Table 2.

Results and Discussion

The proposed decimator was simulated using Matlab. Figure 4 shows the frequency response of the

third CIC filter, the compensation filter, and the filter in which two filters are connected in series. The passband of the cascaded filter is flattened by the compensation filter. However, the characteristics of the transition region are worse because the frequency response of the stop band also increases. An LPF is required to remove the signal from the stop band region.

Figure 5 shows the frequency response of the third CIC filter, the compensation filter, the halfband filter, and the filter in which three filters are connected in series. It is confirmed that the signal in the stopband region is sufficiently low to prevent aliasing. In the DL, the magnitude of the frequency response is -3.67 dB at the passband frequency of 2.45 KHz and -55 dB at the stopband frequency of 2.5 KHz. The frequency response in the pass band is improved and the frequency response at the stop band is sufficiently low to solve the problem of the aliasing.

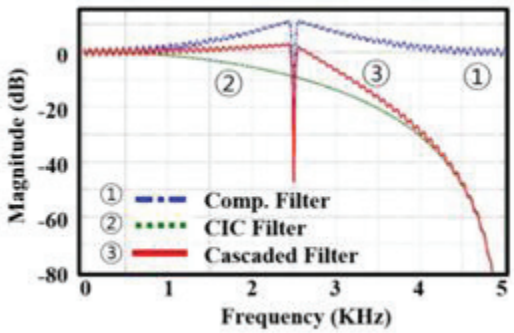


Figure 4: Frequency responses for the compensation filter ①, the third CIC filter ② and the cascaded filter of ① and ②

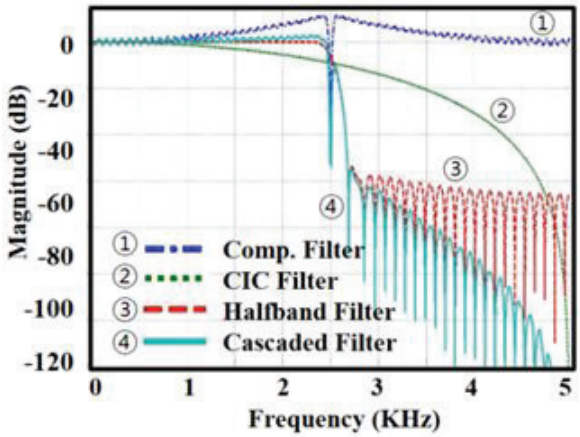


Figure 5: Frequency responses for the compensation filter ①, the third CIC filter ②, the halfband filter and the cascaded filter of ①, ② and ③

Figure 6 shows function simulation results of verilog-hdl design using ModelSim. Input signal (data_in) of the decimator passes through the first and second CIC filters, the halfband filter, the third CIC filter, and the compensation filter, so that the sampling rate was lowered. We verified the verilog-hdl design by comparing Modelsim simulation results with matlab fixed-point simulation results. There were max 1-bit error in the last 16-bit data output signals (data_out_comp).

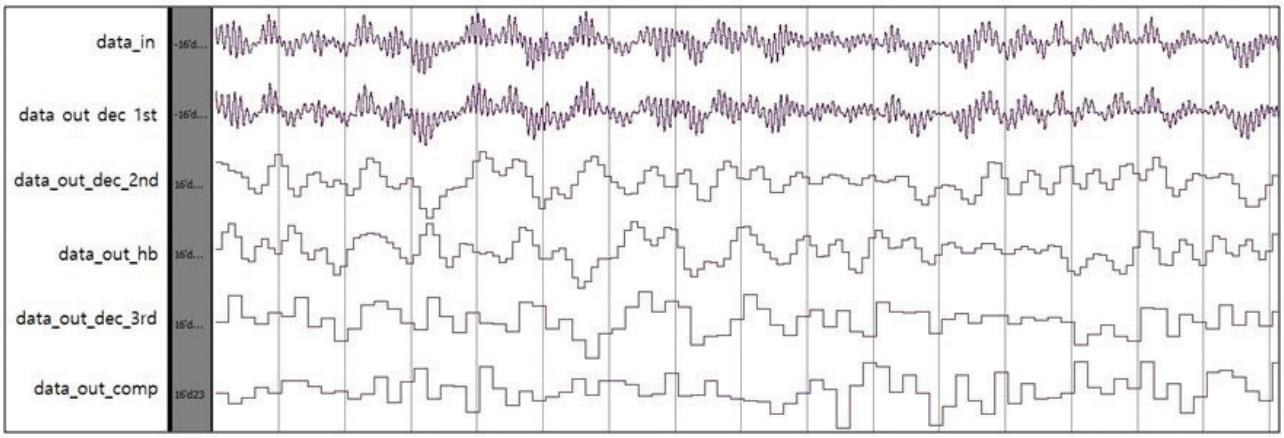


Figure 6: From the top, input signal of the decimator (data_in) and output signals of the 1st CIC filter (data_out_dec_1st), the 2nd CIC filter(data_out_dec_2nd) passes through the first and second CIC filters, the halfband filter, the third CIC filter, and the compensation filter

Conclusion

The low-complexity decimator was designed for communication between the underwater basestation control system and the underwater basestation of the distributed underwater acoustic sensor network proposed by the Hoseo University research group. The decimator was based on three serially-connected CIC filters that consist of only adders without multipliers and storages.

Because the CIC filters had passband droop and a wide transition region, they were not suitable for underwater acoustic communication with narrow channel spacing. We designed the compensation filter for the third CIC filter that was the most influential on passband droop and connected it to the output of the decimator that operated at the lowest sampling rate to reduce power consumption. In addition, the halfband filter was added to attenuate high frequencies more steeply. We confirmed the frequency specification of our proposed decimator by simulation with Matlab and verilog-hdl, and verified the function through function simulation. The proposed decimator will be integrated with the modem system designed in Hoseo University research group in the future and used in the underwater acoustic sensor network.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Writing Reflection Journal on Learning Attitude and Reflective Thinking Level in Students Taking a Clinical Training

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ABSTRACT

Background/Objectives: Effects of a writing reflective journal on learning attitude and reflective thinking among nursing students in clinical training were studied.

Method/Statistical Analysis: A quasi-experimental study of a non-equivalent control group before and after test design was used. The treatment groups(n=33) wrote a reflective journal for 2 weeks while the comparison groups(n=35) wrote traditional nursing practice journal. Participants were sixty-eight undergraduate nursing students from G city's universities. Data were collected using self-reported structured questionnaires and analyzed with χ^2-test and independent t-test using SPSS Win 21.0.

Findings: Analysis of homogeneity of general characteristics, self-directed learning attitude, and reflective thinking level between experimental and control groups before clinical practice showed that there was no significant difference and two groups were homogeneous. The students in the treatment group were reported to have significant positive changes to reflective thinking level but not to learning attitude. The purpose of this study was to investigate the effects of reflection journal writing on self - directed learning ability and reflection level of nursing students in clinical practice classes and to contribute to establish effective teachings and learning strategies. There was a statistically significant difference in the level of reflective thinking before and after the reflection log, but there was no significant difference in self-directed learning ability. The significance of this study is to show the applicability of reflection logbook activities in clinical practice subjects and to measure the effectiveness. Therefore, it was necessary to keep the reflection level of nursing college students constantly through the use of reflection in clinical practice class.

Improvements/Applications: Our study represented that writing a reflective journal was a useful strategy for improving the level of student's reflective thinking level.

Keywords: *Clinical practice, Learning attitude, Nurse, Reflective journal, Reflective thinking*

Introduction

Clinical practice in nursing curriculum was an essential learning process for professional nurses with integrated ability of knowledge and nursing. The role of the nurse should provide patients with complex and rapidly changing medical services. In order to solve the health problems of patients with high severity, they should be equipped with situation awareness and problem solving ability based on critical thinking. Critical thinking should be judged based on facts and evidence, rather than guessing. It was a rational and reflective thinking, a cognitive process leading to problem solving and decision making[1]. The proliferation of critical thinking education was connected with informatization and closely related to the characteristics of modern society. Critical thinking was needed to adapt quickly to new changes and solving problems. It was imperative to have adaptive cognitive ability to cope with the problems

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that arise in a new complex situation. Self-reflection was essential to develop critical thinking skills[2].

Reflection was the process by which learners acquire new knowledge. It was the intellectual and emotional activity that a learner thinks when accepting new knowledge. It was not simply reproducing knowledge or recalling experience. It is a high-level thinking activity that reconstructs knowledge[3].We needed all the feelings of thinking, problem solving and concentration. We needed emotional regulation to remember, search, transmit, and connect all the information we already know. In the field of nursing, reflection was a process in which nursing practitioners critically evaluate the performance of their work. Ability to performed tasks in nursing education and clinical services has an impact. Nurses need to learn to think efficiently for their mission. And to change the practice of the future by applying the results back to their practices[4]. The method of objectifying the learners reflexive thoughts and activities was to ask the learner to write a reflection. Thoughtful learning develops students' critical thinking skills. Learning experience was needed to analyze the experience and improve future performance. Students need to review the types of learning in order to deepen their learning. This can include a variety of activities, including self-review, peer review, and personal development plans[5,6].

We aimed to investigate the effect of the reflection journal on the self-directed learning ability and the reflection level of nursing students in clinical practice class. Based on our results, basic data for establishing an effective teaching and learning strategy of nursing practice education were presented.

The following hypotheses were established to achieve your aims. First, the self-directed learning attitude will be higher in the experimental group who wrote the structured reflection log than the control group who wrote the unstructured practice journal. Second, the experimental group who wrote the structured reflection log would be more Reflective than the control group who wrote the unstructured practice journal.

Materials and Method

Experimental Design: To investigate the effect of reflection journal writing on the self-directed learning ability and reflection level of nursing students in clinical practice class, the experimental group made a structured log of reflection during the 2 week clinical practice period. The control group prepared a traditional practice journal during the same period. Self-directed learning ability and reflection level were assessed beforehand in order to find the difference between self-directed learning ability and reflective thinking level between two groups. After experiments, the self-directed learning ability and the reflection level of the two groups were evaluated and the difference between the groups was analyzed.

Participants & Data Collection: Effects of the 'Nursing for Adult Health Practicum I' in Grade 3 students from April 25 to June 17, 2016 were examined. Students who understood the purpose of the study and agreed to participate in the study were identified. In order to prevent the error of the experiment, students of G hospital were used as an experimental group and students of C hospital were used as a control group.

The minimum sample size required for t-test was determined using a G * Power 3.1 program. As a result, the minimum sample size was determined with an effect size of 0.7, a significance level of .05, and a power of 0.80. Seventy-four patients in total were selected from the two groups with of 36 patients from each, considering 20 ~ 30% of the dropouts in each group. In the analysis of the final data, 68 participants were used in the experiment group with 3 questionnaires and 3 in the control group.

Instrument

Self-Directed Learning Attitude: Self-directed learning attitude was measured using 'Self-Directed Learning Readiness Scale (SDLS)' developed by Guglielmino[7] and standardized by West and Bentley[8].SDLS has a total of 32 items, including attachment to learning, self-confidence as a learner, openness to challenge, curiosity about learning, self - understanding, and acceptance of responsibility for learning. Each item was rated on a Likert scale ranging from 'strongly disagree' to 'strongly agree'. The higher the score represented the higher the self-directed learning ability. West and Bentley was reliability analysis showed Cronbach'α coefficient was 0.73[8]. In the study reliability analysis showed Cronbach's α coefficient was 0.88.

Reflective Thinking Level: Reflective Thinking Level was a tool that Jung MY[10] modified and translated 'The Reflective Learning Continuum' developed by Peltierl[9]. Reflective thinking level consisted of 14 items in habitual

behavior, understanding, reflection, and critical reflection. Each item was rated on a Likert scale ranging from 'strongly disagree' to 'strongly agree'. The higher the score represented the higher the self-directed learning ability. Previous reliability analysis showed Cronbach'α coefficient was 0.71-0.75[10]. In the study reliability analysis showed Cronbach's α coefficient was 0.75.

Ethics in Human Participants Research: The researchers will use the research purpose, research progress, anonymity, and collected data only for research purpose in the ethical aspect of the subject. I explained that I could withdraw the participation at any time during my participation and that I would not be disadvantaged at all. After the completion of the follow-up survey, all participants participated in the study and gave their appreciation for participation and cooperation. The control group was provided with the same education program after the completion of the post-survey.

Data Analysis

SPSS 21.0 program was used to analyze the data. Pre-homogeneity tests of the experimental group and control group were performed by χ^2-test, Fisher's exact test, and independent t-test. Significant difference between the experimental group and control group was determined using, the independent t-test.

Results and Discussion

Students must be self-directed learners. In order to become a self-directed learner, a thoughtful level of thinking must be prepared. To maintain this thoughtful level of thinking, it is important to maintain a self-directed learning attitude and a reflective thinking level that have a positive impact on self-directed learning[11]. The analysis of the general characteristics, self-directed learning attitude and reflective thinking level of experimental group and control group before clinical practice, showed no significant difference between experimental group and control group as shown in Table1.

Table 1: Homogeneity Test of General Characteristics and Dependent Variables between the Treatment and Comparison Groups

Characteristics	Category	Treatment group (n = 33)		Comparison group (n = 35)		x^2 or t	p
		n(%)	or M ± SD	n(%)	or M ± SD		
Age(yr)		21.45	± 2.32	21.03	± 1.34		.354
Sex*	Male	5	(7.4)	1	(1.5)		.101
	Female	28	(41.2)	34	(50.0)		
Satisfaction with major	Very high	3	(1.5)	4	(5.9)	1.958	.581
	High	13	(23.5)	12	(17.6)		
	Moderate	16	(19.1)	15	(22.1)		
	Poor	1	(4.4)	4	(5.9)		
Grade point average	4.00~4.50	6	(8.8)	8	(11.8)	.611	.894
	3.51~3.99	17	(25.0)	15	(22.1)		
	3.00~3.50	8	(11.8)	9	(13.2)		
	2.51~2.99	2	(2.9)	3	(4.4)		
Reflection education experience	Yes	14	(20.6)	22	(32.4)	2.846	0.92
	No	19	(27.9)	13	(19.1)		
Learning Attitude		111.45	± 12.60	109.97	± 10.25	.534	.595
Reflective thinking		45.42	± 3.35	46.49	± 4.00	-1.183	.241

*Fisher's exact test

The results of the hypothesis test were as follows. The first hypothesis is that 'the experimental group who wrote the structured reflection log would have a higher self-directed learning attitude than the control group who wrote the unstructured practice journal'. Hypothesis 1 was rejected because of no statistically significant difference in the mean score between the experimental group and control group (t = 1.45, p = .152) as shown in table 2. There were no significant differences in the self-directed learning ability of nursing students in structured reflection journal and practice journal writing in clinical practice education as shown in Table 2.

Table 2: Differences between Treatment and Comparison Groups for Dependent Variables

Groups	Before test			After test			t	p
	M	±	SD	M	±	SD		
Learning Attitude								
Treatment group (n = 33)	111.45	±	12.60	109.97	±	10.25	1.45	.152
Comparison group (n = 35)	116.97	±	10.82	113.28	±	10.13		

In previous studies, introspection activities have positive effects on improvement of cognitive ability and self-confidence. Teachers of nursing students should provide positive feedback and encouragement to maximize student orientation toward internal control. Students should strengthen their self-esteem by nurturing optimistic attitudes, positive emotional experiences, and self-development[12]. Positive correlation was found between self-directed learning ability and clinical competence with metacognition. The most powerful predictor of clinical ability was metacognition. To improve the clinical competence of nursing students, it was necessary to improve the metacognitive ability[13]. Lack of motivation and confidence was said to affect other social and emotional qualities. Confidence and self-control skills were greatly influenced by support and coaching staff. Socially sensitive skills such as self-confidence were important because students were increasingly obliged in demanding compliance with rules, goal-oriented activities, and positive peer and teacher relationships. And also affect learning emotions such as learning motivation and learning attitudes[14,15]. It could lead to improving the active learning attitude of nursing college students and strengthening capacity as a preliminary nurse. In order to establish the nurses identity, an environment should be established to facilitate the reflection activities in clinical practice education.

The second hypothesis is that 'the experimental group who wrote the structured reflection log would have higher reflective thinking than the control group who wrote the unstructured practice journal'. Hypothesis 2 was supported because the experimental group had higher post-test the post-test scores than the control group ($t = 7.45$, $p < .001$) as shown in Table 3.

Table 3: Differences between Treatment and Comparison Groups for Dependent Variables

Groups	Before test			After test			t	p
	M	±	SD	M	±	SD		
Reflective Thinking Level								
Treatment group (n = 33)	45.42	±	3.35	54.00	±	4.02	7.45	<.001
Comparison group (n = 35)	46.49	±	4.00	46.80	±	3.95		

Logbooks were powerful and effective educational tools for structuring and testing medical education and technology. The evaluation of the surgery journal explains that the current version should be adjusted to meet student and institutional requirements. Otherwise, it will be regarded as purely labor-intensive and will eventually fail. Clinical practice training using structured reflection logbooks was effective in enhancing reflective thinking of nursing students. This is in agreement with previous research that structured questions support learners' reflection activities[16,17,18]. During the clinical practice, students have to better organize the learning situation to optimize their learning. Student education has been developed to improve the structure of clinical practice education. In creating this logbook, students must systematically register essential learning activities. Students routinely record the patient's problems in the manner they face and in some way (passive, active, without feedback)[19].Family practice anesthesiology (FPA) even though residents use incoherent journals, the data obtained provides an initial description of the FPA education year's composition. Resident journal explains that it provides a great tool for improving the goals of the standardized curriculum and assessment program for FPA education[20].The experimental group of this study carefully thought about various nursing problems that occurred in the clinical field through the reflection question provided. It is interpreted that reflexive thinking is promoted by recording seriously, learning through learning activities, and finding out the lack of oneself.

Conclusion

Effects of reflection journal writing on self-directed learning ability and reflection level of nursing students in clinical practice classes were investigated to find their contribution to establishing effective teaching and learning strategies. A statistically significant difference in the level of reflective thinking before and after the reflection log was found, but there was no significant difference in self-directed learning ability. The significance of this study could be the applicability of the reflection logbook activities in clinical practice subjects and measuring their effectiveness. Therefore, it is necessary to keep the reflection level of nursing college students constantly through the use of reflection log in clinical practice class.

Ethical Clearance: Not required

Source of Funding: Gwangju University

Conflict of Interest: Nil

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Correlation Study of Emotional Labor, Self-esteem and Perceived Health Status of Construction Supervisors

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ABSTRACT

Background/Objectives: We investigated the factors that negatively affect construction supervisors due to deterioration in the construction industry. The purpose of this study was to examine the correlation of emotional labor, self-esteem and perceived health status of construction supervisors.

Method/Statistical Analysis: To achieve our objectives, the cross-sectional descriptive design was used with a total subject of 102 construction supervisors. Data were analyzed with independent t-test, ANOVA, and Pearson's correlation coefficients.

Findings: Emotional labor was statistically significant in the presence of spouse (t = -2.03, p = .045), salary (F = 4.38, p = .015) and job satisfaction (F = 7.41, p = .001). Self-esteem was significantly associated with age (F = 4.53, p = .013), religion (t = 3.77, p <.001), salary (F = 9.35, p <.001) and job satisfaction (F = 7.84, p = .001), and the presence of hobbies (t = 2.00, p = .049). There was a statistically significant difference in perceived health status between the presence of religion (t = 2.65, p = .010) and job satisfaction (F = 5.80, p = .004). The mean score of emotional labor was 2.50 out of 5.00, self-esteem was 2.83 out of 5.00, and perceived health status was 3.20 out of 5.00. There were statistically positive correlations between self-esteem and perceived health status(r=.27, p<.005). The higher the self - esteem, the higher the perceived health status. However, emotional labor and self-esteem were not statistically significant. Emotional labor and perceived health status were not statistically significant.

Improvements/Applications: Further research is needed to find other possible affecting perceived health status of construction supervisors. It is necessary to develop a health promotion program and to verify its effectiveness to improve the health of construction supervisors.

Keywords: *Construction Supervisor, Emotional Labor, Health promotion, Perceived Health Status, Self-esteem*

Introduction

The recent construction market was in a difficult situation due to the government's SOC budget decline, new orders from public-sector large-scale construction companies are sluggish, and housing supply in the private sector has deteriorated. The number of disasters in the construction industry has been on an increasing trend, reaching 26,570 in 2016 (an increase of 5.7% over the previous year)[1].

This study investigated emotional labor, self-esteem and perceived health status of construction supervisors who manage construction sites. Emotional labor can include enhancing, counterfeiting, or suppressing emotions to correct emotional expressions. Many job roles have rules related to emotions that employees should disclose. Emotional labor says that other social relations can lead to emotional labor, not service activity. Emotional labor refers to the degree of effort, planning and control necessary to express the emotions required by an organization during large human interactions [2,3]. In addition, stress on service providers affects their health and organizational cultures[4].

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Emotional labor was defined as the situation in which emotional expression varies according to changes in emotions and organizational norms while performing tasks[2].

Self-esteem represented the cognitive and appraisal level of self. In the psychological sense, it was the sense of self-value that was formed according to feelings or values of oneself obtained from life experience [5]. It was the basis for maintaining the quality of life that was the basis of mental and social health. Decreases in self-esteem decrease the belief in ability to control the environment. Decreases in self-esteem have a negative impact on health status[6].

Perceived health status refers to an individual's assessment of all his or her health[7]. Perceived health status is widely used as an index to assess individual health status[8]. Therefore, this study aimed to investigate the relationship between emotional labor, self-esteem and perceived health status of construction supervisors. We seek to improve the perceived health status and create a health management program for health promotion of construction supervisor. Also, we propose its use as a basic data for making a health education program.

Materials and Method

Participants & Data Collection: To find out the relationship between emotional labor, self-esteem and perceived health status of construction supervisors the subjects were 102 construction supervisors to collect data.

Instrument

Emotional Labor: Based on existing researche[2], we used measurement tools developed in consideration of socio-cultural backgrounds in accordance with the characteristics of Korean adults. Reliability analysis showed that Cronbach's α coefficient was .70.

Self-Esteem: Based on existing researche[9,10],the ten questions were scored with a four points scoring. The points scoring was 4 = very good, 3 = relatively good, 2 = relatively poor, and 1= very poor. The response to the negative problem was reversed. Self-esteem scores range were from a minimum of 10 to a maximum of 40. The higher the score represented the higher the self-esteem. Reliability analysis showed that Cronbach's α coefficient was .75.

Perceived Health Status: Based on existing researche[11,12],the three questions were scored with a five points scoring. The points scoring was 5 = very good, 4 = relatively good, 3 = fair, 2 = relatively poor, and 1= very poor. The score range of the perceived health status was from a minimum of 3 to a maximum of 15. The higher the score were the better the perceived health status. Reliability analysis showed Cronbach's α coefficient was .81.

Data Analysis

The data were collected using SPSS/win 18.0 program. The general characteristics of the subjects were presented as frequency, percentage, mean and standard deviation. The subjects' emotional labor, self-esteem, and perceived health status were presented as mean, standard deviation, maximum value, and minimum value. According to general characteristics, the subjects' emotional labor, self-esteem, and perceived health status were analyzed by independent t-test and one-way ANOVA. Post hoc analysis was analyzed by Scheffe' test. The subjects' emotional labor, self-esteem, and perceived health status were analyzed by Pearson's correlation coefficients.

Results and Discussion

The process of emotional labor interaction between the supervisor and the subordinates is concerned with the emotional labor of the subordinate to supervisors with high social status. In daily work, subordinates must work under the supervisor's instructions, and subordinates follow the supervisor's instructions through emotional labor, which is the duty of subordinates[13,14,15].Effective clinical teaching and learning requires the instructor's emotional efforts. Understanding emotional labor in all manifestations will help to create a clinical learning environment that cares for student nurses in Malawi[16].

The general characteristics of the subjects were 3.9% for those under 40 years of age, 39.2% for those aged 40 to 49 years, and 56.9% for those over 50 years old, with an average of 50.40 ± 6.36 years. Sex was 99.0% for male and 1.0% for female, and religion was 49.0%, not for 51.0%, and 88.2% for no spouse or 11.8% for spouse. The degree of education was 4.9% for college graduates and 95.1% for college graduates. In the working form, 74.5% for resident work and 25.5% for non-resident work. The annual salary was less than 30 million won, for 9.8 percent, 33.3 percent less than 40 million won, and 56.9 percent more than 40 million won. At the construction site, the number of supervisors is moderate (45.1%) and insufficient (54.9%).

In the case of client, 55.9% was for public works construction and 44.1% for non-public construction work. There was a hobby 35.3%, 64.7% was not. In the field work experience were Yes. 96.1%and No. 3.9%. The supervisory career was 6.9% for Supervision (Elementary), 18.6% for Supervisor (Intermediate), and 74.5% for Chief Supervisor (Superior). Satisfaction with job satisfaction was 14.7%, average 78.4%, dissatisfied 6.9% as shown in Table 1.

Table 1: General Characteristics

Characteristics	Category	n	%	M ± SD
Age (yr)	<40	4	3.9	50.40 ± 6.36
	40-49	40	39.2	
	≥50	58	56.9	
Gender	M	101	99.0	
	F	1	1.0	
Religion	Yes	50	49.0	
	No	52	51.0	
Spouse	Yes	90	88.2	
	No	12	11.8	
Education	= College graduate	5	4.9	
	≥ University graduate	97	95.1	
Working form	resident work	76	74.5	
	non-resident work	26	25.5	
Income (Year, 10,000won)	<3,000	10	9.8	
	≥3,000, <4,000	34	33.3	
	≥4,000	58	56.9	
Number of Supervisors	moderate	46	45.1	
	insufficient	56	54.9	
Client	public works construction	57	55.9	
	Non-public works construction	45	44.1	
Hobbies	Yes	36	35.3	
	No	66	64.7	
Field Work Experience	Yes	98	96.1	
	No	4	3.9	
Supervisory Career	Supervision (Elementary)	7	6.9	
	Supervisor (Intermediate)	19	18.6	
	Chief Supervisor (Superior)	76	74.5	
Job Satisfaction	Satisfaction	15	14.7	
	Middle	80	78.4	
	Dissatisfaction	7	6.9	

The results of the subjects' emotional labor, self-esteem and perceived health status represented mean, standard deviation, minimum and maximum values. The mean value of emotional labor was 2.50 ± 0.26, the minimum value was 2.00 and the maximum value was 3.25. The self-esteem was 2.83 ± 28, the minimum value was 2.30 and the maximum value was 3.80. The perceived health status was 3.19 ± .50, the minimum value was 2.00, respectively as shown in Table 2.

Table 2: Degree of Emotional Labor, Self-esteem and Perceived Health Status

Variables	M ± SD	Minimum	Maximum	Range
Emotional Labor	2.50 ± .26	2.00	3.25	1-4
Self-esteem	2.83 ± .28	2.30	3.80	1-4
Perceived Health Status	3.19 ± .50	2.00	5.00	1-5

Emotional labor was statistically significant in the presence of spouse ($t = -2.03$, $p = .045$), income ($F = 4.38$, $p = .015$) and job satisfaction ($F = 7.41$, $p = .001$). As a result of the Scheffe' test for significant variables, emotional labor was lower in the group with less than 30 million won than in the group with less than 30 million won. Emotional labor was lower in the satisfied group than in the normal group.

Self-esteem was significantly associated with age ($F = 4.53$, $p = .013$), religion ($t = 3.77$, $p < .001$), income ($F = 9.35$, $p < .001$) and job satisfaction ($F = 7.84$, $p = .001$), and the hobbies ($t = 2.00$, $p = .049$).

As a result of the Scheffe' test, significant self-esteem was higher in the 30s than in the 50s and over. In the annual salary groups, the group with less than 30 million won had higher self-esteem than the group with less than 3,000 to 40 million won and the group with more than 40 million won. Satisfaction with self -esteem was higher in the satisfied group than in the normal group.

There was a statistically significant difference in perceived health status between the presence of religion ($t = 2.65$, $p = .010$) and job satisfaction ($F = 5.80$, $p = .004$). As a result of the Scheffe' test, significant differences were found in satisfaction with job satisfaction, and perceived health status was higher than that of dissatisfied group.

In the correlation between variables, self-esteem and perceived health status showed a positive correlation (r = .27, p = .005). The higher the self-esteem the higher the perceived health status as shown in Table 2. However, emotional labor and self-esteem were not statistically significant. Emotional labor and perceived health status were not statistically significant as shown in Table 3.

Table 3: Correlation among Emotional Labor, Self-esteem and Perceived Health Status

	Emotional Labor	Self-esteem	Perceived Health Status
	r (p)		
Emotional Labor	1	.17(<.096)	-.08(.<442)
Self-esteem		1	.27(<.005)
Perceived Health Status			1

Differences in perceived health status were found between sick and healthy people, but differences in self-esteem were not significant. The average scores of the body images of the RA and HLT groups were similar, but the scores of the SLE subjects were low. Perceived health status was directly related to self-esteem but not to body image. Age and time after diagnosis were weakly correlated with perceived health status. Two similarities and differences have been identified in the problems, needs and fears of RA and SLE subjects[17].

There is statistically significant difference between the experimental group and the control group after applying the reflection log, but there is no statistically significant difference between the learning attitude and the self-efficacy[18]. This affects learning attitudes if you write reflections and if you have positive feedback from your teachers. Teaching method applies learning reflection logbook in the writing subject and applies the reflection journal of the teacher who is suited to the needs of the students and the writing feedback gives the learning efficiency.

Conclusion

Our study was to investigate the relationship between construction supervisors emotional labor, self-esteem and perceived health status and to use it as a basic data to find out ways to increase perceived health status. In this study, the emotional labor was 2.50 (out of 5), self-esteem was 2.83 (out of 5), and perceived health status was 2.83 (out of 5) of construction supervisors.

The self-esteem of the construction supervisor and the perceived health status showed a significant correlation. Therefore, the higher the self-esteem of the construction supervisor the higher the perceived health status. In order to improve the health status of construction supervisors, the state needs social policy management.

Legal guarantees of regular breaks during working hours, health care in periodic public health centers was essential. In order to increase the perceived health status of construction supervisors, it is necessary to develop health promotion program and education program that can enhance self-esteem.

This study investigates the correlations between emotional labor, self-esteem, and perceived health status of construction supervisors. Clinical outcomes have been used to improve the health of workers in public health. Educational outcomes could be provided as evidence for educational program development.

Ethical Clearance: Not required

Source of Funding: Gwangju University

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A Study on Empathy of Korean Nursing College Students

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ABSTRACT

Background/Objectives: This study was attempted to confirm the relationship between nursing student 's self -awareness, others-awareness, schema for persons with disabilities, and empathy. The study subjects were 280 nursing students.

Method/Statistical Analysis: To investigate the relationship between the main variables, correlation and regression analysis were used the SPSS/PC. 19 program.

Findings: The results showed that there was a significant correlation between the self-awareness, the schema for the disabled, other-awareness and empathy of the nursing students. Hierarchical regression analysis was performed to confirm the influence of major variables affecting empathy ability. Results: Self-awareness, schema for the disabled, and other-awareness variables were influenced by the explanatory power 13.7% of nursing student's empathy (F=15.764, p=.000). These results are interpreted as the higher the self-awareness, the higher the others-awareness, the more positive the schema for the disabled, the higher the empathy ability of nursing college students.

Improvements/Applications: Therefore, education methods and strategies are needed to increase self-awareness, other-awareness, and positive schema formation for the disabled to improve empathy of nursing students.

Keywords: *self-awareness, other-awareness, schema for the disabled, empathy, nursing students.*

Introduction

Nurses provide care for people, and this job requires empathy as an important attribute. Educational institutions, therefore, need detailed education strategies for development and improvement of attributes.

In Korean nursing education, the importance of nurse's empathy has been realized and studies on empathy of nurses and nursing undergraduates have been conducted to identify factors and explanatory power of each factor to be evidence of education. However, explanatory power of the related variables affecting empathy is weak, and therefore, exploration of more variables and replication studies are required consistently.

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Empathy is one of essential factors to provide good nursing. It contributes to appropriate responses to emotion and mentality of patients and building of a meaningful relationship. In particular, nurse's empathy facilitates individualized nursing depending on patient's feeling and nurses would be able to predict patient's action to improve the quality of nursing provided for welfare of patients [1]. Nurses help and guide patients as active participants to lead change of health behaviors to solve real or potential problems of patients. In this specialized job, empathy is delivered to patients by responses of a nurse, and it helps interaction with patients and formation of an amicable relationship [2]. Thus, nursing educational institutions should provide education to improve empathy required for therapeutic care and relationship building. Korean nurse training centers provide regular classes and non-academic classes, such as volunteer work, to improve empathy, and these systematic curricula would promote empathy[3].

Previous studies in Korean nurses and nursing undergraduates have focused on identification of

variables affecting empathy and explanatory power, and main factors were suggested including self-awareness, other-awareness, stress, ways of coping, self-esteem, ego-resiliency, sex, clinical experience, and major satisfaction [3-8].

In the previous studies, self-awareness was frequently reported among variables affecting empathy of nursing undergraduates. Self-awareness was highlighted based on the results showing that understanding of others and empathy could be improved by self-understanding. Kang [4] analyzed the effect of self-awareness and other-awareness on empathy, and demonstrated that the level of empathy significantly increased as self-awareness and other-awareness were getting higher, which suggests that curricula for emotional empathy of nursing undergraduates should be provided. In other words, relevance between empathy of nursing undergraduates and self-awareness is high and self-understanding can improve understanding of others to eventually affect empathy in the theoretical structure.

Self-awareness is to recognize inner thinking or feeling of oneself. It is defined as recognition of oneself as a social object affecting others, recognition of concern about others' assessment of oneself, recognition of discomfort against others, and anxiety about recognition of oneself as a social object [9]. Self-awareness of nurses can prevent potential countertransference and understand patients as they are, with empathy [3]. In addition, it can be a vital source in relationship with patients. Other-awareness, one of main variables affecting empathy, is to care about the inner side of others, and it is in the process of understanding others based on information of the inside and outside of others [4]. In the results of previous studies, a correlation among self-awareness, other-awareness, and empathy was high, and self-awareness and other-awareness were main factors improving empathy. However, since the effect of both variables was not strong, replication studies and exploration of additional variables affecting empathy are needed [10].

In the previous studies, right self-awareness of nurses could reduce stigma on patients [10,11]. Nurses with high self-awareness had less stigma on patients to accept them for who they were. It maysuggest that higher self-awareness leads lower stigma and higher empathy on specific patients, such as the disabled. Thus, it needs to be identified whether nurses with high self-awareness have high other-awareness, low stigma, i.e. negative schema, on the disabled, and high empathy.

In the present study, based on the previous studies on empathy, we identified relevance among self-awareness, other-awareness, empathy and a schema for the disabled, and investigated the impact of variables improving empathy of nursing undergraduates and additional factors. Our results could contribute to strategy development for improvement of empathy of nursing undergraduates and suggest basic data for reform of curricula.

Materials and Method

Research Design & Model: The purpose of this study is to investigate the effect of self-awareness, other-awareness, and a schema for the disabled on empathy of college students.

Subjects and Data Collection: In the study, undergraduates in the Department of Nursing Science were recruited and the purpose and methods of the study were explained. The undergraduates who provided informed written consent were included in the study. A structured questionnaire was used in data collection. A total of 280 questionnaires were collected and statistically analyzed. The data was collected from May 2016 to June 2016. The investigator conducted a survey with the questionnaire.

Statistical Method: The effect of self-awareness, other-awareness, and a schema for the disabled on empathy of nursing undergraduates was analyzed using version 19 of the Statistical Package for the Social Sciences (SPSS). The general characteristics of the participants were summarized. Correlation analysis among main variables and hierarchical regression were performed.

Survey Tools

The tools used in this study are as follows.

Self-awareness Tool: Self-awareness was measured using a modified self-awareness test of Eun[12] based on the test of Fenigstein, Scheier, Buss[13]. The tool included 20 questions composed of 9 questions of self-awareness, 5 questions of public self-awareness and 6 questions of social anxiety. The questions used a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high self-awareness. The reliability (Cronbach's alpha) of the tool was 0.74 in the study of Eun [12] and 0.69 in the present study.

Other-awareness Tool: Other-awareness was measured using a tool modified for Korean adolescents by Eun [12]. The tool included 21 questions composed of 12 questions of internal other-awareness, 5 questions of external other-awareness, and 4 questions of fancied other-awareness. The questions used a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high other-awareness. The reliability (Cronbach's alpha) of the tool was 0.90 in the study of Eun [12] and 0.92 in the present study.

Schema for the Disabled: To measure a schema for the disabled, we used a semantic differential scale using adjectives of Koreans developed by Jang [14] based on the semantic differential scale of Osgood [15]. The tool used in the study included 9 pairs of adjectives selected by a pilot test to measure a schema for the disabled. The selected adjectives used a 1 to 10-scale from left to right. A high score means a negative schema for the disabled. The reliability (Cronbach's alpha) of the schema tool in the present study was 0.75.

Empathy Tool: Empathy was measured using a tool modified by Kim et al. [10] based on the tool of Davis [16] and Bryant [17]. A high score means high empathy. The tool included 30 questions composed with a 1 to 5-scale from 'strongly disagree' (1 point) to 'strongly agree' (5 points). A high score means high empathy. The reliability (Cronbach's alpha) of the tool was 0.85 in the study of Kim et al. [10] and 0.83 in the present study.

Results and Discussion

General Characteristics of the Participants: The general characteristics of the participants are shown in Table 1. Among 280 participants, 27 (9.6%) were male and 253 (90.4%) were female. In the result of academic achievement, 5 (1.8%), 51 (18.2%), and 136 (48.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. In the result of major satisfaction, 10 (3.6%), 96 (34.3%), and 136 (48.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. In satisfaction from friendship, 35 (12.5%), 154 (55.0%), and 83 (29.6%) were 'very satisfied', 'satisfied' and 'neither satisfied nor dissatisfied', respectively. Most of the participants were above the average.

Table 1: General Characteristics of Study Particiants (n = 280)

Characteristics	Categories	n(%)
Gender	male	27(9.6)
	female	253(90.4)
Academic achievement	very satisfied	5(1.8)
	satisfied	51(18.2)
	moderate	136(48.6)
	unsatisfied	69(24.6)
	very unsatisfied	19(6.8)
Satisfaction in major	very satisfied	10(3.6)
	satisfied	96(34.3)
	moderate	136(48.6)
	unsatisfied	31(11.1)
	very unsatisfied	7(2.5)
Satisfaction in friendship	very satisfied	35(12.5)
	satisfied	154(55.0)
	moderate	83(29.6)
	unsatisfied	3(1.1)
	very unsatisfied	5(1.8)

General characteristics and a level of self-awareness, other-awareness, schema for the disabled, and empathy

General characteristics including academic achievement, major satisfaction and friendship satisfaction, and main variables including self-awareness, other-awareness, schema for the disabled, and empathy were analyzed and the result is shown in Table 2. The score of self-awareness, other-awareness, schema for the disabled, and empathy was 3.30 ± 6.84, 3.34 ± 11.83, 5.58 ± 7.10, and 3.54 ± 11.13, respectively.

Table 2: The Degree of General Characteristic, Self-awareness, Other-awareness, Schema for the disabled, Empathy (n = 280)

Variable	M ± SD
Academic achivement	2.80 ± .87
Satisfaction in major	3.22 ± .82
Satisfaction in friendship	3.72 ± .80
Self-awareness	3.30 ± 6.84
Other-awareness	3.34 ± 11.83
Schema for the disabled	5.58 ± 7.10
Empathy	3.54 ± 11.13

Correlation analysis among self-awareness, other-awareness, schema for the disabled, and empathy

In the result of correlation analysis among self-awareness, other-awareness, schema for the disabled, and empathy, a significant correlation was found (Table 3). In particular, there was a positive correlation between empathy and self-awareness (r=.297, p<.000), and between empathy and other-awareness(r=.203, p=.001). A negative correlation between empathy and a schema for the disabled(r=-.220, p<.000) was also found.

Table 3: Correlations between empathy and major variables (n = 280)

Variables	Pearson Correlation (p)			
	a)	b)	c)	d)
a) Self-awareness	1			
b) Schema for the disabled	-.102 (.089)	1		
c) Other-awareness	-.309 (.000)	.111 (.063)	1	
d) Empathy	.297 (.000)	-.220 (.000)	.203 (.001)	1

3.4 The effect of self-awareness, other-awareness, and a schema for the disabled onempathy

Self-awareness, other-awareness, and a schema were included in independent variables, and empathy was included in a dependent variable in hierarchical regression analysis to identify the effect of self-awareness, other-awareness, and a schema for the disabled on empathy. In the result as shown in table 4, the Durbin-Watson statistic was 1.96, which suggests no residual autocorrelation between independent variables. Homoscedasticity assumption and normal distribution assumption of the standardized residuals were satisfied. All the variance inflation factor(VIF) scores were under 10, and therefore, multicollinearity was deemed not important for the independent variables. In the result of regression analysis, self-awareness(β=.227), a schema for the disabled(β=-.214), and other-awareness(β=.156) affected empathy significantly (F=15.764, p=.000) with 13.7% of AdjustedR^2. In other words, empathy of nursing undergraduates increased as self-awareness and other-awareness rose and a schema for the disabled was more positive.

Table 4: Influencing factors onempathy (n = 280)

Independent Variables	Model			
	SE	β	t (p)	VIF
Constant	7.914	-	11.170 (.000)	
Self-awareness	.096	.227	3.831 (.000)	1.129
Schema	.089	-.214	-3.786 (.000)	1.034
Other-awareness	.056	.156	2.644 (.009)	1.132
Statistic	R^2=.146, Adjusted R^2=.137, F=15.764, p=.000, Durbin-Watson=1.966			

Discussion

In the study, we found variables based on the previous studies on empathy, and then self-awareness, other-awareness, a schema for the disabled, and empathy of nursing undergraduates were investigated. The variables affecting empathy were explored and a correlation was identified. In the result, a score of self-awareness and other-awareness of the participants was 3.30 ± 6.84 and 3.34 ± 11.83 (a 1 to 5-scale), respectively. The score of self-awareness in our study was higher than 2.82 ± 0.74 in the previous study of Kang [4], and lower than 3.40 ± 0.32 of Oh et al. [18], 3.45 ± 0.40 of Park et al. [19], 3.49 ± 0.38 of Kim et al. [10], and 3.50 ± 0.38 of Park et al. [20]. A developmental stagewas different, but our result was similar to the result (3.31) of Eun [12] who investigated middle and high school students. Thus, it was confirmed that self-awareness in the present study was generally similar to the results of previous studies. However, the score in the subjects in the same developmental stage in other studies was different from our result, and therefore, additional replication studies are needed.

Other-awareness of the participants was 3.34 ± 11.83 in a 1 to 5-scale, and was similar to Kang's result (3.34 ± 0.65) [4] while it was lower than the result (3.41 ± 0.50) reported by Oh et al. [18] and higher than the result (3.19 ± 0.60) by Eun [12]. Due to a different design, the results cannot be compared directly. Self-awareness and other-awareness seem to be higher in nursing undergraduates in the Department of Nursing Science who were educated by curricula for improvement of self-awareness and other-awareness than those who were not educated. However, evidence is not enough.

Further studies to compare non-medical undergraduates in the same developmental stage are needed to identify the effect of education.

A score of a schema for the disabled was 5.58 points, which is higher than 5.23 from the study of Kim et al. [21] who also investigated nursing undergraduates. A high score of schema for the disabled means a negative schema. A semantic differential scale was used to measure a schema for the disabled (a 1 to 10-scale). The average score of a schema was moderate, not extremely negative or positive.

In the analysis result of empathy, a score was 3.54 ± 11.13, which is lower than 3.58 ± 0.41 of Kim et al. [10] and 3.67 ± 0.39 of Kang [4]. Although we also recruited the participants from the Department of Nursing Science, our participants were sophomores due to convenient sampling. They have not completed the whole course of the Department of Nursing Science, and it might be the reason of a lower score. However, Kim et al. [10] reported 3.60 ± 0.42 and Kang [4] reported 3.61 ± 0.39 of empathy in the same grade, which are higher than our result. Thus, further replication studies are needed to identify a significant difference in empathy among universities.

In the result of correlation analysis among self-awareness, other-awareness, a schema for the disabled, and empathy, a correlation between empathy and other variables was found. There was a positive correlation between self-awareness and empathy and between other-awareness and empathy while a negative correlation between a schema for the disabled and empathy. In one previous study, right self-awareness reduced stigma [11]. However, a correlation between self-awareness and a schema for the disabled, which has been reported in the previous study, was not found. It needs to be identified in further replication studies with validity of a tool considered.

In the analysis result of the variables affecting empathy, self-awareness, other-awareness, and a schema for the disabled were demonstrated and their explanatory power was 13.7%. The power of self-awareness was the greatest, followed by a schema for the disabled and other-awareness. This result is similar to the result of Kim et al. [10]. Nursing undergraduates with high self-awareness may understand other's feelings well and make good use of their emotion to improve empathy for others [10]. In addition, it is interesting that a schema for the disabled was identified to affect empathy. It suggests that a positive schema for the disabled improves empathy. The result supports that institutionalization of volunteer work in facilities for the disabled and disability awareness education contribute to improvement of empathy of undergraduates in the Department of Nursing Science. It provides evidence to support the existing education and programs.

In the present study, it was confirmed that a schema for the disabled affected empathy, as one of additional factors affecting empathy. Our results support that self-awareness and other-awareness could improve empathy as reported by previous studies.

Conclusion

In the study, we found variables based on the previous studies on empathy, and then self-awareness, other-awareness, a schema for the disabled, and empathy of nursing undergraduates were investigated. In the analysis result of the variables affecting empathy, self-awareness, other-awareness, and a schema for the disabled were demonstrated and their explanatory power was 13.7%. To conclude, nursing educational institutions need to provide curricula to promote self-awareness and other-awareness, and actively institutionalize voluntary work to form a positive schema for the disabled, or run disability awareness educational programs.

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Influencing Factors of Fatigue, Perceived Stress, Self-efficacy and Social Support in the Middle Age on Health Conservation

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ABSTRACT

Background/Objectives: This study is descriptive survey study to factors influencing health conservation among middle age.

Method/Statistical Analysis: The study subjects are 173 middle age who reside in M & C city area, and data-collection was done in period from March 05 to 23, 2018. The collected data was analyzed with Pearson's correlation, multiple linear regression with stepwise method analysis.

Findings: The result showed Health conservation was negatively correlated with fatigue and perceived stress, positively correlated with self-efficacy and social support. The major factors that affect health conservation in middle age were self-efficacy, social support, perceived stress, which explained 31.8% of health conservation.

Improvements/Applications: The findings can provide the basis for the development of nursing interventions to improve health conservation.

Keywords: *Health conservation, Fatigue, Perceived Stress, Self-efficacy, Social support*

Introduction

The middle age is between the young age and the old age, and is usually defined to be in between 40 and 65 years old. Middle-ages, which occupy about one-third of the total population, are heads of household taking adults or caring for children at home and play a role of backbone socially that their weight is greater than expected[1]. Therefore, it is important for middle-aged people to conserve their bodies healthy at this time, and the health in this period can be continued to the old age, so health conservation in this age is also necessary to improve the quality of life in old age.

People are exposed to stress by experiencing various changes such as changes in roles, physiological and psychological changes in middle age[2]. In order to qualitatively improve such middle-aged life, a health-conservation approach that maintains integrated well-being in physical, psychological, psychological and social aspects is required[3]. Health conservation refers to maintaining physical, mental, and social well-being or maintaining a balance between physical, mental, social and psychological integration [3]. In previous studies, health conservation has been influenced by health promoting behavior, wisdom, pain, self-care behaviors, subjective health status and health concern[4].

Fatigue is common in everyday life, but physical symptoms such as fatigue are mixed with medical and psycho-social factors and can be chronicized by interactions of various factors[5]. In particular, middle-aged women are reported that they felt more fatigue than men due to their family responsibilities and physical and physiological changes such as menopause[6,7]. However, middle-aged men are also reported that they feel a decrease in sexual desire, change in mood, fatigue and anger[8] that the demand for fatigue management is considered to be an important issue.

Thomas[9] found that 66% of middle-aged men were exposed to high stress due to physical decline and

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energy loss, family health problems, lack of time for roles and responsibilities, uncertainty about their future, and negative thinking [9]. Such physical change, changes in family system and role are the stresses in middle age, and middle age stress is an important factor affecting all areas of life.

Self-efficacy is a factor that helps in minimizing the impact of actual problems with confidence and enables successful performance of certain tasks[10]. Thus, self-efficacy is an important factor in promoting behavioral change and motivation for middle-aged problems[11]. The results of this study were as follows: First, there was a significant relationship between self-efficacy and perceived self-efficacy, and self-efficacy had a positive effect on health beliefs, choice of health promoting behaviors and is a major determinant of the quality of life [12,13].

Social support is one of the important factors influencing individual health behavior, treatment compliance, and health outcomes[14,15]. Particularly in middle age, which is in a period of various changes in physical and psychological, the social support through social interaction such as family, friends, neighbors is more important. In previous studies, there was a correlation between social support and health promoting practice[16], and it was also found to affect mental health of middle-aged women[17].

Middle-aged women may be able to reduce weight and increase bone density through proper exercise[18], and reduce the severity of menopausal symptoms to alleviate and prevent problems related to menopause and aging[19]. In addition, exercise is also effective in mental health and social aspects, so exercise is needed to conserve middle-aged health.

Health conservation is important for middle-aged people in time of various changes, because it gives meaning to their lives, affects their physical and psychological treatment effects on the disease, and motivates their activities to conserve health [20]. In addition, identifying the fatigue, stress, self - efficacy, social support and exercise that may affect the health conservation of the middle age will be an important factor in promoting health promotion behavior. The purpose of this study is to develop a nursing intervention program that helps maintaining the integrated state of wellbeing by identifying the degree of health conservation in middle age and examining the effects of fatigue, stress, self –efficacy and social support.

Research Method

Research Design: This study is a descriptive research study to identify fatigue, perceived stress, self - efficacy, social support and exercise, which are factors affecting middle - aged health conservation.

Subjects of Research: The subjects of this study were 173 middle-aged people aged 40 to 64 living in two regions. The size of the study sample was calculated using the G * POWER 3.1 program. The number of predictors needed for multiple regression analysis was16, medium effect size: .15, significance level: .05, and power: .80. Therefore, finally, 173 subjects were selected as subjects and the required number of samples was met.

Research Tools

Fatigue: Fatigue was measured using the Multidimensional of Assessment Fatigue (MAF) developed by Tack[21]. This scale is composed of sub-concepts of degree of fatigue and fatigue effect. Ten points were assigned to each question, and the higher the score on the Likert scale, the higher the fatigue. Cronbach's αin this study = .940 in this study.

Perceived Stress: Perceived stress was developed and modified by Cohen et al.[22]. This scale means the degree to which an individual's life has been unpredictable, uncontrollable, and burdensome over the last month. This tool was composed of 5 points for each question and a Likert scale. In this study, Cronbach's α= .719.

Self-Efficacy: Self-efficacy was measured by the general self-efficacy scale developed by Chen, Gully, and Eden[23]. The tool consists of 8 questions, with 5 points assigned to each question. The higher Likert scale means higher self-efficacy. In this study, Cronbach's α= .908.

Health Conservation: The health conservation scale was developed by Sung[3]. This tool consists of 37 questions, 14 questions on personal unity, 8 questions on energy conservation, 8 questions on structural integrity, and 7 questions on social integrity. Four points were assigned to each question, and the higher the score of the Likert scale, the higher the degree of health conservation. Cronbach's α= .880 in this study.

Exercise: Exercise was measured by four questions corresponding to exercise in sub-domains in the Health Promotion lifestyle Profile (HPLP), a tool developed by Walker, Sechrist and Pender[24]. The higher the score, the higher the exercise level. Cronbach's α= .948 in this study.

Data Analysis

Data was analyzed using SPSS/WIN 22.0. The general characteristics of the subjects were calculated using descriptive statistics, real number, percentage, mean and standard deviation. The differences in health conservation according to general characteristics of the subjects were analyzed by t-test and ANOVA. Pearson correlation coefficient was used for the relationship between fatigue, perceived stress self-efficacy and health conservation. Multiple linear regression with stepwise method was used to analyze factors affecting health conservation.

Results

Health Conservation according to Characteristics of Subjects: The degree of health conservation according to general characteristics was statistically determined according to the monthly income (F = 3.045, p = .019), economic condition (F = 7.518, p = .001) and pain intensity (F = 4.974, p = .002) showing a significant difference in statistics as shown in table 1.

Table 1: Health conservation according to characteristics of subjects

Characteristics	Categories	N (%)	M ± SD	t/F(p)
Gender	Male	58(33.5)	2.99 ± .33	.009 (.494)
	Female	115(66.5)	2.85 ± .30	
Age(year)	40-49	58(33.5)	2.86 ± .29	.247 (.964)
	50-64	115(66.5)	2.92 ± .33	
Marital status	Married	148(85.5)	2.90 ± .31	1.780(.153)
	Unmarried	12(6.9)	2.90 ± .35	
	divorced	7(4.0)	2.65 ± .23	
	Bereavement	6(3.5)	3.00 ± .35	
Education	Primary School	11(6.4)	2.69 ± .40	1.851(.140)
	Middle School	20(11.6)	2.94 ± .30	
	High School	64(37.0)	2.90 ± .29	
	College or above	78(45.1)	2.92 ± .33	
Occupation	Worker	23(13.3)	2.90 ± .23	.748 (.632)
	Engineer	17(9.8)	2.93 ± .40	
	Profession	38(22.0)	2.30 ± .36	
	Business	21(12.1)	2.90 ± .33	
	Agriculture	9(5.2)	2.82 ± .33	
	Day labor	30(17.3)	2.86 ± .31	
	Inoccupation	15(8.7)	2.81 ± .35	
	Other	20(11.6)	2.86 ± .21	
Religion	Buddhism	57(32.9)	2.91 ± .32	.634 (.639)
	Christianity	63(36.4)	2.93 ± .33	
	Catholic	7(4.0)	2.80 ± .21	
	irreligion	42(24.3)	2.85 ± .32	
	Other	4(2.3)	2.92 ± .27	
Inmate	Spouse	34(19.7)	2.89 ± .33	.651 (.627)
	Children	9(5.2)	2.75 ± .34	
	Spouse&Children	113(65.3)	2.91 ± .31	
	None	10(5.8)	2.86 ± .36	
	Other	7(4.0)	2.97 ± .37	
Monthly income	Less than one million won	25(14.5)	2.75 ± .27	3.045 (.019)
	More than one million won - Less than two million won	41(23.7)	2.83 ± .29	
	More than two million won - Less than three million won	38(22.0)	2.95 ± .30	
	More than three million won	52(30.1)	2.97 ± .35	
	Non fixed income	17(9.8)	2.94 ± .28	

Conted…

Economic status	Upper	9(5.2)	3.11 ± .54	7.518 (.001)
	Middle	133(76.9)	2.92 ± .29	
	Lower	31(17.9)	2.73 ± .27	
Payer	The person himself	126(72.8)	2.92 ± .33	1.805 (.181)
	Family	47(27.2)	2.84 ± .27	
Smoking	Yes	14(8.1)	2.86 ± .38	.187 (.666)
	No	159(91.9)	2.90 ± .31	
Alcohol	Yes	42(24.3)	2.91 ± .32	.043 (.836)
	No	131(75.7)	2.90 ± .32	
Pain area	Neck	13(7.5)	2.93 ± .28	2.034 (.076)
	Shoulder	39(22.5)	2.89 ± .26	
	Low back	68(39.3)	2.97 ± .34	
	arm, leg	29(16.8)	2.76 ± .27	
	Knees	20(11.6)	2.87 ± .37	
	Other	4(2.3)	2.79 ± .32	
Treatment Period	Less than 6 months	69(39.9)	2.90 ± .29	.114 (.736)
	More than 6 months	104(60.1)	2.90 ± .34	
Pain intensity	none	10(5.8)	3.12 ± .26	4.974 (.002)
	mild	76(43.9)	2.95 ± .30	
	moderate	70(40.5)	2.80 ± .33	
	severe	17(9.8)	2.92 ± .26	

Relations between Fatigue, Perceived Stress, Self-efficacy, Social Support and Health Conservation: The relationship between fatigue, perceived stress, self-efficacy, social support, and health conservation was as follows. The health conservation and fatigue (r=-.129, p=.001), perceived stress (r=-.634, p=.001) showed to have negative correlation, and the health conservation and self-efficacy (r=.598, p=.001) and social support (r=.516, p=.001) and exercise (r=.357, p=.001) showed to have positive correlation. In other words, the less the fatigue, less stress, higher self-efficacy, more social support, more exercise, the higher health conservation degree is shown in table 2.

Table 2: Correlations of fatigue, perceived stress, self-efficacy, social support, exercise and health conservation (N = 173)

	Fatigue	**Perceived stress**	**Self-efficacy**	**Social support**	**Exercise**	**Health conservation**
Fatigue	1					
Perceived stress	0.500** (<.001)	1				
Self-efficacy	-0.352** (<.001)	-0.625** (<.001)	1			
Socialsupport	-0.246** (<.001)	-0.383** (<.001)	0.539** (<.001)	1		
Exercise	-0.239** (.002)	-0.312** (<.001)	0.360** (<.001)	0.308** (<.001)	1	
Health conservation	-0.429** (<.001)	-0.643** (<.001)	0.598** (<.001)	0.516** (<.001)	0.357** (<.001)	1

Impact Factors on Health conservation of Subjects: In order to identify the factors affecting the subject's health conservation, the regression model was analyzed (F = 37.559, p <.001). The perceived stress (β = -. 360, p = .001), social support (β = .220, p = .001) and self-efficacy (F = .190, p = (Table 3) were appeared to be the factors affecting health conservation of the subjects. In addition, these variables were descriptive (51.7%) for health conservation.

Table 3: Influencing factors of health conservation according to fatigue, perceived stress, self-efficacy, social support, health conservation (N = 173)

Variables	B	SE	β	t	p	Adjus-ted R^2	F	p	Dubin-watson
Constant	2.779	.213		13.072	.001	.517	37.559	<.001	1.947
Fatigue	-.025	.014	-.109	-1.759	.080				
Perceived stress	-.219	.045	-.360	-4.877	.001				
Self-efficacy	.093	.037	.190	2.509	.013				
Social support	.101	.029	.220	3.444	.001				
Health conservation	.022	.016	.079	1.359	.176				

Discussion

This study attempted to understand the degree of middle-aged health conservation and to identify the factors that affect health conservation. Based on this, the researcher would like to provide basic data for the development of a nursing intervention program to help the middle-aged maintain an integrated well-being status.

According to general characteristics, health conservation showed significant differences according to monthly income, economic status, and intensity of pain. In previous studies for elderly people, there was significant relationship between pocket money and economic status [25], gender, age, and disease[26]. Although most of the studies are for elderly people, it is difficult to compare them, but it is confirmed that economic condition and pain are factors affecting health conservation. In the middle ages, it is necessary to activate occupational health services and education in order to promote health conservation behavior because the middle age is the age where the activity related to income and labor is the most active while physiological and psychological change occurs such as menopause. Such that, the occupational health service and education for health conservation behavior promotion need to be activated for the middle-aged.

As a result of analyzing the correlation between fatigue, perceived stress, self-efficacy, social support, exercise and health conservation, the health conservation, fatigue and perceived stress showed to have negative correlation while self-efficacy, social support and exercise showed to have positive correlation with health conservation. That is, the less the fatigue, the lower the stress, the higher the self-efficacy, the more the social support, the more exercise, the higher the degree of health conservation is. The middle ages are exposed to a lot of fatigue and stress due to complex roles and physical changes such as job life and changes in roles within the family, and the prevalence of chronic diseases is also rapidly increasing. Therefore, interest and approach are needed to maintain physical, psychological, mental and social well-being for middle-aged health conservation. Social support, in turn, affects mental health conservation[27], such as reducing stress and forming self-esteem and trust[28]. The higher the self-efficacy, the more likely the health behaviors of middle-aged[16] are supported. Therefore, for middle-aged adults, physical, psychological and mental health conservation will motivate integrated health conservation activities to maintain health.

Finally, factors affecting health conservation were self-efficacy, social support, and perceived stress. In previous studies, social support has influenced the quality of life in middle age[29], protecting health from stress and leading health behaviors[30]. Therefore, in order to practice health conservation activities, personal and social environment should be supported[16]. It is necessary to maintain effective and continuous interactions with others, such as forming positive interpersonal relationships and utilizing community resources.

Self-efficacy is a factor influencing health promotion behavior[16], and is a major factor influencing health-

related behaviors as well as health-related behaviors [31]. Therefore, the self-efficacy of middle-aged adults is an important index for health maintenance. Also, they may confirm the importance of motivation with the belief that middle-aged can do appropriate actions for health conservation. This suggests that a positive awareness of self leads to self-confidence, which leads to motivation for health conservation behavior.

The most important thing for middle-aged health conservation is positive awareness, belief and support for oneself. Therefore, this study is meaningful in that it suggests the direction of nursing intervention development for middle-aged health conservation. In order to improve the efficiency of intervention, it is necessary to consider the influential factors in this study.

Conclusion and Suggestion

This study is a descriptive research to identify the degree of health conservation in middle-aged adults and to identify factors affecting it. The results showed that social support, perceived stress and self-efficacy were the factors affecting the health conservation of middle-aged adults. This study is significant in that it suggests the direction of nursing intervention for middle-aged health conservation. Based on the above results, the researcher proposes a study on concrete implementation plan for health conservation of middle-aged adults.

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Development of a Tool to Evaluate the Quality of Mentoring for Nurses

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ABSTRACT

Background/Objectives: This study developed a tool to evaluate the quality of mentoring(QOM) for nurses and verified its validity and reliability before implementing a mentoring system as a strategy to manage them.

Method/Statistical Analysis: One hundred twelve preliminary questions were derived from literature and the tool included 74 questions with a content validity at 0.75 or higher selected by an expert group. Ninety nine mentees participated in the prior survey and the main survey, respectively. Their general characteristics were analyzed using the SPSS Windows 18.0 program. The tool's construct validity and internal consistency reliability were analyzed using factor analysis and Cronbach's α coefficient, respectively.

Findings: The subjects of this study were 99 nurses who had participated in a mentoring system for new nurses as mentees in an advanced general hospital located in Seoul. The general characteristics of the subjects are as follows: The subjects' average age was 24.8. Females accounted for 92.9% of the subject population. The subjects' average clinical experience was 14.4 months. The final version of the tool to evaluate the quality of mentoring consisted of 32 questions. To examine the construct validity of the tool, an exploratory factor analysis was performed. The tool to evaluate the QOM was composed of three factors and five domains: the structure factor (mentoring program domain), the process factor (psychosocial function, career development function, and role model function domains), and the outcome factor (mentoring value domain). Cronbach's α, a measure of the tool's internal consistency reliability, was 0.96.

Improvements/Applications: This study developed a tool to comprehensively evaluate the quality of a mentoring program to apply an effective mentoring system and establish an efficient human resource management strategy in nursing.

Keywords: *mentors, Mentorships, Interprofessional Relations, Surveys and Questionnaires, Reproducibility of Results*

Introduction

Mentoring, a type of efficient human resource management strategy, was found to decrease organizational members' turnover intent and increase their career and organizational commitment[1,2,3,4]. Mentoring is a useful and valuable means to help new nurses in role socialization and professional growth[5], thereby decreasing their anxiety, promoting their self-efficacy, and positively influencing their interpersonal relationship. It is conducive to their performing a new role as a nurse[6]. Accordingly, mentoring programs have recently been presented as an efficient human resource management strategy for the securing and maintaining of excellent nurses. In mentoring, new nurses, or, mentees, form a relationship of emotional commitment with experienced nurses, or, mentors. The mentees continuously receive formal and informal

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support from their mentors for continuous advice, expertise, role development, and career development while interacting with them[7]. In mentoring, experienced nurses support new nurses so that they can further develop theirself-esteem as professional nurses in all nursing areas such as clinical practice, nursing education, research, and administration, thereby helping them to become more professional nurses. Mentoring also provides experienced nurses opportunities to exert their leadership. Therefore, mentoring is a crucial element in developing the career of both new nurses and experienced nurses[7,8]. Mentoring has positive effects on an organization as well as the participating individuals. Nonetheless, most domestic research on mentoring involved the mediating effects of a mentoring program and correlation among mentoring, turnover intent, and organizational commitment[1,9,10]. Only one research studied the functional aspects of a mentoring program[11]. There was no research that comprehensively measured the quality of a mentoring program in terms of its structure, process, and outcome. This study is a methodological study that intends to develop and verify the validity of a tool to comprehensively measure the quality of a mentoring program before implementing a mentoring system that will be employed effectively for the efficient management of nurses in a nursing organization.

Materials and Method

Study Design: This study is a methodological study to develop a tool to evaluate the quality of mentoring based on Donabedian's theoretical framework for the quality of medical care drawn from three categories of structure, process, and outcome[12,13] and to test the reliability and validity of the developed tool before implementing a mentoring system that will be employed effectively as an efficient human resource management strategy in a nursing organization[15,16].

Definitions of Terms Used

The Quality of Mentoring (QOM)

Theoretical Definition: Mentoring refers to the mentors' guidance and instruction provided to the mentees. This includes passing on the wisdom the mentors obtained through their organizational lives so that the mentees can adapt to their new organizational lives and develop their careers[14].

Operational Definition: In this study, the QOM signifies the overall evaluation of the structure, process(function), and the outcome of a mentoring program. The score on the QOM was measured with a tool developed by this study. The higher the score was, the higher the QOM would be.

Ethical Consideration: This study was approved by the Institutional Review Board for advanced general hospitals in Seoul(IRB No: 2016-03-041-001). The purpose and methods of this study were explained to the subjects. Written explanations were distributed to the participants so that the comprehensive content could be read thoroughly. A written consent for subjects to voluntarily participate in this study was obtained from the participants. It was specified in the written consent that personal information obtained for this study would not be used for purposes other than research. The written consent also stated that the subjects participated in this study on a voluntary basis and that they could discontinue participation at anytime.

Tool Development Procedure

Composition of Preliminary Questions for the Tool: The preliminary evaluation tool was written based on domestic and overseas literature examinations. One hundred twelve preliminary questions were included in the tool to evaluate the QOM.

Expert Test: To check the content validity of the preliminary questions, an expert group composed of five nursing professors and three field experts was formed. A content validity index (CVI) was computed for each of six items—career function, psychosocial function, organizational commitment, self-efficacy, degree of self-satisfaction, and turnover intent (never valid: zero points, extremely valid: four points) using a four-point scale (extremely valid: 4 points, mostly valid: 3 points, not valid: 2 points, and never valid: 1 point). Then,74 questions for the mentees whose CVI was 0.75 or higher in each item were derived.

Prior Survey on Preliminary Questions: A prior survey was conducted from April 4 to 22, 2016 to check the subjects' degree of understanding on the items in the draft whose verification of content validity had been completed. The survey also examined the time it took for the subjects to complete the questionnaire. Nineteen nurses working in an advanced general hospital located in Seoul were surveyed. Each nurse received his or her

own questionnaire. The nurses' degree of understanding on the surveyed items was scored on a four-point scale (extremely easy: 4 points, mostly easy: 3 points, mostly difficult: 2 points, and extremely difficult: 1 point). Then, 32 questions for the mentees whose CVI was 0.75 or higher in each item were derived.

Main Survey: The main survey was conducted from May 9 to May 27, 2016, with an evaluation tool composed of 32 revised and supplemental questions for mentees to reflect the outcomes of the expert verification and the prior survey. The questionnaires completed by 99 mentees were then collated. The researcher explained the purpose of this study to the nurses in an advanced general hospital located in Seoul. A five-point scale (extremely important: 5 points, never important: 1 point) was used to measure the nurses' perception about the importance of the items.

Tool Evaluation: Validity, Reliability: Data was collected from the nurses in an advanced general hospital located in Seoul using the tool to evaluate the QOM developed by this study. An exploratory factor analysis aimed at examining whether the tool to evaluate the QOM was effectively measuring the basic construct concepts was conducted to test the construct validity. The analysis method was a principal component analysis using the varimax method. Items whose eigenvalue was 1.0 or higher, whose factor loading value was 0.4, and whose communality value was 0.4 or higher was selected. In addition, the tool's Cronbach's α coefficient, a measure of the tool's internal consistency reliability, was calculated to test the homogeneity of the tool's content. As a result, the overall reliability of the tool was 0.96 and its reliability in the five domains ranged from 0.67 to 0.94.

Development of a Final Tool: The construct validity and internal consistency reliability of the tool, which comprised 32 questions selected by the prior survey, were verified and the tool to evaluate the QOM was finally developed.

Data Analysis Method

Statistical data analysis was conducted using SPSS 18.0 Windows. The subjects' general characteristics were analyzed with frequency, percentage, and standard deviation. The tool's construct validity and internal consistency reliability were also analyzed.

Results and Discussion

The subjects' general characteristics are as follows: The subjects' average age was 24.8. Females accounted for 92.9% of the subject population. The subjects' average clinical experience was 14.4 months.

The tool to evaluate the QOM was composed of 32 questions. CVI results in each item were derivedas seen in Table1.

Table 1: CVI results of a Tool to Evaluate the Quality of Mentoring (n = 99)

No.	Question	CVI
1.	My mentor informs me of the stages of my work life and encourages me.	0.94
2.	My mentor recommends that I prepare in advance to perform the job in a future, more developed organization.	0.94
3.	My mentor treats me as a human being.	0.90
4.	If I become a mentor in my workplace, I will try to emulate my mentor's behaviors.	0.78
5.	I was able to understand the mentoring program through the orientation course for the program.	0.91
6.	I am satisfied with the way that the mentors, who work in different departments, are randomly assigned.	0.91
7.	I think the point in time at which the mentoring program was initiated is appropriate.	0.89
8.	I think my mentor has sufficient professional abilities as a mentor.	0.96
9.	My mentor expresses his/her emotions well.	0.91
10.	My mentor expresses his/her trust in me.	1.00
11.	My mentor shows considerable interest in my personal matters.	0.95
12.	My mentor offers adequate encouragement when I experience anxiety or fear.	0.80
13.	I know that my mentor regularly reads professional books to improve his/her nursing expertise.	0.96
14.	The diverse types of information I received from the mentoring program is conducive to my adaptation in my hospital.	0.72
15.	Owing to the mentoring program, I developed a more active attitude toward my hospital life.	0.84

Conted…

16.	I resolve most tasks related to my nursing job by myself.	0.88
17.	The work performed by a nurse requires commitment.	0.92
18.	I think the official mentoring duration period is appropriate.	0.79
19.	I think my mentor has shared with me knowledge and indirect experiences.	0.92
20.	I think my mentor has supported me for my mental stability.	0.93
21.	My mentor has a high sense of morality and ethics.	0.87
22.	My mentor has the ability to understand my hospital as an organization.	0.88
23.	I am benefiting from many aspects in my workplace.	0.95
24.	I feel a sense of belonging at my workplace.	0.83
25.	I think I will be able to perform my job as a nurse well.	0.91
26.	I have a firm attitude about and a sense of ethics on the nursing job.	0.88
27.	I think the nursing job is more essential than any other job.	0.93
28.	I think my nursing work is very important.	0.86
29.	Mentoring was helpful for me to learn new techniques.	0.98
30.	Mentoring prepares me to have a greater sense of responsibility.	0.81

Conted…

31.	Mentoring was a valuable experience to me.	0.94
32.	I am satisfied with the mentoring program I experienced.	0.93

Factor analysis was conducted to divide the questions into five domains. Based on Donabedian's theoretical framework for the QOM, which was drawn from three categories of structure, process, and outcome, the questions were included in the three upper concepts of the five domains—the structure factor (mentoring program domain), the process factor (psychosocial function, career development function, and role model function domains), and the outcome factor (mentoring value domain).

The construct validity was examined to check whether the items grouped through factor analysis were valid as seen in Table2. The total cumulative explained variance was 67.37%. Factor 1's eigenvalue was highest at 14.80 among those with an eigenvalue of 1 or higher, which explained the 23.56% value of the entire variance. Factor 2's eigenvalue was 2.72 which explained the 17.19% value of the entire variance. Factor 3's eigenvalue and factor 4's eigenvalue was 1.52 and 1.39, respectively, explaining the 10.77% and 9.90% values, respectively, of the entire variance.

The total Cronbach's α coefficient(Table 2), which is an indicator of the common meanings of the questions of the tool share, was high at 0.96. Each factor's Cronbach's α coefficient ranged from 0.67 to 0.94(Table2).

Table 2: Results of Exploratory Factor Analysis (n = 99)

Factor	Domain	No.	Question	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Factor of Structure	Mentoring Program	11	My mentor shows considerable interest in my personal matters.	.774				
		9	My mentor expresses his/her emotions well.	.773				
		10	My mentor expresses his/her trust in me.	.755				
		19	I think my mentor has shared with me knowledge and indirect experiences.	.742				
		20	I think my mentor has supported me for my mental stability.	.727				
		12	My mentor offers adequate encouragement when I experience anxiety or fear.	.712				
		21	My mentor has a high sense of morality and ethics.	.674				

Conted…

		8	I think my mentor has sufficient professional abilities as a mentor.	.627				
		22	My mentor has the ability to understand my hospital as an organization.	.586				
		31	Mentoring was a valuable experience to me.	.564				
		7	I think the point in time at which the mentoring program was initiated is appropriate.	.516				
		13	I know that my mentor regularly reads professional books to improve his/her nursing expertise.	.514				
		18	I think the official mentoring duration period is appropriate.	.502				
		3	My mentor treats me as a human being.	.406				
Factor of Process	Psychosocial Function	28	I think my nursing work is very important.		.840			
		26	I have a firm attitude about and a sense of ethics on the nursing job.		.819			
		27	I think the nursing job is more essential than any other job.		.812			
		24	I feel a sense of belonging at my workplace.		.747			
		25	I think I will be able to perform my jobas a nurse well.		.740			
		23	I am benefiting from many aspects in my workplace.		.632			
		17	The work performed by a nurse requires commitment.		.623			
	Career Development Function	29	Mentoring was helpful for me to learn new techniques.			.701		
		14	The diverse types of information I received from the mentoring program is conducive to my adaptation in my hospital.			.659		
		30	Mentoring prepares me to have a greater sense of responsibility.			.588		
		15	Owing to the mentoring program, I developed a more active attitude toward my hospital life.			.539		
	Role Model Function	5	I was able to understand the mentoring program through the orientation course for the program.				.747	
		1	My mentor informs me of the stages of my work life and encourages me.				.723	
		2	My mentor recommends that I prepare in advance to perform the job in a future, more developed organization.				.557	
		4	If I become a mentor in my workplace, I will try to emulate my mentor's behaviors.				.461	
		16	I resolve most tasks related to my nursing jobby myself.				.459	

Conted…

Factor of Outcome	Mentoring Value	6	I am satisfied with the way that the mentors,who work in different departments, are randomly assigned.					.740
		32	I am satisfied with the mentoring program I experienced.					.521
Eigenvalue				14.80	2.72	1.52	1.39	1.13
Variance(%)				23.56	17.19	10.77	9.90	5.95
Cumulative variance(%)				23.56	40.75	51.52	61.42	67.37
Cronbach's α Coefficient				.94	.91	.91	.80	.67

Conclusion

The number of mentoring programs for nurses has recently been increasing in the nursing field. However, the evaluation on these programs has only involved the participants' degree of satisfaction with those programs or their impact. There was no credible and comprehensive tool to evaluate the QOM that can be used as a human resource management system for nurses.

In addition, even when the QOM was evaluated, the functional aspects of mentoring, the participants' degree of satisfaction with mentoring, or the mentors or mentoring programs in the relevant institutions were primarily evaluated separately.

To resolve such limitations, this study attempted to develop a valid evaluation tool that comprehensively measures the QOM of a mentoring program based on Donabedian's theoretical framework for the quality of medical care drawn from three categories of structure, process, and outcome. To this end, literature was examined and 112 preliminary questions for the tool were subsequently derived. Seventy-four questions, whose content validity was verified by an expert group composed of 8 people, were selected. Then, a prior survey on 19 nurses was conducted. Factor analysis was conducted based on 32 questions, which were derived from the main survey completed by 99 mentees-nurses who had participated in a mentoring program. The factor analysis aimed at verifying the construct validity of the tool to evaluate the QOM. Then, Cronbach's α coefficient was calculated to verify the tool's internal consistency reliability. A final tool to evaluate the QOM was developed with three factors and five domains within them—these included the factor of structure (mentoring program), factor of process (psychosocial function, career development function, and role model function), and the factor of outcome (mentoring values). The tool's total cumulative explanatory power was 67.37 and its Cronbach's α coefficient, which demonstrates the tool's overall reliability, was 0.96. From this process, a valid and reliable tool was developed.

The evaluation of the quality of a mentoring program for new nurses will make positive contributions to organizational socialization. These benefits include a decrease in turnover rate, career commitment, and an increase in productivity of nursing organizations in the short term.

Because the subjects comprised those who had participated in an official mentoring program for new nurses in an advanced general hospital, the total subject sample size was small. The researcher plans to refine the tool through follow-up research.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Warmed Fluid Irrigation Intervention and Forced-Air Warming Intervention on Hypothermia in Transurethral Operation Under Spinal Anesthesia

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ABSTRACT

Background/Objectives: The purpose of this study was to investigate an effective nursing intervention for prevention of hypothermia and thermal discomfort in patients undergoing transurethral procedure under spinal anesthesia.

Method/Statistical Analysis: A total of 63 patients were randomly assigned to one of 3 groups. During the procedure, the warmed fluid irrigation group received warm irrigation fluid at 37°C, while the forced-air warming group received forced-air warming by means of Bair Hugger set at 38°C. The control group received room-temperature irrigation fluid.

Findings: Body temperature measured immediately after the procedure showed a significantly higher in the warmed fluid irrigation group than in the control group. The level of thermal discomfort on arrival at the recovery room was significantly lower for the warmed fluid irrigation group than for the other two groups.

Improvements/Applications: The present results suggest that warmed fluid irrigation is more effective than forced-air warming for preventing hypothermia and thermal discomfort during a transurethral procedure under spinal anesthesia.

Keywords: *Warmed fluid irrigation, Forced-air warming, Hypothermia, Body temperature, Thermal discomfort, transurethral operation, spinal anesthesia*

Introduction

Humans have properties of homoeothermic animal that can maintain their core temperature within 37^0C ± 0.2^0C even when the ambient temperature changes, and can maintain active life even under a wide range of climatic conditions by keeping their core temperature constant[1]. However, during surgery, it is difficult to maintain a patient's body temperature due to various factors including indispensable body exposure, application of cold disinfectant, use of cleansing solutions for internal organs, injection of saline solution, loss of blood and low temperature of operating room for prevention of infection. These cause hypothermia during surgery at 50 to 90 percent of surgical patients[2]. Transurethral operation can give off body heat from the surgical site and lower core temperature caused by injecting a large amount of irrigation fluid without heating up in order to secure visibility and prevent bleeding[3], which is particularly prone to hypothermia. In such case, the temperature of irrigation fluid is set to room temperature, which can cause heat loss, hypothermia and tremble to the patient during surgery if using a temperature lower than the body temperature[4]. In fact, patients who underwent a transurethral resection of prostatic hypertrophy suffered a heat loss of approximately 0.98^0C during surgery[5]. Especially, most of patients who underwent transurethral operation are elderly patients. The elderly is more likely to suffer from heat loss due to the reduced ability to maintain body temperature, the reduced basal metabolic rate, decreased cardiovascular ability, thin skin and decreased muscle mass.

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Since transurethral operation has a high incidence of hypothermia as mentioned above, it is recommended to apply warming intervention to patients during surgery in order to prevent hypothermia[6]. In case of partial anesthesia such as spinal anesthesia, ASPAN's(American Society of PeriAnesthesia Nurses) evidence-based clinical practice guideline recommends to measure body temperature, tremble and thermal discomfort of each patient at regular intervals and to provide patient with a waterbed, insulated thermal blanket, radiant warmer and forced-air warming system to be circulated according to patient's body temperature when hypothermia occurs. However, it is true that patients subject to transurethral operation with spinal anesthesia have a short surgical time, do not appeal the cold and are negligent in managing their body temperature. Other inconveniences such as lack and difficulties in application of heating equipment result in using such equipment selectively in actual clinical circumstances only when a prolonged large operation is anticipated or a serious hypothermia is concerned during surgery. There is no exact protocol for application of warming, and warming intervention is being done by preference of medical staff.

Most of researches related to 'warming intervention for the surgical patients' conducted in Korea were for the general anesthesia patients[7-9], and researches for patients who underwent spinal anesthesia were those using warmer(Bair-hugger Warming Unit) before surgery and electro-circulating water blanket(Blankroll) during surgery[10], and those applying warmed saline solution, forced-air warmer and warmed blanket[11]. However, there is little research on warming intervention for patients with spinal anesthesia using a large amount of irrigation fluid. Whereupon, this study applies an irrigation fluid warming intervention which was proven to significantly reduce the body temperature drop[5] and a forced-air warming intervention which is the most recommended clinical practice in recent days with advantages of maintaining normal body temperature in a wide range of operations[12], in a transurethral operation whose operation time is relatively short but uses a large amount of irrigation fluid and shows discomfort resulting from body temperature change after surgery, and then presents the effects, and provides basic data for the development of nursing interventions and protocols for the management of body temperature of patients who will undergo transurethral operation in the future.

Materials and Method

This research is a randomized control group pretest-posttest design that randomly assigns research targets to two experimental groups and one control group for patients undergoing transurethral operations under spinal anesthesia.

Research Subjects: Research subjects are persons for whom preoperative treatment (Mobinul 0.2mg, Midazolam 1mg IM) and anesthesia method(spinal anesthesia) are the same and whose vitals sign is under normal condition, out of patients who underwent transurethral operations under spinal anesthesia for the period from October 2013 to January 2016 in a hospital. Using G*Power 3.1 Program based on the preceding research[13], the sample counts were calculated at significant level(α) .05, power(1-β) .80 and effect size .40, and finally, a total of 63 patients were included: 21 patients in each experimental group respectively and 21 patients in control group.

Research Tools

Body Temperature: The central body temperature was measured using a tympanic thermometer(Infrared Thermometer IRT 4520, Braun GmbH, Germany).

Thermal Discomfort: A tool developed by [14] was used. The higher the score on 7-score scale, the higher the degree of thermal discomfort.

Intervention

Warmed Irrigation Fluid Group: 3L of physiological saline solution was maintained at 37^0C using a digital heating cabinet(DHT-1800, Donghwa System, Incheon, Korea) and then used as a cleansing solution.

Forced-air Warming Group: 38^0C temperature, which is most similar to the temperature of warming irrigation fluid, was applied using a forced-air warmer(Warming unit model 505, Arizant Healthcare Inc. Minnesota, USA). The application method was to cover a patient removed operating gown with a cotton sheet, and to apply a warmed air blanket thereon from shoulder to belly button except the face.

Control Group: As usual, the patient was covered with a cotton sheet under the condition of removing operating gown, and the irrigation fluid of physiological saline solution at room temperature(23~24^0C) was used as a bladder cleansing solution when conducting surgery.

Ethical Consideration: This study was approved by the research ethics committee of a general hospital(***IRB 2013-039), and then the researcher collected data in collaboration with nurses of anesthesiology and pain medicine, urology and operating room. The researcher selected patients who were suitable for the selection criteria of research targets, explained them the research purpose, method and research ethics when wiring a surgery consent form, and then received a documented consent to participate in the research.

Data Analysis

The collected data were analyzed using IBM SPSS Statistics 21 program. The general properties and the surgical-related characteristics of research targets were analyzed with real number, percentages, mean and standard deviations, and the homogeneity test for three groups was analyzed using –test, One-way ANOVA, respectively. Further, the body temperature and thermal discomfort of the experimental group and the control group were analyzed using One-way ANOVA. Post-test was conducted with Tukey HSD(honestly significant difference). All statistical significant levels are adopted at <.05.

Results and Discussion

Homogeneity Test: As a result of conducting homogeneity test on the general characteristics of experimental group and control group in this study, there was no significant difference among three groups, and homogeneity of three groups was secured. As a result of conducting homogeneity test on surgery-related properties, there was no significant difference among three groups in ASA score, spinal anesthesia level, average operation time, average amount of fluid, cleansing volume, and homogeneity of three groups was secured. As a result of conducting a preliminary investigation on body temperature and thermal discomfort immediately after entering into the operating room, there was no statistically significant difference among three groups, and homogeneity of three groups was secured[Table 1].

Table 1: Homogeneity Test of Study Variables for Groups

Characteristics		EI (n = 21)	EII (n = 21)	Control group (n = 21)	F/χ^2	p
		M ± SD or n(%)	M ± SD or n(%)	M ± SD or n(%)		
Age		69.71 ± 8.10	69.19 ± 7.75	69.90 ± 6.70	0.05	.951
Height(cm)		162.53 ± 5.69	165.17 ± 5.90	163.04 ± 6.59	1.11	.335
Weight(kg)		66.5 ± 8.33	62.56 ± 6.70	67.03 ± 8.01	2.11	.130
Cold*	often feel	6(9.5)	7(11.1)	8(12.7)	1.06	.973
	normal	13(20.6)	13(20.6)	12(19.0)		
	do not feel	2(3.2)	1(1.6)	1(1.6)		
ASA score*	1	2(9.5)	5(23.8)	1(4.8)	3.88	.433
	2	13(61.9)	9(42.9)	13(61.9)		
	3	6(28.6)	7(33.3)	7(33.3)		
Level of spinal anesthesia	under T9	15(23.8)	9(14.3)	15(23.8)	4.84	.089
	over T10	6(9.5)	12(19.0)	6(9.5)		
Anesthetic time(min)		78.10 ± 27.68	80.71 ± 21.87	77.14 ± 22.67	0.72	.696
Operating time(min)		51.19 ± 27.79	49.29 ± 19.58	47.38 ± 20.77	0.12	.940
Infusion fluid(ml)		552.38 ± 237.42	566.67 ± 189.30	561.90 ± 165.76	0.03	.973
Irrigation fluid(ml)		17,260.95 ± 8,172.90	20,074.76 ± 9,445.24	18,876.19 ± 9,096.24	0.53	.594
Body Temperature(°C)		36.48 ± 0.29	36.62 ± 0.35	36.62 ± 0.32	1.31	.276
Thermal discomfort		3.86 ± .73	4.29 ± 1.01	3.76 ± 0.77	2.30	.109

Note: EI: Experimental groupI=warmed fluid irrigation group, EII: Experimental groupII=forced-air warming group Control group=room temperature irrigation fluid group, *Fisher exact test

Research Hypothesis Test

Hypothesis 1

Hypothesis 1: Postoperative body temperature of experimental group to which the warmed irrigation fluid and forced-air warming applied will be different from that of control group.

There was a statistically significant difference among groups in body temperature immediately after surgery(F=3.50, p=.037). The warmed irrigation fluid group showed a higher body temperature than the control group[Table 2]. Therefore, the first hypothesis was supported.

As I could not find any study applying air worming therapy and warmed irrigation fluid to patients who had undergone transurethral prostatic resection under spinal anesthesia, the timing of these changes in body temperature was difficult to directly compare with results of each research, but similar to the result of research applying warming intervention to patients who underwent transurethral operation. However, the difference with this study was that study[7] was targeting at patients who underwent transurethral operation under a general anesthesia, and intervention was applied to this study from the beginning of actual surgery, but to study[7] from the beginning of anesthesia. Also, there was a difference in intervention application method that study[7] applied water-circulating pad to both experimental group and control group. As for the research results, the study[7] showed that the body temperature of airway warming group and control group continued to decrease from 30 minutes after staring surgery, but this study showed a significant difference at the end of surgery. This is because study[7] applied intervention immediately after the general anesthesia, that is, including pre-operative preparation time, but this study applied intervention from the beginning of actual surgery, as it was an operation under spinal anesthesia. In the study[5] on intravenous injection of warmed irrigation fluid and warmed saline solution at 38^0C for patients who underwent prostatectomy, the results were consistent with this study, showing that the average body temperature decrease was greater in the group using irrigation fluid and saline solution at room temperature at the end of prostatectomy than the group using warmed irrigation fluid and saline solution at room temperature. Further, the average body temperature of the group using warmed irrigation fluid and warmed saline solution was increased by 0.12^0C from the beginning of surgery, but was not significant. The study used both saline solution and irrigation fluid for intravenous injection, which was different from this study. This study also showed that there was significantly less temperature variation in the warmed irrigation fluid group than the forced-air warming group immediately after surgery, compared with the control group. This is in contrast to the result of study[15] on existing in vivo warming method and in vitro warming method. In the study[15], the result of comparing the warming therapy with 37^0C saline solution and 37^0C skin warming therapy for the laparotomy patients showed that the skin warming therapy combined with the radiant heat had a higher body temperature retention and a less body temperature drop than the warming therapy with saline solution. It is judged this is due to the fact that study[15] combined radiant heat to the skin warming group, and the amount of saline solution in the warming saline solution therapy was 2,273ml on average, which was considerably less than the average cleansing amount of warming irrigation fluid group in this study, 20,075ml.

Hypothesis 2

Hypothesis 2: There will be differences in postoperative thermal discomfort between experimental groups to which warmed irrigation fluid and forced-air warming applied and the control group.

There was statistically significant difference in thermal discomfort between the groups when entering into the recovery room after surgery(F=3.94, p=.025). The warmed irrigation fluid group showed the less thermal discomfort than the control group and the forced-air warming group[Table 2]. Therefore, the second hypothesis was supported.

Even though it is not possible to compare directly due to the different method of surgery, anesthesia and intervention, this result is consistent with the result of study[16] showing that in case of the subjective thermal discomfort of abdominal surgical patients, the application of warmed saline solution(37^0C) was less than the application of the warming blanket(38^0C). But, a study[17] to apply the warmed saline solution therapy(42^0C) and the forced-air warming therapy(43^0C) for the patients who underwent gastric cancer surgery showed that the forced-air warming group had a significantly less thermal discomfort than the warmed

saline solution group when entering into the recovery room, which was in contrast to this study. It is judged that this is because the amount of warmed saline solution was about 500ml in the study[17], which largely differed from the amount of irrigation fluid in this study and 3100ml of saline solution in study[16]. As mentioned above, when a large amount of saline solution is used for intravenous injection or cleansing solution, warming intervention of saline solution and cleansing solution may be effective, and the body temperature control during surgery leads to a decrease in the patient's discomfort after surgery.

Table 2: Comparison of Body Temperature and Thermal Discomfort between Groups

	Body Temperature (Immediately after procedure)	**Thermal Discomfort (Arrival at recovery room)**
EI[a] (n=21) M ± SD	36.00 ± 0.30	4.10 ± 0.54
EII[b] (n=21) M ± SD	35.81 ± 0.56	4.76 ± 1.09
C[c] (n=21) M ± SD	35.64 ± 0.40	4.76 ± 0.94
F(p) Tukey	3.50(.037) a>c	3.94(.025) a<b,c

Note: EI: Experimental groupI=warmed fluid irrigation group,

EII: Experimental groupII=forced-air warming group,

Control group=room temperature irrigation fluid group

Conclusion

Taken together the effect of warming intervention method on the postoperative body temperature and thermal discomfort in the transurethral operation under spinal anesthesia, the warmed irrigation fluid group has a statistically and significantly less body temperature drop and a less thermal discomfort than the control group and the forced-air warming group immediately after surgery. The incidence of hypothermia was also lower in order of control group, forced-air warming group and the warmed irrigation fluid group. Therefore, it is concluded that the warmed irrigation fluid, an in vivo warming method, is more effective than the forced-air warming method, an in vitro warming method, in transurethral operation. This is thought to be due to the characteristics of transurethral operation using a large amount of cleansing solution. In conclusion, the result of this study suggests that the warmed irrigation fluid intervention is more effective than the forced-air warming intervention in transurethral operation under spinal anesthesia.

Ethical Clearance: Obtained written consent from the subjects

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Orofacial Muscles Exercise Program on Swallowing Function and Satisfaction in Sub-Acute Stroke Patients with Dysphagia

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ABSTRACT

Background/Objectives: The aim of present study was to examine the effect of orofacial muscle exercise programs on swallowing function with smartphone video as well as satisfaction with outcome in sub-acute stroke patients with dysphagia.

Method/Statistical Analysis: We enrolledsub-acute phase of sixteen stroke patients with dysphagia. The participants were randomly assigned to the study group (orofacial muscle exercise program using smartphone video) orcontrol (paper-based orofacial muscles exercise program). All subjects completed their prescribed orofacial muscle exercise programs 20 min/day, 3 times per week, for 4 weeks. The outcome measures were the FDS(Functional Dysphagia Scale), PAS (Penetration-Aspiration Scale) and VASS(Visual Analog Satisfaction Scale).Main analysis was Mann-Whitney U test for comparison between groups.

Findings: After intervention, there were no significant differences in swallowing function between the two groups. Nevertheless, in study group satisfactionwas significantly higher than that of the control group.

Improvements/Applications: Authors suggest that orofacial muscle exercise programs using smartphone can have a more positive impact on satisfaction than can paper-based orofacial muscle exercise programs in sub-acute stroke patients with dysphagia.

Keywords: *Oral cavity, Stroke, Swallowing function, Dysphagia, Swallowing disorder*

Introduction

Stroke is a chronic disease that causes motor and sensory function disorder, speech disorder, dysphagia, etc. Dysphagia refers to problems that occur during the process of food moving from the oral cavity to the stomach. It has been reported that the occurrence of stroke with dysphagia varies from 25% to 63% [1]. The main symptoms of patients with oropharyngeal dysphagia after stroke are weakness and functional disorders in the tongue, pharynx, lips, cheeks, and masticatory muscles. These problems become the cause of death and are associated with decreased quality of life [2].

There are somemethods for the interventions of dysphagia. The interventions that have been introduced include head lift exercise [3], effortful swallow and Mendelsohn maneuver [4], lingual strength training [5], expiratory muscle strength training [6], oromotor exercises [7], etc. Oromotor exercises are methods that strengthen the muscles used in the oral phase as well as the pharyngeal muscles, are relatively easy for patient training compared to other interventions.

The muscles that make up the cheeks, lips and tongue are called the orofacial muscles, and greater muscular strength in the orofacial muscles translates

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to safer and more effective chewing and swallowing [8]. Orofacial muscle exercise improves muscular strength and movement in the muscles associated with tongue, lips, face, and chewing [9]; it can also be beneficial for patients with delayed oral and pharyngeal transit time [10]. Orofacial muscle exercise is also used in patients with decreased tongue movements, those with decreased sensation and coordination in the oropharyngeal muscles, or patients with reduced bolus control [7-10].

The number of people worldwide using the Internet with their smartphones went over 80% of the global population in 2015 [11]. As an IT powerhouse, South Korea is one of the countries that shows high rate of smartphone ownership and use [12]. One of the biggest advantages of smartphones is that they are easy to carry and can be used anytime and anywhere. Many studies have reported about rehabilitation intervention and assessment using smartphone [13,14], but little has been studied on the effectiveness of orofacial muscle exercise program using smartphone. Researches related to swallowing, in particular, are seriously lacking in studies on smartphone-based measurement and intervention [13,14]. Given the widespread use of smartphones equipped with video playback function among the general public in Korea, implementing orofacial muscle exercise while watching an instructional video instead of following the existing method of booklet-based implementation may yield higher effectiveness and satisfaction.

Therefore, this study aims to investigate whether an orofacial muscle exercise program using smartphone will have greater effects than the existing method of orofacial muscle exercise using the booklet on the swallowing function and intervention satisfaction in stroke patients with dysphagia.

Materials and Method

Subjects: Sixteen subacutepatients with stroke and dysphagia voluntarily participated in present study. The criteria used in the selection of participants were as follows: A patient 1) who has been diagnosed with stroke and is confirmed of dysphagia by a medical specialist, 2) who is in stable medical condition, 3) whose onset of stroke has been no less than a week but less than 3 months [15], and 4) who has scored 21 or higher in the Korean Mini-Mental State Examination and is capable of understanding the intervention program. Visual impairment was used as the exclusion criterion. After informed consent agreements, all subjects voluntarily participated in the study.

Measurements

Functional Dysphagia Scale (FDS): Functional Dysphagia Scale (FDS) is assessed through video fluoroscopy. The score ranges from a minimum of zero point to a maximum of 100 points. The higherscore, more severe the dysphagia. FDS is not intended simply to distinguish between penetration and aspiration but is a measure used for assessing the motor functions of the structures related to the swallowing function. This scale is useful for quantitative assessment of dysphagia. The inter-tester reliability of FDS is .59 [16].

Penetration-Aspiration Scale (PAS): Penetration-Aspiration Scale (PAS) assess the severity of penetration and aspiration through a video fluoroscopic swallowing study. The score ranges from level 1 to 8 depending on whether the bolus enters the airway and how the bolus is ejected once it is in the airway. Level 1 is normal swallowing, while level 8 is silent aspiration, which is the most severe stage of dysphagia. The test-retest reliability of PAS is .91 [17].

Visual Analog Satisfaction Scale (VASS): Visual Analog Satisfaction Scale (VASS) was used in this study to assess the satisfaction of both the experimental and the control group with respect to their respective interventions. In using this measurement instrument, the level of satisfaction was determined by using a 100 mm horizontal line drawn on a A4 paper with the left end marked as 0 and the right end as 10 and having the subject indicate on the line his/her level of satisfaction. A subject's score closer to 0 meant that he/she is less satisfied with the intervention. On the contrary, a subject's score closer to 10 suggests he/she has higher satisfaction with the intervention [18]. The VASS was administered after the completion of all interventions.

Procedures: Sixteen subjects who met the selection criteria were recruited in present study. All subjects were randomly assigned to experimental group or control group, 8 persons each. A pre-intervention assessment was conducted on all the subjects. Both groups received the same 30-minute-long traditional dysphagia therapy three days in a week for four weeks, twelve sessions in total. In addition, both groups performed orofacial muscle exercise under guardian supervision in a hospital room. The experimental group performed 20 minutes of orofacial muscle exercise by following an instructional video played back on a smartphone, and the control group performed 20 minutes of orofacial muscle exercise using the existing method of booklet guide.

The orofacial muscle exercise performed by both groups was composed of fifteen different movements in the following order; opening the mouth wide, moving the jaw from side to side with the mouth wide open, moving the jaw backward and forward with the mouth wide open, smiling, lifting the angle of the mouth to each side one after another, pouting the lips, sucking in the lips then bouncing them off, blowing from the mouth, sticking out the tongue, sticking out the tongue and moving it from side to side, making a candy inside the mouth with the tongue, swiping the gums with the tongue, inflating the cheeks, sucking in the cheeks and inflating one side of the check after another. The orofacial muscle exercise video was produced by having an occupational therapist model the movements. The total length of the video was seven minutes, and each movement was repeated five times. The experimental group was asked to perform the orofacial muscle exercise while watching the 7-minute video three times so as to repeat each movement fifteen times. Meanwhile, the control group was asked to perform the orofacial muscle exercise looking at a booklet with pictures of the fifteen movements. As in the experimental group and control group was asked to repeat each movement fifteen times. All subjects performed the orofacial muscle exercise for 20 minutes per session. Every session was monitored and guided by an occupational therapist for accurate performance of the exercise. All the subjects completed twelve sessions of intervention. Post-intervention assessment was conducted after completing the 4-week intervention.

Statistical Analysis

The collected data were analyzed using SPSS 22. The general characteristics and pre-intervention data between the groups were compared and analyzed using the Mann-Whitney U test and the Chi-square test. The Wilcoxon signed rank test was used to confirm the statistical difference between the two groups before and after intervention. The Mann-Whitney U test was used to compare and confirm the amount of variation in the both groups. The statistical significance level was set at .05.

Results and Discussion

There was no significant difference between the two groups of stroke patients with dysphagia in terms of general characteristics and swallowing function prior to the intervention ($p > 0.05$) [Table 1]. Two groups, however, showed significant improvement in swallowing function after the intervention ($p < 0.05$) [Table 2]. There was no significant difference between the groups in the amount of variation of swallowing function after the intervention ($p > 0.05$) [Table 3]. In satisfaction level, the experimental group was significantly higher than that of the control group after the intervention ($p < 0.05$) [Table 4].

Table 1: Comparison of general characteristics and swallowing function

	Study group (n = 8)	Control group (n = 8)	p
Age (year), mean ± SD	54.13 ± 5.41	55.38 ± 14.88	.224
Gender, n (%)			
Male	5(62.5)	4(50)	.614
Female	3(37.5)	4(50)	
Lesion side, n (%)			
Right side	4(50)	5(62.5)	.614
Left side	4(50)	3(37.5)	
Stroke type, n (%)			
Ischemic	7(87.5)	7(87.5)	1.000
Hemorrhagic	1(12.5)	1(12.5)	
Lesion location, n (%)			
Supratentorial	5(62.5)	4(50)	.614
Infratentorial	3(37.5)	4(50)	
Onset period (day), mean ± SD	22.75 ± 9.21	21.00 ± 9.02	.713
K-MMSE, mean ± SD	24.00 ± 3.38	24.25 ± 2.92	.813
FDS	27.75 ± 5.50	28.50 ± 3.96	.916
PAS	5.38 ± 1.51	5.50 ± 1.31	.911

Footnotes: K-MMSE = Korean Mini-Mental State Examination; FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 2: Comparison of swallowing function between pre and post-intervention within groups

	Study group (n = 8)			Control group (n =8)		
	Pre	Post	p	Pre	Post	p
	Mean ± SD	Mean ± SD		Mean ± SD	Mean ± SD	
FDS	27.75 ± 5.50	16.25 ± 5.28	.012*	28.50 ± 3.96	19.00 ± 4.41	.012*
PAS	5.38 ± 1.51	2.63 ± 1.19	.010*	5.50 ± 1.31	2.88 ± 0.64	.010*

Footnotes: *p<0.05, FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 3: Change score of swallowing function between two groups

	Study group (n = 8)	Control group (n = 8)	p
	Mean ± SD	Mean ± SD	
FDS	-11.50 ± 5.32	-9.50 ± 4.50	.368
PAS	-2.75 ± 0.71	-2.63 ± 0.92	.606

Footnotes: FDS =Functional Dysphagia Scale; PAS =Penetration-Aspiration Scale.

Table 4: Comparisons of satisfaction in the both groups after intervention

	Study group (n = 8)	Control group (n = 8)	p
	Mean ± SD	Mean ± SD	
VASS	8.90 ± 0.92	7.47 ± 0.82	.011*

Footnotes: *p<0.05, VASS =Visual Analog Satisfaction Scale.

The effectiveness of orofacial muscle exercise could not be ascertained until know due to serious lack in studies on the effects of orofacial muscle exercise training programs. Thus, this study investigated whether implementing a smartphone-based orofacial muscle exercise program instead of the existing booklet-based orofacial muscle exercise program will have a better effects on swallowing function and intervention satisfaction in subacute patients with stroke and dysphagia. The main three results are as follows:

First, both groups showed significant improvement in swallowing function after performing the orofacial muscle exercise. The orofacial muscle exercise program used in this study largely involved training the jaw, mouth, cheeks and tongue. Among these exercise for the jaw, mouth, cheeks and tongue, the jaw and the tongue exercises have been reported to be effective in strengthening the suprahyoid muscles (SH) [19-21]. According to previous studies, jaw opening exercise improves hyoid bone movement in patients with chronic dysphagia and is an effective training for improving muscular strength of the SH [19]. In this study, all of the jaw movements performed during the orofacial muscle exercise were tasks involving repeated forward and backward as well as side to side open-jaw movements. Therefore, the jaw movements are thought to have helped strengthen the SH. Muscle strengthening training in the SH improves the opening function of the upper esophageal sphincter by increasing the anterior and the upper movements of the hyoid bone [22]. Improvement of the upper esophageal sphincter opening reduces the residue of pyriform sinuses after swallowing [23] and protects the airway in a safer manner. Therefore, it appears that improved swallowing function resulted from the muscle training on the jaw, mouth, cheek and tongue through the orofacial muscle exercise.

It is surmised that the tongue movements performed in the orofacial muscle exercise program helped improve the upper esophageal sphincter opening from enhancing chewing movement and the strength of the SH [21-22]. The muscles that make up the mouth and the cheeks, such as the orbicularis oris muscle, buccinator muscle and superior pharyngeal constrictor, work with the tongue to provide adequate pressure to the food during chewing and swallowing and help ensure safe and effective swallowing [24]. Therefore, it appears that the mouth and the cheek movements performed during the orofacial muscle exercise program helped improve chewing movement and the strength of the SH, having a positive effect on improved swallowing function.

Second, although both groups showed improved swallowing function after the intervention, there was no significant difference in swallowing function between the groups. This can be explained as a combined outcome involving the neurological recovery after stroke and the

intervention effect from swallowing rehabilitation [25, 26]. Studies have demonstrated that a great deal of recovery happens in the early stage after the onset of stroke and that swallowing rehabilitation during this stage is effective [3-7]. This result also supports the recovery of dysphagia through neurophysiological repair and brain reorganization after two to three months from the onset of stroke, which is based on the theory of neuroplasticity [27]. Another possible explanation for the result showing no difference between the two groups is that the research period of four weeks was rather short and the sample size too small to yield significant intervention effect.

Third, after completing the intervention, the experimental group showed higher level of satisfaction for the intervention than the control group. This suggests that the intervention incorporating video watching can have a positive influence on the effectiveness in intervention for stroke patients with dysphagia. Higher satisfaction of rehabilitation leads to stronger motivation and more enthusiastic participation in rehabilitation [28, 29]. Thus, this result implies that the longer the intervention period is implemented, it is likely that the orofacial muscle exercise using video instructional guide will be perceived more positively by the patients compared to the orofacial muscle exercise using booklet guide.

This study is meaningful in that it presents an exercise intervention that can be performed in a hospital room using an easy-to-carry and easy-to-use smartphone. In order to improve the physiological functions and quality of life instroke patients with dysphagia and to overcome the limitations in the current rehabilitation system, it is necessary to develop, implement and evaluate interventions using a variety of device. Despite its merits, our study has the following limitations. The small sample size makes it hard to generalize the findings of present study to other stroke patients with dysphagia. And the research period of four weeks was rather short. Finally, long-term or sustained effects of the orofacial muscle exercise program could not be ascertained because a follow-up research was not conducted.

Conclusion

The purpose of present study was to examine whether an orofacial muscle exercise program using smartphone will have greater effects than the existing method of orofacial muscle exercise using the booklet on the swallowing function and intervention satisfaction in patients withdysphagia and stroke. There was no significant difference between the two groups in the amount of variation of swallowing function after the intervention, but in satisfaction level, the experimental group was significantly higher than that of the control group. These findings show that, compared to the orofacial muscle exercise program using a booklet, the orofacial muscle exercise program implemented while watching an instructional video using a smartphone does not result in better swallowing function but does lead to higher level of satisfaction for the intervention in stroke patients with dysphagia.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Effects of Lateral Shift Correction Squat on Muscle Activation and Dynamic Balance in Scoliosis

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ABSTRACT

Background/Objectives: The purpose of this study was to effects of the muscle activity of elector spinae and gluteus maximus and dynamic balance ability during lateral shift correction squat in scoliosis.

Method/Statistical Analysis: The subjects of this study were 17 female and 11 male who has scoliosis were recruited. Surface electromyography data were collected from the both of electer spinae(T6 and L3) and gluteus maximus. Dynamic balance was collected from bio-resque device. A Paired t - test was performed to examine the effect of both of elector spinae(T6 and L3) and gluteus maximus muscle activity and dynamic balance during lateral shift correction squat.

Findings: The results of this study show that the trunk lateral shift correction squat increased ratio of elector spinae(T6 and L3) and gluteus maximus compared with general squat. Also dynamic balance ability was increased during lateral shift correction squat compared with general squat.

Improvements/Applications: This study suggests that lateral shift squat maybe useful in subject with scoliosis.

Keywords: *Electromyography, Elector spinae, Level bar, scoliosis, Squat*

Introduction

Scoliosis is defined as a cobb's angle of 10 degrees or more, which is a three-dimensional deformity of the vertebral curvature that takes place in its normal posture [1]. Scoliosis exhibits reduced flexibility and balance compared to normal subjects due to asymmetrical posture and muscle imbalance of the trunk.

The treatment of scoliosis is divided into surgical and non - surgical conservative treatment. Conservative therapies include braces, electrical stimulation, traction, and exercise. Many researchers recommend exercising for scoliosis because it release or/and strengthens the muscles of the unbalanced spine to enhance a balanced posture. Therapeutic exercise for scoliosis can reduce the deformation of the vertebrae, preventing the decline in cardiopulmonary function and improving the unbalanced posture. Simon et al.(1999) stated that the muscular strengthening exercises around the spine and pelvis prevent the lateral bending of the spine. It has also been reported that sustained exercise therapy improves vertebral deformity and flexibility [2].

Exercise for scoliosis consists of breathing technique, muscular strengthening exercises to correct the lateral displacement and rotation deformation of the vertebrae. Squat is exercises to strengthen muscles around the spine and pelvis. In a squat exercise, the correct posture should be that the gaze is directed forward, the trunk is raised from the sagittal plane, and the knee is bent so that the knee does not cross the toe line. The squat movement is a closed kinematic chain in which is a movement wherein the distal part is fixed, as when the sole of the foot makes contact with the ground or the exercise equipment. Therefore, it is important to exercise in the right posture as the weight increases the risk of injury if you exercise with wrong posture. Mcconell (2002) showed that when Meconnell taping was intervened in a patient with patellofemoral pain syndrome, increased the ratio of muscle activity of the vastus medialis/vastus lateralis muscles Meconnell taping was recommended[3].

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Kim(2013) reported that squat exercises using visual feedback reduced the quadriceps-angle for knee femur pain syndrome and, reduction of the quadriceps-angle to be helpful in the hypermobility of the knee joint and in the knee joint instability [4].

In previous studies, squat-related exercise control studies are mostly related to the correction of knee joints. Squat exercises with incorrect trunk alignment cause back problems and pain. However, there is a lack of research on squat exercises using trunk correction intervention for scoliosis. The purpose of this study was to compare the muscle activity of elector spinae and gluteus maximus and dynamic balance ability during intervention during trunk correction intervention for scoliosis.

Method

Prior to this study, preliminary measurements were performed with five subjects and the problems of the measurement method were identified and corrected during the preliminary measurement. The subjects of this study were 28 men and women who had positive response to scoliosis test who agreed to participate and listen to the explanation and purpose of the study. The general characteristics of the subjects are as follows [Table 1].

Table 1: General characteristics of subjects (Mean ± SD)

	Male (11)	Female (17)
Height(cm)	171.08 ± 5.35	160.94 ± 38.50
Weight(kg)	66.83 ± 14.55	55.12 ± 15.26
Angle(°)	6.00 ± 2.41	5.94 ± 2.06
BMI(kg/m^2)	23.22 ± 5.56	20.00 ± 6.94

The inclusion criteria for this study are as follows.

- Subjects with a scoliometer angle more than 5 degrees.
- Subjects do not have orthopedic or neurological disorders in the lower extremity.
- Those without knee joint disease or surgical history.
- Subjects with a range of motion and strength who can perform a squat exercise
- The difference between the left and right leg lengths is less than 2cm

Measuring Tool

Test for Scoliosis: The method of measuring scoliosis is to bend the subject's back 90 ° forward and measure with a scoliometer at the maximum projecting area. When the angle of the scoliometer is 5 °, the vertebrae are warped about 11 ° on the X-ray [Figure 1, Figure 2].

Figure 1: Adam forward bending test

Figure 2: Scoliometer

Surface Electromyogram: The surface EMG WEMG-8 (LXM 5308, Laxtha, Korea) was used to measure muscle activity of both elector spinae and gluteus maximus muscles during squat exercise. The sampling rate of the signal was set at 1024Hz and a 60Hz notch filter was used. Telescan program was used for EMG signal storage processing. EMG signals of each muscle were analyzed by root mean square (RMS).

Bio-rescue: Bio-rescue was used for balance measurements during the squat exercise. The bio-rescue consists of a platform that can detect the COP (center of pressure), a data collection device and an analysis program. The moving area, distance, velocity and density are calculated using an analysis program. The composition of Bio-rescue is composed of 610 × 580 × 10mm force plate and computer. The pressure sensor of the force plate consists of 1600 pieces, and the sampling rate of the data through the force plate sensor is to be obtained at 100 Hz.

EMG Attachment: Before measuring the muscle activity of elector spinae and gluteus maximus on both sides, the hair was shaved off with a razor to reduce skin resistance, and the skin was cleaned with sterilized alcohol. gluteus maximus was attached to the middle of the caudal and large protrusions, and the attachment site of ES was attached to T6 and L3 [5]. EMG pads were attached according to the direction of muscle fibers [Figure 3].

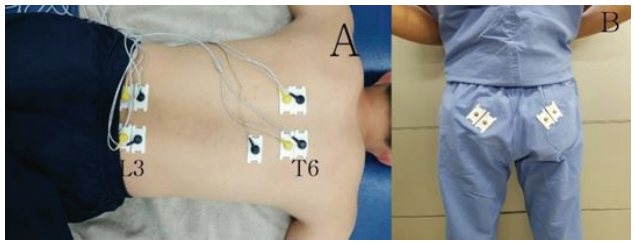

Figure 3: EMG attachment
(A) Elector (B) Gluteus maximus

Application: In this study, to improve the balance of right and left trunk during squat exercise, a mobile phone was attached to the weight bar to provide biofeedback to those with vertebrae. The biofeedback used a smartphone application, Bubble Level (Antoine Vianey, France) [Figure 4], and fixed with velcro in the center of the weight bar. In order to provide visual feedback, the slope of the weight bar was output to the notebook in real time using Side Sync(Samsung Electronics, Korea).

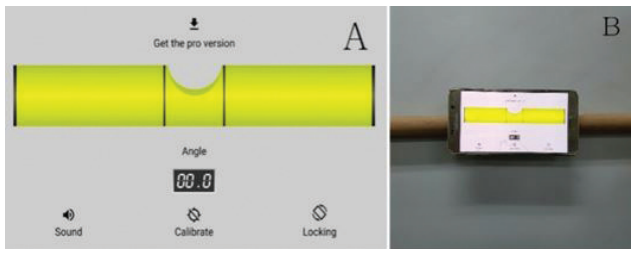

Figure 4: Application
(A) Bubble level (B) Bubble level attached to weight bar

Maximal Voluntary Isometric Contraction; MVIC): The maximum isometric contraction method was referenced to Kendall[Figure 5]. During the maximum isometric contraction of each muscle, muscle activity was measured three times for 5 seconds and treated with root mean square (RMS). Then, the mean EMG signal intensity for the middle 3 seconds except the first and last 1 second was used as% MVIC. The following is a formula for normalizing electromyogram signals

Figure 5: Maximal isometric contraction
(A) Thoracic spine 6 level (B) Lumbar spine 3 level(C) Gluteus maximus

Squat Exercise: The squat exercise was performed with the weight bar spread over the shoulder, with the feet spreading to the shoulder width. In this study, the knee angle was set to 70 °. A rod was used to apply the same knee angle between experiments. The total squat exercise time was 12 seconds, divided into the descending phase (0-4 seconds), the holding phase (4-8 seconds), and the ascending phase (8-12 seconds). All squat exercises were allowed to take one minute of rest for each measurement to minimize fatigue. All squats were performed three times.

General Squat: The subjects were given a comfortable and natural squat [Figure 6 A].

Lateral Shift Correction Squat: In order to apply trunk intervention during the squat exercise, we provided visual feedback in real time to the subject in front of the 13.3 inch notebook. The subject was squatted so that the trunk did not deviate to the left or right as much as possible through the level meter measured by the notebook.[Figure 6 B]

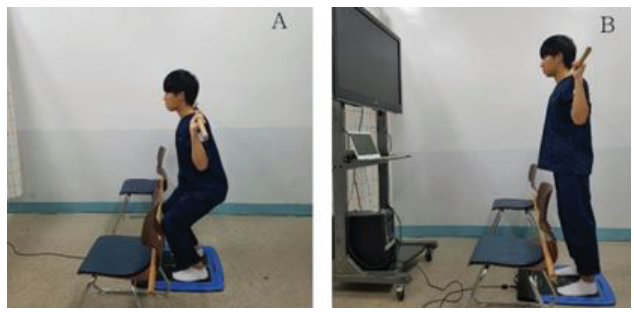

Figure 6: Squat exercise
(A) General Squat (B) Lateral shift correction squat

Analysis

A Paired t - test was performed to examine the effect of both T6 and L3 on elector spinae and gluteus maximus muscle activity and dynamic balance. The statistical significance was ą = 0.05. The collected data were analyzed using the SPSS statistics 18.0 software program for Windows

Results and Discussion

Results

Muscle activity of trunk and hip during descending phase of squat: There was a significant difference in elector spinaeand gluteus maximus muscle activity in descending phase[Table 2].

Table 2: Muscle activity of trunk and hip during descending phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	20.28 ± 10.88	18.27 ± 8.62	0.57 ± 0.23	0.78 ± 0.15	4.6	.00*
Right T6	17.67 ± 11.72	17.72 ± 8.85				
Left L3	14.18 ± 7.55	13.91 ± 7.56	0.71 ± 0.14	0.87 ± 0.1	6.17	.00*
Right L3	14.35 ± 7.5	13.91 ± 7.56				
Left GM	4.14 ± 1.32	4.03 ± 1.36	0.77 ± 0.16	0.84 ± 0.13	2.6	.01*
Right GM	3.89 ± 1.13	4.03 ± 1.36				

Holding Phase: There was a significant difference in elector spinae in holding phase. (P<.05)[Table 3].

Table 3: Muscle activity of trunk and hip during holding phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	24.56 ± 14.55	24.95 ± 13.92	0.61 ± 0.22	0.78 ± 0.15	5.1	.00*
Right T6	28.29 ± 16.47	24.95 ± 13.92				
Left L3	17.39 ± 7.66	17.1 ± 7.74	0.73 ± .013	0.86 ± 0.09	6.17	.00*
Right L3	18.1 ± 9.66	17.1 ± 7.74				
Left GM	4.32 ± 0.81	5.38 ± 5.64	0.75 ± 0.18	0.82 ± 0.12	1.47	.15
Rihgt GM	4.5 ± 1.78	5.38 ± 5.64				

Ascending Phase: There was a significant difference in elector spinae and gluteus maximus muscle activity in ascending phase(P<.05)[Table 4].

Table 4: Muscle activity of trunk and hip during Ascending phase of squat

Muscle	Squat	Corrective Squat	Squat ratio	Corrective Squat ratio	t	p
Left T6	17.31 ± 8.63	18.36 ± 8.89	0.61 ± 0.23	0.78 ± 0.15	4.06	.00*
Right T6	19.34 ± 8.31	18.36 ± 8.89				
Left L3	16.24 ± 6.67	16.22 ± 6.82	0.77 ± 0.14	0.86 ± 0.08	3.73	.00*
Right L3	16.11 ± 6.68	16.22 ± 6.82				
Left GM	5.5 ± 2.01	5.24 ± 2.24	0.76 ± 0.14	0.85 ± 0.12	3.05	.01*
Right GM	5.42 ± 3.18	5.24 ± 2.24				

Dynamic Balance: There was a significant difference in sway speed and sway length. (P<.05) [Table 5].

Table 5: Comparison of change in balance

Phase		Squat	Corrective Squat	t	p
descending	Swayspeed (mm/s)	1.82 ± 1.12	1.38 ± 0.97	4.04	.00*
	Sway length (mm)	6.29 ± 1.72	4.53 ± 1.38	6.83	.00*
holding	Sway speed (mm/s)	2.42 ± 0.77	0.72 ± 0.48	2.68	.01*
	Sway length (mm)	3.05 ± 1.05	0.84 ± 0.39	4.71	.00*
ascending	Sway speed (mm/s)	3.66 ± 1.1	1.06 ± 0.84	5	.00*
	Sway length (mm)	5.23 ± 1.59	1.53 ± 1.17	5.58	.00*

Discussion

Spinal deformity can be caused by weakness of the muscles supporting the spine due to lack of exercise. Therefore, therapeutic exercise is needed to prevent and treat scoliosis[6].

In this study, the ratio of muscle activity of left and right of T6 was significantly increased in the descending phase, holding phase, and ascending phase during the lateral shift correction squat movement compared to the general squat($p<.05$). Lee(2015) compared the muscle balance around the spine with asymptomatic patients and scoliosis, and confirmed muscle imbalance in scoliosis compared with asymptomatic [7]. As a result of applying the therapeutic exercise to the scoliosis, there were differences in muscle thickness and muscle activity of left and right T7. The deformity of the vertebrae is a fixed contralateral spinal coupling pattern associated with lateral bending and axial rotation of the vertebrae. The spinous processes rotate in a horizontal plane toward the concave surface of the fixed thoracic spine, which generally results in a rib hump in the convex surface in a frontal plane and the ribs follow the rotation of the spine. Due to the strong bending torque applied to the ribs, the upper lumbar region receives intensive bending stress. Therefore, correction of scoliosis is important because it may damage the bony structures.

In this study, the ratio of muscle activity of left and right elector spinae of T6 was significantly increased during lateral shift correction squat exercise that the stress of the bony structure in the ribs could be reduced.

In this study, the ratio of muscle activity of left and right of L3 was significantly increased in the descending phase, holding phase, and ascending phase of the lateral shift correction squat compared to the general squat. Kennelly and Stokes (1993) reported that the cross-sectional area of the multifidus in the concave and convex parts of the vertebrae differs between the scoliosis and asymptomatic subjects [8]. This means that the ability to adjust the balance of the trunk is decreased in scoliosis compared to asymptomatic. The importance of exercise has been emphasized because elector spinae is developed to maintain the posture and stability of the spine and pelvis when the therapeutic exercises to improve muscle imbalance are applied to the scoliosis.

In this study, when we applied the lateral shift correction squat to scoliosis, the ratio of left and right elector spinae muscle activity of L3 was significantly increased, so that the left and right unbalance of the trunk was reduced and the spine was stabilized. In this study, the muscle activity ratio of GM increased significantly in the descending and ascending phase of the trunk correction squat. Hip joint muscles are very helpful in maintaining the stabilization of the trunk. This is because the muscles origin or insertion on the pelvis plays a role in controlling the balance of the body, which regulates the movement of the pelvis along the axis of the hip joint [9]. Mahaudens et al. (2005) reported that a scoliosis affects the pelvic dysfunction and pain during daily gait and gait due to GM imbalance [10]. In this study, it was suggested that the left and right GM muscle activity ratio of the vertebral flexion patients was significantly increased during the trunk correction squat, so that the left and right imbalance of the pelvis would be reduced to help decrease the pelvic dysfunction.

In this study, the dynamic balance was significantly increased in descending, holding, and ascending phase during the lateral shift correction squat compared to the general squat. According to a study, on the balance ability of scoliosis show a much greater trunk sway area, as well as more sway, surging, and sway radius. Muscle imbalances affect reflexes, postural sway due to muscle weakness, flexibility and decreased co-ordination in the ankle and knee. Compared lateral shift correction

squat, during the general squat, the shaking of the trunk during the dynamic balance test will be increased due to the muscle tension due to the unbalance of the left and right muscles and the deformation of the center of gravity due to skeletal misalignment. During the general squat movement, skeletal misalignment would be caused by the imbalance of the left and right muscles, and the dynamic balance would be degraded due to the deformation of the center of gravity. On the other hand, it seems to be possible to improve the dynamic balance ability of all the squat phase by keeping the equilibrium without side shift due to the muscle balance of left and right sides of the trunk and pelvic muscles during the lateral shift correction squat.

The limitations of this study are as follows. First, only the cross - sectional study was conducted in this study. The lateral shift correction squat should proceed in the long term in scoliosis. In the next study, it is necessary to study long term intervention.

Second, it is necessary to investigate the kinematical phenomenon in order to investigate the effects of direct trunk correction squat. In this study, however, only the left and right muscle activity ratio and balance ability were confirmed. Future studies will require a kinematical study to determine the correct curvature enhancement.

Conclusions

In this study, we compared the muscle balance and dynamic balance of the trunk and hip extensor muscles during lateral shift correction squat. Compared to the general squat, the ratio of muscular activity of left and right elector spinae and gluteus maximus was increased, and dynamic balance ability was significantly increased. Therefore, we recommend a lateral shift correction squat to increase the balance between the trunk and pelvis for those with scoliosis.

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Source of Funding: Self

Conflict of Interest: Nil

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Levels of Wellness, Health Literacy and Health Promoting Behavior Related Factors among Industrial Workers

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ABSTRACT

Background/Objectives: The aim of this comparative descriptive study is to identify in the characteristic and health promoting behavior of employees who work for the workplace.

Method/Statistical Analysis: The subjects were 142industrial workers in D, K, U city. Questionnaires were used to measure wellness, levels of health literacy and health promoting behavior. The data were collected from April 15,2018 to May 15,2018. Regression analyses were carried out to study the relationship of wellness, health literacy and health promoting behavior with Industrial workers, data were analyzed t-test, ANOVA, Pearson Correlation Coefficient by SPSS win 21.0 program.

Findings: Among the participants in the study, 55% were in 40s and 56.3% were manufacturer worker. The mean score of Wellness was 2.86, Health literacy was 80.53, Health promoting behavior was 2.78. The ability to understand health information was 18 points in 3 areas and the average was 80.53 points when converted into 100points. The factors that have significant relationships with wellness were age, working hours, next health literacy were educational, manufacturer worker and subjective health status. Health promoting behavior factors were age, smoking, shift work, night work, working hours, subjective health status and subjective safety status. Factors affecting the health promoting behavior were support from wellness(β =.561, p<.001) and night work(β=.449, p=.002).The explanatory power of these variables was 40.9%.The major factor influencing health promoting behavior intention was wellness and night work.

Improvements/Applications: These results suggest that wellness improvement programs should be focused on developments to improve the quality of Health promoting behavior.

Keywords: *Wellness, Health literacy, Health promoting behavior, Industrial workers, Education*

Introduction

Health is an important source supply to economic and social well-being[1], decisive determinant factor of steady workforce participation, a lot of research shows that poor health often precedes early retirement[2,3]. The health promotion behavior is a high level of health care process in the process of changing personal habits or circumstances[4]. In particular, as many workers are taking a long time at the company, we need a way to induce diverse health promotion activities[5]. Therefore, many workers are under a lot of stress due to their various social roles and require care and need for medical services. Male workers are less aware of their own health than women workers because of the lack of practice of health management practices such as smoking cessation, stress management, and regular exercise[6]. Especially male workers are bad socio-economic group, associated with poor health and high levels of chronic disease[7]. Health promotion behavior refers to behavior actively responding to the environment in order to reach a high standard by lifestyle improvement, act to promote the level of well-being, self-achievement and self-realization[8,9]. Also, it is important to investigate factors that affect workers health management improvement, these factors are physical, mental and spiritual integrity are organically integrated into health and made in a way that is optimal called Wellness[10,11].Because workers

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wellness spend a lot of time at long-term task company, improvement in individual health and quality of life is improved, job satisfaction, reduction in absenteeism, reduction of enterprise productivity as we acquire it, worker wellness management is necessary[12]. In other words, many workers should be able to lead a better way of life and health promotion activities. It is also necessary to have the ability to acquire, think, and understand health related information in order to make informed decision making when using various health services, and this is called health literacy[13]. The acceptance of health information understanding ability plays a useful role in dialogue with medical personnel. As it was recognized by assets that can control health and social, environmental and health problems, it gained broad attention in the field of health promotion for individuals and society as a whole[14].

The purpose of this study was to investigate the relationship between health information understanding ability and health information comprehension ability, and to utilize it as basic data to promote more effective health promotion behavior through development of correct health information cognition enhancement.

Materials and Method

The purpose of this study is to identify the wellness, health literacy and health promoting behaviors of industrial workers and to clarify the relationship among these variables.

1. Identify the degree of wellness, health literacy, and health promotion behavior of Industrial Workers
2. Identify differences in wellness, health literacy, and health promoting behavior according to general characteristics of industrial Workers

Design: This research is descriptive and seeks to understand the recognition of and related causes of wellness, health literacy and health promoting behavior of various industrial workers.

Sample: The subjects of this study were various industrial workers in D, K, U city. The number of subjects was estimated using G * power 3.12 program. 95 and significance level .05, respectively. A total of 142 subjects were studied considering the dropout rate.

Instruments

Wellness: The wellness consisted of 18 items that were revised of Worker Wellness Measurement Tool developed by Choi et. al.[15]. The subjects were Physical area, Emotional area, Social area, Cognitive area, Occupational area, and consisted of 5 points from 'not at all' to 'always'. The higher the score the higher the wellness. Cronbach's α = .91 in Choi et al. study and Cronbach's α = .92 in this study.

Health Literacy: Health literacy is the ability to acquire, process, and understand basic health information and services that individuals need to make the right health decisions in 2009, Health People 2010. In this study, Kang Su-jin[16] was measured by Korean Health Literacy Instrument (KHLI) to measure functional, mutual and evaluative health literacy for adults. Cronbach's alpha = .82, and Cronbach's alpha = .709 in the present study.

Health Promoting Behaviors: The health promoting behaviors consisted of 26 items that were revised and supplemented by 40 items of Health Promoting Life Style(HPLP) developed by Walker et. al.[17]. The subjects were positive self-image, self-realization, regular exercise, diet management, interpersonal support, stress management, and consisted of 4 points from 'not at all' to 'always'. The higher the score the higher the health promotion behavior. Cronbach's α = .84 in the minimum LA(2006) study and Cronbach's α = .881 in this study.

Data Collection

The data collection period was from April 15, 2018 to May 15, 2018 and explained the research background, purpose, and procedure at the time of data collection and voluntarily agreed, and explained that the questionnaire response can be discontinued at any time. Also, we explained that the records that can identify the subject are kept confidential and will be discarded after the end of the research. 153 of the total 160 were collected, and 142 of them were analyzed except for those who responded unfairly or were abandoned.

Data Analysis

The collected data were analyzed using SPSS 21.0 program. We analyzed the general characteristics of the subjects, wellness, health literacy and health promoting behaviors using descriptive statistics such as frequency, percentage, and mean standard deviation. The differences of the variables according to the general characteristics of the subjects were analyzed by t-test and ANOVA. Scheffe`s test was used for the post test. Regression analyses were carried out to study the relationship of wellness, health literacy and health promoting behavior.

Results and Discussion

Results of study concerning demographic characteristics of the samples, demonstrated that out of 142 participating in the study, 100% them were male. In total, 78.2% them married, 38.7% of the workers were between 40 to 49 years old. Furthermore, 43.7% of the workers were high school graduation, 64.8% were alcohol drinking and 56.3% were smoking. A total of 70.4% of the workers shift pattern working and 71.1% had night working. Also, 56.3% of the workers in manufacturer worker. Of all the workers, 45.1% of them worker 8 hours a day and 26.1% of the workers had been under total working experience more than 26 years. It was subjective health status that most of them 48.6% had experienced normal status and 59.2% of them had been subjective safety status. Furthermore, 31.7% of the workers are salary from both 40 million won and 49 million won, 94.0% of them had no health problem[Table 1].

In terms of the general characteristics of the subjects, the wellness differed from the age(F=3.154, p>.016), working hours(F=11.653, p>.001). Scheffe`s test results were more meaning for 8 hours working than 9-10 hours and 11hours or more. The health literacy varied according to education(F=9.080, p>.001), working setting(t=-2.627, p=.010), subjective health status(F=3.019, p=.020). And Health promoting behaviors showed differences in age(F=3.727, p=.007), smoking(t=0.394, p=.035),shift work(F=-2.448, p=.016), night work(t=-3.174, p=.002), subjective safety status(F=4.924, p=.009). Scheffe`s test results were more meaning for the higher self - conscious awareness, the more significant differences are seen with health promoting behaviors[Table1].

The wellness was 2.86 out of 5, health literacy was 80.53 out of 100, and health promoting behavior was 2.78 out of 4. Health promotion behaviors showed a statistically significant correlation with wellness(r= .595, p< .05), it did not correlate with health literacy[Table2].

Multiple regression indicated two predictors wellness and night work of health promoting behaviors in industrial workers[Table 3]. Health promoting behaviors showed that wellness(B = .441, S.E. = .054, t = 8.233, p < .001) and night work(B = .383, S.E. = .121, t = 3.170, p = .002) were significantly positively related. These variables explained 40.9% of the variance.

Table 1: Correlation between the Level Wellness, Health Literacy and Health Promoting Behavior (N = 142)

Characteristic	Categories	N(%)	Wellness		Health Literacy		Health Promoting Behavior	
			M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Marital status	Unmarried	31(21.8)	2.89 ± .333	.544 (.588)	.529 ± .180	-.967 (.335)	2.78 ± .232	-.100 (.921)
	Married	111(78.2)	2.85 ± .528		.551 ± .153		2.78 ± .421	
Age	20-29	13(9.2)	2.91 ± .264	3.154 (.016)	.525 ± .178	.193 (.942)	2.84 ± .146	3.727 (.007)
	30-39	24(16.9)	2.55 ± .351		.555 ± .169		2.57 ± .387	
	40-49	55(38.7)	2.92 ± .512		.551 ± .160		2.74 ± .411	
	50-59	44(31.0)	2.93 ± .555		.531 ± .153		2.91 ± .371	
	≧ 60	6(4.2)	2.98 ± .169		.564 ± .158		2.96 ± .296	
Education	High school	62(43.7)	2.85 ± .481	.447 (.641)	.480 ± .159	9.080 (.000) a, b,c<d	2.75 ± .339	.388 (.679)
	College	31(21.8)	2.80 ± .490		.544 ± .132		2.80 ± .438	
	≧ university	49(34.5)	2.91 ± .511		.624 ± .140		2.81 ± .414	
Alcohol drinking	Yes	92(64.8)	2.82 ± .447	-.413 (.680)	.552 ± .147	.796 (.428)	2.76 ± .352	-.966 (.336)
	None	50(35.2)	2.88 ± .569		.528 ± .179		2.83 ± .445	
Smoking	Yes	62(43.7)	2.80 ± .426	-1.358 (.177)	.546 ± .154	.156 (.876)	2.70 ± .358	.394 (.035)
	None	80(56.3)	2.91 ± .535		.542 ± .164		2.84 ± .400	
Shift work	Shifting	42(29.6)	2.75 ± .544	-1.648 (.104)	.526 ± .168	-.859 (.392)	2.66 ± .377	-2.448 (.016)
	No shift	100(70.4)	2.91 ± .462		.551 ± .155		2.83 ± .382	

Conted…

Night work	Yes	41(28.9)	2.80 ± .510	-1.012 (.313)	.532 ± .166	-.555 (.580)	2.63 ± .349	-3.174 (.002)
	None	101(71.1)	2.89 ± .484		.549 ± .157		2.85 ± .385	
Work setting	Manufacturer worker	80(56.3)	2.84 ± .549	-.650 (.517)	.514 ± .168	-2.627 (.010)	2.73 ± .411	-1.686 (.094)
	Office job	62(43.7)	2.89 ± .408		.582 ± .139		2.84 ± .347	
Working duration (year)	1-10	41(28.9)	2.83 ± .578	.301 (.877)	.544 ± .157	.403 (.807)	2.88 ± .455	1.241 (.296)
	11-15	20(14.1)	2.97 ± .493		.525 ± .202		2.84 ± .373	
	16-20	20(14.1)	2.85 ± .473		.577 ± .152		2.73 ± .328	
	21-25	24(16.9)	2.86 ± .380		.523 ± .134		2.74 ± .303	
	≧26	37(26.1)	2.84 ± .478		.549 ± .159		2.70 ± .384	
Working hours (hr/day)	≦ 8	64(45.1)	3.05 ± .484	11.653 (.000) a>b, c	.537 ± .162	1.468 (.234)	2.86 ± .372	3.005 (.053)
	9-10	37(26.1)	2.81 ± .435		.581 ± .168		2.76 ± .269	
	≧ 11	41(28.9)	2.61 ± .436		.521 ± .143		2.68 ± .472	
Salary (won)	≦ 3,000	47(33.1)	2.84 ± .486	1.528 (.210)	.540 ± .163	.093 (.964)	2.78 ± .391	.088 (.966)
	3,100-3,900	12(8.5)	2.70 ± .245		.560 ± .126		2.83 ± .297	
	4,000-4,900	45(31.7)	2.81 ± .511		.538 ± .170		2.77 ± .358	
	≧ 5,000	38(26.8)	2.99 ± .520		.551 ± .155		2.78 ± .448	
Subjective Health status	Very good	4(2.8)	3.16 ± .029	1.565 (.187)	.569 ± .027	3.019 (.020)	3.22 ± .257	3.960 (.005)
	Good	60(42.8)	2.92 ± .497		.500 ± .158		2.87 ± .273	
	Normal	69(48.6)	2.77 ± .485		.580 ± .160		2.68 ± .437	
	Bad	5(3.5)	2.95 ± .489		.633 ± .100		2.60 ± .310	
	Very bad	4(2.8)	3.17 ± .588		.444 ± .078		2.95 ± .557	
Health problem	Yes	48(33.8)	2.94 ± .461	1.365 (.174)	.531 ± .190	-.628 (.532)	2.86 ± .419	1.726 (.086)
	No	94(66.2)	2.82 ± .504		.550 ± .141		2.74 ± .366	
Subjective safety status	Very high	9(6.3)	3.03 ± .408	2.994 (.053)	.561 ± .093	.183 (.833)	3.16 ± .301	4.924 (.009) a>b,c
	high	84(59.2)	2.92 ± .440		.537 ± .168		1.77 ± .362	
	Normal	49(34.5)	2.73 ± .564		.552 ± .154		2.74 ± .412	
	Low	-	-		-		-	
	Very low	-	-		-		-	

Table 2: Difference of Level Wellness, Health Literacy and Health Promoting Behavior according to demographic characteristics (N = 142)

	Wellness r(p)	Health Literacy r(p)	Health promoting behavior r(p)
Wellness r(p)	1		
Health Literacy r(p)	-.025(.764)	1	
Health promoting behavior r(p)	.595**(p<.05)	-.094(.264)	1

Table 3: Predictors of industrial workers Health Promoting Behaviors

Various	B	SE	β	t	p
(Constant)	1.271	.273		4.665	.000
Wellness	.441	.054	.561	8.233	.000
Health Literacy	-.194	.163	-.080	-1.189	.237
Night work	.383	.121	.449	3.170	.002
R^2=.447 Adjusted R^2=.409 F=11.834, p<.00, Durbin-Watson= 1.78					
*p< .05, **p<.01					

Conclusion

Considering the findings of the present study, and regarding of health promoting behaviors, wellness in industrial workers which impact on health promoting behaviors and quality of life these them, makes health promoting behaviors more comfortable. That is, the more increase in the level of wellness, the more adoption of health promoting behaviors in industrial workers. Therefore, given the role of wellness life style in improving health behaviors in industrial workers, it is important that healthcare providers adopt measures to improve their industrial workers positive health behavior and motivate them.

Health promoting behaviors play a key role in wellness and can enhance an individual`s physical, social, and psychological satisfaction. Considering the findings of the present study, and regarding of health promoting behaviors, wellness in industrial workers which impact on health promoting behaviors and quality of life these them, makes health promoting behaviors more comfortable. That is, the more increase in the level of wellness, the more adoption of health promoting behaviors in industrial workers. Therefore, given the role of wellness life style in improving health behaviors in industrial workers, it is important that healthcare providers adopt measures to improve their industrial workers positive health behavior and motivate them. Health promoting behaviors play a key role in wellness and can enhance an individual`s physical, social, and psychological satisfaction.

Namely point is that it should be approve that industrial workers with a longstanding health promotion behavior condition may adapt objectives and tasks of their job to their condition. Suggests that it is necessary to revise and supplement the tools to assess the ability of wellness to comply with the current situation of medical institutions, and to study the difference in wellness, health literacy, and health promoting behavior according to the night working.

Since this study did not focus on interventions, future studies need to focus on the exploration of the types of nursing care and health services that may be most effective in promoting healthy behaviors in industrial workers. This study suggests that it is necessary to revise and supplement the tools to assess the ability of wellness to comply with the current situation of medical institutions, and to study the difference in wellness, health literacy, and health promoting behavior according to the night working. Since this study did not focus on interventions, future studies need to focus on the exploration of the types of nursing care and health services that may be most effective in promoting healthy behaviors in industrial workers.

Ethical Clearance: Not required

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The Relationship between the Subjective Health Status, e-Health Literacy, Health Literacy and Health Promoting Behavior in Under Graduate Nursing Students

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ABSTRACT

Background: Many people use the internet for health information, Nursing students should be well-acquainted with e- health information and resources to better provide information for their patients.

Method: Participants were 138 undergraduate nursing students in D, K, U city. Questionnaires were used to measure levels of health literacy, e-Health literacy, and health promoting behavior. The data were collected from April 2,2018 to May 2,2018. Data were analyzed using t-test, ANOVA, Pearson Correlation Coefficient by SPSS for Windows 21.0 program.

Findings: e-Health literacy and subjective health condition were high and ability to understand health information was in the middle. The degree of health promoting behavior was a little low. Participants' ability to understand health information came from the following: ability to understand inter active health information, understand critical health information, understand functional health information. E-Health information comprehension ability appeared in the order of use ability, solution ability, evaluation ability. The major factor influencing health promoting behavior intention was e-Health literacy.

Improvements: These results suggest that Health literacy, e-Health literacy interventions should focus on improving the quality of health promoting behavior.

Keywords: *Health literacy, e- Health literacy, Health promoting behavior, Subjective health status, Nursing students*

Introduction

College life is a period of change in behaviors that can lead to good lifestyles in life and to carry out health promotion activities. Health habits of this period have an important influence on lifelong health care activities [1]. According to the Korea Internet & Security Agency (KISA) in 2015, health information and health activities searched by college students ranked second in Internet search followed by information acquisition area (99.6%), week search was related to disease and injury information (61.9%), lifestyle And nutrition information (50.2%) [2].In the flood of many health information, the need to search, select, understand and evaluate the right health information is increasing, and this ability is called e-Health Literacy [3]. In addition, not only the Internet, but also the information obtained by visiting the medical institutions themselves, is diversified, and the ability to apply and utilize such information is called the Health Literacy [4]. Health literacy is an important issue for the public, health care providers should also learn to use the basic skills to develop and use the electronic sources in order to implement better standards of health services [5, 6]. The acceptance of health information understanding ability plays a useful role in dialogue with medical personnel [7, 8]. In particular, nursing college students, who are future nurses, firstly recognize that their right health information understanding ability and e-health information understanding ability are related to their own health promoting behavior, and they also connect with the subjects and effective health explanatory power. The purpose of this study was to investigate the relationship between health information understanding

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ability and e-health information comprehension ability, and to utilize it as basic data to promote more effective health promotion act as a preliminary medical person through development of correct health in formation cognition enhancement.

Materials and Method

The purpose of this study was to identify the health literacy, e-health literacy, and health promoting behaviors of nursing college students and to clarify the relationship between these variables.

1. Identify the degree of health literacy, e-health literacy, and health promoting behavior of nursing students.
2. Identify differences in health literacy, e-health literacy, and health promoting behavior according to general characteristics of nursing college students.

Design: This research is descriptive and seeks to understand the recognition of and factors influencing health literacy, e-health literacy, and health promoting behavior of nursing students.

Sample: Participants in this study included students attending Nursing College in D, K, U city. The number of subjects was estimated using G * power 3.12 program. 95 and significance level .05, respectively, the largest calculated sample size was 119 subjects. A total of 138 subjects were studied considering the dropout rate.

Instruments

Health Literacy: According to Healthy People 2010, health literacy is the ability to acquire, process, and understand basic health information and services that individuals need to make the health. In this study, Kang Su-jin[9] was measured by Korean Health Literacy Instrument (KHLI), which measures functional, mutual, and evaluative health literacy in adult populations. Reliability was assessed using Cronbach's alpha. KHLI had a Cronbach's alpha = .82, and Cronbach's alpha = .83 in the present study.

e-health Literacy: e-Health is the ability to find, understand and evaluate health information on the Internet and apply it to health decision making[3].In this study, e-Health was used to measure e-health literacy. Developed by Norman & Skinner(2006), e-Health is a scale that measure technology, knowledge, and perceived convenience using 8 items. We used modified tool by Lee et al[8], This scale consists of 5 responses, that range from 'not at all' to 'very highly'. The greater the score, the higher the ability to comprehend e-health information. Reliability of this scale was assessed using Cronbach's alpha (α = .88 and α = .93)

Health Promotion Behaviors: The health promoting behaviors consisted of 26 items (26 items) that were revised[10] and supplemented by 40 items of Health Promoting Life Style (HPLP) developed by Walker et al[11]. Item measure positive self-image, self-realization, exercise, diet management, interpersonal support, and stress management. Responses were on a likert scale and ranged from 4'not at all' to 'always'. The greater the score, the higher the health promotion behavior. Cronbach's α = .84 in choistudy[10], and Cronbach's α = .81 in this study

Data Collection

The data collection period was from April 02, 2014 to May 02, 2018. All participants provided informed consent prior to participation in this study. Out of 160 potential participants, the final sample consisted of 138 individuals. 143 of the total 160 were collected, and 138 of them were analyzed except for those who responded unfairly or were abandoned

Data Analysis

The collected data were analyzed using SPSS version 21.0. We analyzed the general characteristics of the subjects, the ability to understand health information, the ability to understand e - health information, and health promoting behaviors using descriptive statistics such as frequency, percentage, and mean standard deviation. The differences of the variables according to the general characteristics of the subjects were analyzed by t-test, ANOVA, Pearson correlation coefficient.

Results and Discussion

A total of 138 (114, 82.6% female and 24, 17.4% male) nursing students participated in this study. Mean age of the subjects was 21 years. 56% were fourth grade students and 55% lived with family. 87% drank alcohol and 5% smoked. 63% slept six to seven hours a day. 55% ate at home and 68% had irregular eating pattern. Overall, a majority of individuals reported themselves to be in "very good" or "good" health condition. Sociodemographic characteristics of are shown in[Table 1].

Table 1: Sociodemographic characteristics of study participants (N = 138)

Characteristic	Categories	N (%)
Gender	Female	114(82.6)
	Male	24(17.4)
Residence type	Living with family	76(55.1)
	Dormitory	23(16.7)
	Self-boarding	34(24.6)
	Etc	5(3.6)
Grade	2	60(43.5)
	4	78(56.5)
Alcohol drinking	Yes	87(63.0)
	No	51(37.0)
Smoking	Yes	5(3.6)
	No	133(96.4)
Sleep time/day (hours)	4-5	28(20.3)
	6-7	87(63.0)
	8≥	23(16.7)
Circumstance of eating	Eating with family	77(55.8)
	Eating in School	15(10.9)
	Eating delivery food	41(29.7)
	Etc	5(3.6)
Eating pattern	Regular	44(31.9)
	Irregular	94(68.1)
Exercise	Yes	74(53.6)
	No	64(46.4)
BMI	18.5<	17(12.3)
	18.5-22.9	99(71.7)
	23.0-24.9	13(9.4)
	25.0>	9(6.5)
Subjective health status	Excellent	5(3.6)
	Very good	55(33.9)
	Good	47(34.1)
	Fair	29(21.0)
	Poor	2(1.4)

The Participants' health literacy was 13.4 out of 18: among its sub-areas, ability to understanding of interactive health information scored the highest with 3.34 ± 4.29and functional health information scored the lowest with 2.68 ± 1.39.

e-Health literacy was 3.35 out of 5, and Health promoting behavior was 2.79 out of 4. Among the e - Health literacy sub-areas, ability to use scored the highest with 3.91 ± 0.59andability to evaluation scored the lowest with 3.67 ± 0.72.

The mean scores for subscales of the Health literacy, e-Health literacy, Health promoting behavior are shown in [Table 2].

Table 2: Degree of the Health literacy, e-Health literacy and Health promoting behavior (N = 138)

	Subscales	M ± SD	Range
Health literacy	Ability to Understand Functional health information.	2.68 ± 1.39	2~3
	Ability to Understand Interactive health information	3.34 ± 4.29	1~4
	Ability to understand Critical health information	2.74 ± 2.69	1~3
e-Health literacy	Ability to use	3.91 ± 0.59	2~5
	Ability to evaluation	3.67 ± 0.72	2~5
	Ability to solution	3.76 ± 0.78	1~5
Health promoting behavior	Health promoting behavior	2.79 ± 0.32	2~4

There was no significant correlation between Health literacy and e-Health literacy (Pearson correlation coefficient, r=.01, p=.92) and Health promoting behavior (Spearman correlation coefficient, r= -.13, p=.12).

There was a significant difference in terms of total e-Health literacy scores between Health promoting behavior (r=.41, p<0.001) [Table 3].

Table 3: Correlation between the Health literacy, e-Health literacy and Health promoting behavior (N = 138)

	Health Literacy r(p)	e-Health Literacy r(p)	Health promoting behavior r(p)
Health Literacy	1		
e-Health Literacy	.01 (.92)	1	
Health promoting behavior	-.13 (.12)	.41** (.00)	1

*p<.01, **p<.001

In terms of the general characteristics of the subjects, Health literacy differed from the circumstance

of eating(F=2.812, p=.042). e-Health literacy varied based on gender(F=-2.468, p=.015), smoking(F=3.016, p=.003), and circumstance of eating(F=1.464, p=.007), and exercise (F=-1.226, p=.022). Additionally, health promotion behaviors were different based on circumstance of eating(F=4.130, p=.008), eating pattern(F=4.111, <0.001), exercise, (F=-3.297, p=.001) and subjective health status(F=7.904, <0.001)[Table 4].

Table 4: Correlation between the Level Health Literacy, e-Health Literacy and Health Promoting Behavior (N = 138)

Characteristic	Categories	Health Literacy		e-Health Literacy		Health Promoting Behavior	
		M ± SD	t/F (p)	M ± SD	t/F (p)	M ± SD	t/F (p)
Gender	Female	0.74 ± 0.15	-.693 (.490)	3.78 ± 0.58	-2.468 (.015)	2.77 ± 0.30	-1.567 (.119)
	Male	0.77 ± 0.18		4.10 ± 0.56		2.88 ± 0.41	
Residence type	Living with family	0.72 ± 0.17	1.374 (.253)	3.72 ± 0.62	2.447 (.057)	2.81 ± 0.33	1.149 (.332)
	Dormitory	0.79 ± 0.14		3.95 ± 0.44		2.85 ± 0.37	
	Self-boarding	0.76 ± 0.12		3.94 ± 0.53		2.71 ± 0.25	
	Etc	0.77 ± 0.10		4.25 ± 0.72		2.70 ± 0.33	
Grade	2	0.72 ± 0.15	-1.480 (.141)	3.91 ± 0.62	1.375 (.171)	2.77 ± 0.36	-869 (.386)
	4	0.76 ± 0.16		3.77 ± 0.56		2.82 ± 0.29	
Alcohol drinking	Yes	0.75 ± 0.16	0.513 (.609)	3.88 ± 0.61	1.300 (.196)	2.82 ± 0.33	1.234 (.219)
	No	0.74 ± 0.15		3.75 ± 0.54		2.75 ± 0.30	
Smoking	Yes [a]	0.87 ± 0.12	1.813 (.072)	4.63 ± 0.54	3.016 (.003)	2.88 ± 0.59	0.635 (.527)
	No [b]	0.74 ± 0.16		3.80 ± 0.57		2.79 ± 0.31	
Sleep time/day (hours)	4-5	0.77 ± 0.13	0.406 (.667)	3.64 ± 0.70	2.170 (.118)	2.81 ± 0.37	1.067 (.347)
	6-7	0.74 ± 0.15		3.90 ± 0.53		2.81 ± 0.31	
	8≥	0.73 ± 0.20		3.79 ± 0.63		2.70 ± 0.29	
Circumstance of eating	Eating at home [a]	0.73 ± 0.16	2.812 (.042) b>c>a>d	3.71 ± 0.63	1.464 (.007) b> d >c> a	2.83 ± 0.29	4.130 (.008) b> d >a> c
	Eating in School [b]	0.84 ± 0.09		4.05 ± 0.52		2.97 ± 0.37	
	Eating delivery food [c]	0.75 ± 0.16		3.75 ± 0.53		2.66 ± 0.26	
	Etc [d]	0.74 ± 0.21		4.20 ± 0.45		2.84 ± 0.65	
Eating pattern	Regular	0.72 ± 0.20	-.871 (.387)	3.83 ± 0.56	-.074 (.941)	2.95 ± 0.31	4.111 (.000)
	Irregular	0.75 ± 0.13		3.84 ± 0.60		2.72 ± 0.30	
Exercise	Yes	0.75 ± 0.17	-.234 (.816)	3.89 ± 0.55	-1.226 (.022)	2.87 ± 0.33	-3.297 (.001)
	No	0.74 ± 0.14		3.77 ± 0.62		2.69 ± 0.28	
BMI	18.5<	0.67 ± 0.20	1.586 (.196)	3.85 ± 0.53	0.411 (.745)	2.78 ± 0.22	.646 (.587)
	18.5-22.9	0.75 ± 0.15		3.85 ± 0.59		2.80 ± 0.32	
	23.0-24.9	0.78 ± 0.12		3.86 ± 0.73		2.79 ± 0.42	
	25.0>	0.80 ± 0.13		3.62 ± 0.46		2.65 ± 0.32	
Subjective health status	Very healthy [a]	0.75 ± 0.18	0.436 (.782)	3.68 ± 0.68	1.209 (.310)	3.19 ± 0.79	7.904 (.000) b>c>a>d>e
	Good [b]	0.74 ± 0.16		3.42 ± 0.46		2.90 ± 0.27	
	Moderate [c]	0.73 ± 0.16		3.31 ± 0.56		2.69 ± 0.27	
	Not good [d]	0.77 ± 0.14		3.24 ± 0.48		2.69 ± 0.33	
	Illness [e]	0.83 ± 0.15		3.19 ± 0.79		2.83 ± 0.29	

Conclusion

The results of this study provide evidence that the acquisition of health information by nursing college students, who are future nursing educators, increases their e-health literacy. e-Health literacy is correlated with health promoting behaviors, and nursing college students as future health leaders need to understand health information acquisition in various ways and to have critical thinking ability about correct health knowledge. In addition, it is important that the education method that can convey the method and understanding ability of health information through various education methods is important, and this study has significance as the basic data of practical nursing education program. This study suggests that it is necessary to revise and supplement the tools to assess the ability of health information to comply with the current situation of medical institutions, and to study the difference in Health literacy, e-Health literacy, and health promoting behavior according to the circumstance of eating.

It is found that the acquisition of health information of nursing college students who are future nursing educators mainly occurs through e-health literacy and they are more comfortable with it. Therefore, it is necessary for nursing students as future health leaders to have an understanding of health information acquisition in various channels and critical thinking ability about correct health knowledge. In addition, it seems that education methods that can convey the method and understanding ability of health information through various education methods are important. It suggests the necessity of applying education and program to obtain health information by the right internet search to nursing students in the future.

Ethical Clearance: Not required

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Big Data Analysis: Medical Accident

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ABSTRACT

Background/Objectives: Medical accidents have been happening in major large hospitals and real-time search queries for portal sites are increasing. We purpose to provide basic data on medical dispute resolution and medical accident prevention.

Method/Statistical Analysis: We based data collected through educational and academic information sources(RISS) and *aver search as big data, and analyzed the keywords and the network analyzed by the 'Medical accident' keyword. The frequency, ranking, and connection of the keywords were analyzed through the process of processing the collected unstructured text into the data suitable for research and analysis.

Findings: As a result, in case of the academic research related to the medical accidents, the study on the medical dispute is most active. In the analysis of the network, the medical accidents lead to the medical disputes and are mostly resolved by law in a manner that judge criminal responsibility and other responsibilities(punishment and compensation).Analysis of search words from news, blogs and Internet cafes, and the most frequently mentioned keyword related to medical accidents was criminal responsibility. In the analysis of the network it will be as follows: the handling of medical accidents involving criminal liability and other liabilities shall result in punitive damages resulting from legal proceedings or monetary damages resulting from civil agreements.

Improvements/Applications: We suggest that the human, institutional, and physical environment should be improved to avoid medical accidents, conflicts and litigation.

Keywords: *Medical accident, Big data, Medical error, medical dispute, prevention*

Introduction

According to the Korea Medical Dispute Mediation & Arbitration Agency (2018), a total of 36,099 medical dispute counseling and 1,398 mediation applications were received in 2013. And now the figure is about 57,349, which is about double. As can be seen from these results, the aspect of conflict on medical accidents is getting serious[1].

'Medical accident' means a case of 'damage caused to a person's life, body and property due to a medical practice', and a medical accident in the narrow sense means only a result that occurs in the course of medical practice. On the other hand, the medical accidents in a broad sense include accidents that occur in the course of patient management or facility management of hospital[1]. Medical accidents involving patient safety during the provision of health care services are occurring much more often than are generally perceived, and in fact such accidents are reported to be preventable[2,3]. In the United States, which boasts the world's best medical technology and services, there are at least 4,300 similar cases[3]. There is no official statistical data on the status of medical accidents in Korea. However, due to the improvement of economic level and the realization of health guarantee for the whole nation, the utilization rate of medical services has increased and medical services have diversified and the number of claims for damages caused by medical accidents has also been increasing steadily[4].

Recently, various efforts and basic researches have been actively conducted to prevent medical accidents

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and to provide a safe medical environment to patients, especially in developed countries. In addition, the increase in the number of medical disputes is considered to be a major social phenomenon, which is caused by the complexity of other social background factors rather than merely increasing medical accidents[5][6]. Unlike in the past, where the person involved in the accident asked for responsibility and punished accordingly in the event of a medical accident, the approach that focuses on the patient safety is focusing on finding out the problems of the medical delivery system itself that allows the occurrence of repeated accidents and preventing medical errors from occurring in advance by defining the cause of the medical error as an incomplete systematic problem[2][7].

The general procedure for dealing with a medical accident is to judge the responsibility of a hospital or a medical staff involved in the medical accident, and to provide compensation and relief to the victim according to the relevant law[8][9][10]. However, it is more important to prevent the occurrence of medical accidents than to compensate the victims according to the laws and precedents, taking into account the causes and responsibilities of medical accidents, which are recognized as the most important point in medical accidents. Nevertheless, most studies are concentrated only on the corresponding procedures and damage compensation on the assumption of occurrence of the medical accident rather than focusing on the prevention of medical accidents. The purpose of this study is to provide basic data for the prevention of medical accidents by understanding the perception of medical professionals and the general public about the medical field in order to prevent the occurrence of the medical accidents.

Materials and Method

Data Investigate: The study was intended to collect a wide range of data from various perspectives in order to understand the perception of experts and the general public about medical accidents. The big data of the database used by experts and the general public was studied. In order to investigate the perception of experts on medical accidents, related academic research data were collected from the homepage of the Korea Education and Research Information Service (KERIS) by inserting the keyword of the medical accident. Academic information was collected from books, theses, journals, and other academic materials from the Research information service system(RISS) which is used by the majority of researchers. Secondly, I collected blogs, cafes, web documents, and news materials from the portal site "*AVER" using the key word of "medical accident" to figure out the public awareness and understanding on the medical accident. Finally, I gathered questions and answers about medical accident shared in 'Jisik-In' to understand the social knowledge of medical accident, that is, the sharing of actual knowledge information[Table 1].

Table 1: Result of Data Investigate

	Thesis and Article	Internet café, Blog, web documentary, Jisik-In	News
Period	2018.05.01~05.15.	2018.05.01~05.30.	2018.05.15~05.30.
Type	Title, Author, Abstract, Keyword, Published date, Publisher	Title, URL, Contents, Writer, Published date, Publisher etc.	Title, Contents, Writer, Published date, Publisher
Total	298 out of 7,335 (104 books, 33 Th esis, 161 Article)	8,332 out of 262,024 (115 café, 43 Blog, 135 Web documenta ry, 7,989 Jisik-In(Q: 3,395, A: 4,594)	188 out of 132,268

Data Analysis

The frequency, ranking, and connection of the keywords were analyzed through the process of processing the collected unstructured text into the data suitable for research and analysis. First of all, a word frequency analysis table was presented through the keyword analysis and visualization analysis was performed on the data. Second, the relationship between major keywords was analyzed through the keyword network analysis.

Results and Discussion

The number of analysis data related to Research information service system (RISS) is shown in [Figure 1].

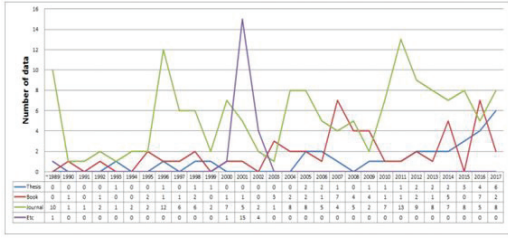


Figure 1: Research information service system (RISS)

The academic research on the medical accident that was searched from the research information service system (RISS) was conducted in 1978, and the academic research was an important research topic for the researchers. The special issue was that the book publication has risen dramatically in 2007 and 2016. The interest in medical accidents seems to have increased since the medical law was revised in 2007. And the reason for the increase in academic research in 2011 can be interpreted as the fact that the medical dispute law eventually passed the National Assembly in 23 years. The beginning is related to the dramatic increase in demand for medical care in 1989 by expanding medical insurance coverage for all citizens. In December 1995, a blood transfusion mistake occurred in Seoul National University Hospital due to an unconfirmed blood type, and dozens of medical mistakes and medical accidents were found in the prosecution investigation. A total of 22 people, including doctors and nurses, were placed in the case. As a result of such an incident, it is interpreted that a lot of academic research related to the case conducted in 1996. And, reflecting this fact, the court published the law reports on medical accident in 2001. In 2016 and 2017, as the medical accidents related to celebrities were widely reported through the media, not only the interest of the general public, but also the interest of the researchers has greatly increased.

Academic Research Analysis

Analysis on the Frequency of Keywords (Medical Accidents): In academic research, the most frequently mentioned keyword associated with 'medical accidents' was 'medical dispute', which appeared 46 times in total. The next most frequently occurring words were 'relief', which appeared 32 times in total. In addition, words such as disputes, medical care, law, dedication, research, compensation, responsibility, methods and procedures for this have appeared frequently. The [Table 2] shows the frequency of major words among the words related to the 'medical accidents'

Table 2: Frequency of Major Words among the Words Related to the Medical Accidents

Ranking	Word	Frequency	Ranking	Word	Frequency	Ranking	Word	Frequency
1	Medical accidents	270	11	Method	15	21	Type	12
2	Medical dispute	46	12	Compensation	15	22	Investigation	12
3	Relief	32	13	Accountability	15	23	Judicial precedent	12
4	Criminal responsibility	25	14	Anesthesia accident	14	24	Awareness	11
5	dispute	23	15	Prevention	14	25	Institution	11
6	Medical	23	16	Dentist	13	26	Anesthesia	10
7	Law	22	17	Occurrence	13	27	Insurance	8
8	Adjustment	22	18	Case	13	28	Irresistible force	8
9	Research	21	19	Patient	13	29	Litigation	8
10	Analysis	20	20	Countermeasure	12	30	Proceeding	8

The [Figure 2] describes the results of the keyword analysis which are visualized in the order of frequently shown words in order to identify the weight of the words mentioned with the medical accidents. According to the above findings, in case of the academic research related to the medical accidents, the study on the medical dispute is most active. In addition, it can be interpreted that there are a lot of studies on the compensation and counter measures for damages such as laws and counseling system for damage relief and mediation.

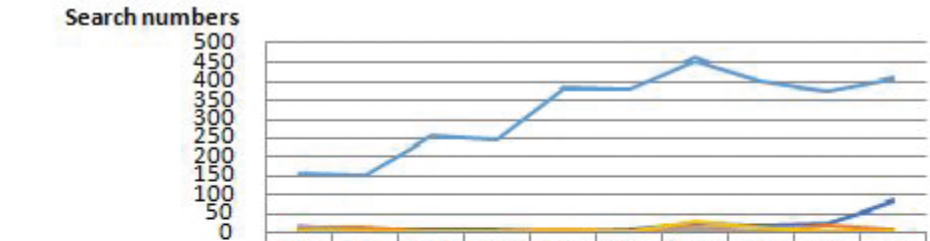
Figure 2: Keywords Visualization of Medical Accidents in Academic Research (Word cloud)

Network Analysis (Medical Accidents): Understanding the context in which the word 'medical accidents' is used in academic research can increase the understanding of researchers' interest and awareness of the medical accidents. For this purpose, the network analysis was conducted to analyze the aspect of the connectivity of the words through the relationship between 'medical accidents'' and other key words. The words that are intensively connected with the word 'medical accident' are criminal, civil, liability, appraisal, counter-measure, negligence, loss and damages. The 'medical dispute' is intensively linked to cause, issue, type, case, judicial precedent, law, counter-measure, and so on. The word 'damages' is intensively linked with words, 'medical accidents' and 'medical dispute'. The medical accidents generally call civil and criminal liability for the negligence. And the medical dispute that judges the subject of such liability can be interpreted as being divided into types based on cause, issue, type and law.

The 'medical accidents' lead to the 'medical disputes' and are mostly resolved by law in a manner that judge criminal responsibility and other responsibilities. And the punishment and compensation for the assigned liability shall be linked to legal punishment or damages. However, it has been difficult to find intensive connection to prevention, mediation, and counseling, which are the most important factors for medical accidents and medical disputes. In other words, there is a lack of recognition and research on the most basic factors such as preventive and post mediation procedures of medical accidents and medical disputes. It seems that more efforts are needed to identify and prevent the cause of medical accidents.

Analysis of Search Words from News, Blogs and Internet Cafes.

Status of the Search Words: The number of analysis data related to the search word is shown in [figure 3]. 'Jisik-In' is a knowledge sharing service among internet users by using collective intelligence in *AVER, and it can be regarded as a kind of knowledge information communication field in which any one can provide answers to the general questions and receive compensation after providing answers.



	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
News	5	6	7	7	2	8	24	21	23	85
Web document	8	8	2	2	4	2	10	0	14	4
Web Community	16	0	0	0	0	0	3	0	0	0
Blog	0	0	0	0	1	0	26	12	1	1
Jisikin Q	153	150	257	248	389	383	463	401	374	412

Figure 3: Number of Analysis Data Related to the Search Word

The total number of data of the last 10 years collected after inserting the word 'medical accidents' as a key word was 1,640,012 and a total of 3532 cases were finally analyzed among them. What is unusual is that search volumes have increased dramatically in 2010, 2012, and 2014. Those years are also the year when major medical accidents involving celebrities or medical care and health occurred. The explosive growth of news releases in 2016 and 2017 reflects public interest in medical accidents and celebrity's death due to medical accidents, and there was a lot of news coverage related to medical accidents at that time. The reason why the amount of search in 'Jisik-In' is more than the search volume of web documents, cafes and blogs is that the initial consultation about the medical accidents is mainly done in the Internet search site and there is a high level of public interest in medical accidents as well.

Keyword Frequency Analysis (Medical Accidents): The most frequently mentioned keyword related to 'medical

accidents' was 'criminal responsibility', which appeared 248 times and was about 8 times higher than 32 times of medical accidents. [Table 3] shows the frequency of major words among the words related to 'medical accidents'.

Table 3: Frequency of Major Words among the Words Related to the Medical Accidents

Ranking	Word	Frequency	Ranking	Word	Frequency	Ranking	Word	Frequency
1	Criminal responsibility	248	11	Dispute	7	21	Anesthesia	2
2	Medical accidents	32	12	Judgment	6	22	Criminal	2
3	Law	26	13	Awareness	5	23	Civil case	2
4	Medical dispute	15	14	Operation	4	24	Comparison	2
5	Adjustment	12	15	Status	4	25	Compensation	2
6	Countermeasure	11	16	Type	4	26	Dental accident	2
7	Civil case accountability	10	17	Case	3	27	Dentist	2
8	Prevention	9	18	Cause	3	28	Forensics	2
9	Accountability	8	19	Medical	3	29	Improving	2
10	Relief	8	20	Anesthesia accident	2	30	Institution	2

In order to understand the weight of the words mentioned with the medical accidents, the results of the keyword analysis are presented in the order of frequency, as shown in <Figure 4>.

Figure 4: Keywords Visualization of Medical Accidents in *AVER

Network Analysis (Medical Accidents): Understanding the context in which the word 'medical accidents' is used in the search word material can increase the understanding of the researcher's interest and awareness of medical accidents. To that end, I conducted a network analysis to analyze the connection of words through the relationship between 'medical acids' and other major words. If these results are summarized in a sentence, it will be as follows: the 'handling of medical accidents involving criminal liability and other liabilities shall result in punitive damages resulting from legal proceedings or monetary damages resulting from civil agreements' This is the status of medical accidents we have seen through the search word data and the corresponding responses. Given the reality of socially exposed knowledge and the information about medical accidents, it is very worrisome that there is a lack of information related to efforts to identify the causes of medical accidents and to prevent them.

According to the results of analyzing academic journals and search words regarding the medical accidents; first of all, in academic research, disputes caused by medical accidents were the subject of greatest interest. The words that are mainly connected with medical dispute are judicial precedent analysis, indemnification, damages, civil and criminal lawsuits and procedures. It can be interpreted that experts have a high interest in the types and procedures of counter-

measures to disputes caused by the medical accidents. In addition, there was a connection with words such as prevention, mediation and prevention that were difficult to find in the search word data. This can be interpreted as the experts are aware of the necessity of the prevention of medical accidents and arbitration strategy necessary in case of disputes. It also suggests that the interest and understanding of experts and general public about medical accidents should be integrated. On the other hand, when looking at the search word results, the words such as civil and criminal liability, law, dispute, judicial precedent, responsibility, indemnification, law and so on are intensively linked to the word medical accidents. It can be seen that there are active discussions on civil and criminal proceedings and accusations against medical accidents, and damages compensation. Looking at the appearance of emotional words unique to the search word, words such as 'resentment' and 'absurd' frequently appear. These words express the feeling of victims in a compressed way. The victims of medical accidents have to be absolutely subject to the authority of the doctor as a passive being within the medical service system. A victim undergoing medical accidents will only be baffled and perplexed by a series of circumstances that have occurred regardless of his will.

In the search word analysis, a counter-measure for medical accidents is represented by three stages of procedures as follows. The first step is to ask questions about whether the victim is an accident, and then the attorney, who is the stakeholder involved in the accident, generally defines the accident as medical accidents. Then, the final step, the response procedure, will lead to litigation and legal procedures by means of damages and compensation. In other words, information pollution which is the same as the environment is serious, and victims suffering from medical accidents are over-exposed to the knowledge and information on counter-measure procedures related to the medical accidents rather than arbitration or mediation procedures. It means that the current information environment can cause repeated wasteful vicious circle of litigation.

Out of the total number of counseling cases on medical devices, the number of cases involving plastic surgery was the sixth in the raking, but search word showed a high frequency and connectivity. Considering that the word 'surgical' and 'surgical procedure' were the most commonly linked words, the number of counsels regarding surgical procedures and surgery related to medical accidents and medical disputes caused by the plastic surgery is different from the search word interest have. In the case of medical accidents and disputes about plastic surgery, it seems that people take counter measures individually using knowledge and information on the Internet before they receive mediation or counsel. In other words, the vast majority of active exchange of knowledge and information figured out through the search word pattern can be regarded as related to the plastic surgery and since people are more likely to take counter measures to medical accidents based on the information and knowledge they receive on the web, regulations on knowledge information on the web regarding plastic sourcing are highly required. To summarize, experts have been primarily concerned with the current status of medical accidents, progression after the incident, and legal procedures related to them. The search word analysis results show that people tend to exchange knowledge and information about actual medical accidents and disputes, and plastic surgery.

Conclusion

The pre-accident phase is the best time to prevent medical accidents from occurring. However, looking at the key words in the academic materials, it is difficult to find words and networks related to prevention of medical accidents other than the world 'prevention'. While studies or research may be an important means of preventing accidents, most studies or research are about the judicial precedents, accident status, post-accident handling and so on related to the medical accidents. In the academic network analysis figure, it can be seen that words that show intensive connection with studies or research are words such as judicial precedents and laws, etc. On the other hand, 'prevention' is closely related to the word 'study' or 'research', but the strength or frequency of connections seems weak. There are some studies that are trying to approach the problem at the preventive point of view about the medical accidents. Authorities and experts are required to carry out more diverse and extensive researches and cause investigations to prevent medical accidents to improve and build physical and human systems for the prevention of the medical accidents and it is also necessary to ensure that a variety of practical measures and prevention education are connected.

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Applying the Havruta Learning Method to Nursing Education

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ABSTRACT

Background/Objectives: This study aims to nurture competitive nurses by applying the havruta learning method to nursing science classes and verifying the learning method's effects on the competencies of learners.

Method/Statistical Analysis: This study was conducted on 146 nursing students at Baekseok Culture University taking Community Nursing III and Nursing Management. Havruta-style paired discussion was applied during the 15-week curriculum and students submitted activity journals. This study was designed as a descriptive research study consisting of self-directed learning competency, discussion competency, individual and collective creativity and a satisfaction survey. Self-directed learning competency was measured through 45 questionnaire items across three criteria.

Findings: The results of this study show that among the 3 sub-criteria of self-directed learning, "learning practice" had the highest average score at 3.6 out of 5. The questionnaire item that scored the highest point(4.08) was "I complete tasks or work to see through to the end." The average score of discussion competency was 3.35 out of 5. Communication skill competency consisting of adaptation, argument, and non-verbal communication had the highest average score at 3.54, while prediction competency had the lowest average score at 3.18. The average total score of discussion competency was 35.38, which indicates "middle" discussion competency. In terms of individual creativity, the questionnaire item regarding "intrinsic task motivation" scored the highest at 3.91, and the average score of collective creativity was 3.56. Regarding satisfaction with the havruta learning method, the item "I would strongly recommend the havruta learning method to my juniors," scored the highest at 4.09.

Improvements/Applications: The new havruta learning method, focused on havruta-style paired discussion, needs to be applied to nursing classes of all school years with continuity so as to prove the effects of the learning method.

Keywords: *Havruta-style paired discussion, self-directed learning competency, discussion ability competency, individual creativity, collective creativity*

Introduction

Currently, universities are attempting to innovatively improve their curriculums by focusing on such topics as outcome-based education and a user-oriented education paradigm and responding to the fourth industrial revolution. In particular, the education accreditation system, including nursing science accreditation, is utilized as a major mechanism in the innovation of higher education as the system is reflected in the evaluation index of government-funded support projects, led by the Ministry of Education[1]. In the 21st century characterized by informatization, exponentially increasing knowledge, diversification and the need for lifelong education, learners are demanded to develop various competencies to effectively communicate using various communication media, such as the Internet and other information technologies, and to successfully adapt to fast-changing environments. Therefore, the education method in which all learners study in a uniform and passive manner is inappropriate. One of the most essential competencies learners need to develop is the ability to study in an autonomous and self-directed manner, while taking responsibility for their own learning procedures.

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Self-directed learning is based on the idea that education should help learners develop qualifications to respond more wisely and actively to the changing society[2]. It is time for learners to change from passive learners to active and self-directed learners due to fast changes in the environments of society and deteriorating internal and external economic structures. Nursing college students will face changes in the environments when they become nurses. Low birthrate is a large concern in Korea, the aging population makes the medical environment more complex and increases customer demand for medical services, and the medical market seeks to develop competent nursing talent as hospital organizations pursue innovation and achievement.

Learners need to develop the competency to respond to the needs of customers, while exposed to various customers and various practical business environments. As members of society have more diverse faiths and arguments in an increasingly complex structure of society, conflicts and problems occur due to differences in opinions among different groups or individuals, and some previous studies have found that discussion is an effective way to reach a common agreement[3,4]. Discussion is a way to derive a conclusion when people have different arguments about a given issue, and thus discussion enables people to explore rational methods while they understand and persuade opponents. Discussion competency includes not only communicative competency but also various other competencies seen in discussion activities. According to the analysis of a previous study on discussion competency and strategies, having a successful discussion requires expression competency, material analysis competency, argumentation competency, listening competency and adjustment/negotiation competency, and these competencies are components of discussion competency. This study shows how havruta-style discussion improves such discussion competency[3].

College students will play major roles in the future of society and therefore, they need to develop the competency to solve problems through original ideas and creative thinking by creating new ideas and generating creative things, more than any other age groups. This means that universities need to prepare an educational environment for them to develop creative problem-solving abilities. It has been confirmed that creative classes and creative problem-solving classes are effective in improving the creativity and problem-solving abilities of college students[5].

Creativity is one of the goals in education to prepare students for the future, and it is stressed as a key competency that learners should develop. Nurses are also required to develop problem-solving abilities through creative thinking, and creativity is considered an important job competency for nurses.

The above-mentioned self-directed learning competency, discussion competency and individual and collective creativity are key competencies that should be developed through university education.

This study intends to nurture nurses by applying the havruta learning method—a learning method that strengthens interaction between learners through questions and discussions—to the nursing science classes Community Nursing and Nursing Management and verifying the effects of the learning method on self-directed learning competency, discussion competency and individual and collective creativity, all of which are qualities nurses are required to develop. The havruta learning method will encourage nursing students to actively participation in class, help them develop broad thinking and gain competence as nurses in the future

Materials and Method

The study was conducted on 146 students at Baekseok Culture University taking Community Nursing and Nursing Management in the second semester of the third year. This study used a one-group, post-test research design, with the dependent variables consisting of the havruta learning method's effects on self-directed learning competency, discussion competency and individual and collective creativity and the level of satisfaction with the learning method among students.

Research Tools

Self-Directed Learning Competency: In this study, self-directed learning competency was measured through three sub-criteria: planning of learning, learning practice and learning assessment. For measurement, this study used the self-directed learning competency index, developed by Lee Seok-Jae et al.[6]. Each questionnaire item was scored as either 5 (very often), 4 (often), 3 (usually), 2 (seldom) or 1 (very seldom) on a five-point Likert scale. In terms of Cronbach's alpha coefficient of reliability for these sub-criteria, the Cronbach's alpha coefficient averaged 0.87. Planning of learning was found to have a coefficient of 0.85; learning practice 0.87; and learning assessment 0.85.

Discussion Competency: The research tool used to measure discussion competency was developed by Park Se-hwan[7] and was later revised and complemented by Jeong Seong-hong[8]. "Communication skill competency" had four questionnaire items—two in adaptation, one in argument and one in non-verbal communication. "Critical thinking competency" had three items—one in problem definition competency, one in analysis competency and one in judgment competency. "Expectation competency" had two items, and "listening competency" had two items. Thus, "communication skill competency" had a total of 11 items. Each questionnaire item of discussion competency was scored as either 5(very much), 4(yes), 3(not sure), 2(no) or 1(hardly) on a five-point Likert scale, and the mean and standard deviation of each item were calculated. Individuals or groups with opposing views or opinions about a task have a discussion with knowledge that can affect others and that they put their knowledge forward in order to justify their beliefs, attitude, and values. Components of discussion competency include communication skill competency, critical thinking competency and listening competency. The highest possible total score of the discussion competency test was 55. Students with a total score of 30 or lower were categorized as the "low" discussion competency group; students with a score ranging from 31 to 40 as the "middle" discussion competency group; and students with a score of 41 or higher as the "high" discussion competency group.

Individual and Collective Creativity: Individual and collective creativity consisted of a total of 17 questionnaire items. Individual creativity consisted of three sub-criteria of expertise, creativity-related work and intrinsic task motivation, based on the componential theory of creativity suggested by Amabile[9]. Individual creativity was measured through a total of 9 items. To evaluate individual creativity, a self-report method was used regarding creative actions and achievements[10,11,12]. "Expertise" means knowledge, skills or talent in the field, and in this study, expertise was measured through two items: "I think I have considerable talent in what I currently do," and "I think I have a lot of specialized knowledge and experience in what I currently do."

"Creativity-related work" means cognitive abilities and personality traits in relation to creative thinking. It was measured through three items, including, "I think I am good at coming up with original and novel ideas," and, "I make new ideas by combining existing ideas."

"Intrinsic task motivation" means basic attitude toward tasks, and this was measured through four items, including, "I am motivated by curiosity," and, "I believe it is important for people to enjoy their work."

"Collective creativity" means a group's creative activities and its perception of the results. This was measured through eight items, including, "I think that my team (group) can solve problems considered difficult by other teams (groups) quite well", "My team (group) can present a new and effective solution when a problem occurs," and, "My team (group) derives many new ideas that have not been tried before."

Each item was scored as either 5(very much), 4(yes), 3(not sure), (no) or 1(hardly) on a five-point Likert scale.

Satisfaction with the Havruta Learning Method: The content of five items, represented on a five-point Likert scale, were checked to examine students' satisfaction with the havruta learning method.

Results and Discussion

The results of the analysis on self-directed learning competency show that among the sub-criteria, the "learning practice" area scored the highest average at 3.66 out of 5. Among the sub-factors, basic self-management competency scored the highest average at 3.79. The item with the highest score (4.08) was, "I complete tasks or work to see through to the end" [Table 1].

Table 1: Self-directed Learning Competency

Questionnaire item Sub-factor	Average	Competency factor	Average
Learning need Diagnosis	3.56	Planning for learning	3.56
Goal setting	3.58		
Examination of learning resources	3.54		
Basic self-management competency	3.79	Learning practice	3.66
Learning strategy selection	3.67		
Continuity of learning practice	3.51		
Effort attribution about results	3.55	Learning assessment	3.55
Self-introspection	3.54		

The results of the analysis on discussion competency show that the nursing students averaged 3.35 out of 5. Communication skill competency, consisting of adaptation, argument and non-verbal communication, scored the highest average at 3.54 among the sub-criteria. Prediction competency scored the lowest average at 3.18. The total average score was 35.38[Table 2].

Table 2: Discussion competency

Classification	Questionnaire Item Content	Discussion Competency	
		Average	Total
Communication skill competency	Adaptation, argument, non-verbal communication	3.54	14.15
Critical thinking competency	Problem definition competency, analysis competency, judgment competency	3.38	10.14
Prediction competency	Prediction competency	3.18	5.91
Listening competency	Listening competency	3.28	5.18
Total		3.35	35.38

In terms of individual creativity, the "intrinsic task motivation" area scored the highest average at 3.91. The average score of collective creativity was 3.56 [Table 3].

Table 3: Individual and collective creativity

Classification	Questionnaire item content	Average
	Expertise	3.41
Individual creativity	Creativity-related work	3.48
	Intrinsic task motivation	3.91
Collective creativity		3.56

The overall level of satisfaction with the havruta learning method is shown in Table 4. The item with the highest average score(4.09 out of 5) was, "I would strongly recommend the havruta learning method to my juniors. The level of satisfaction with individual and collective creativity was found to be relatively low [Table 4].

Table 4: Satisfaction with the havruta learning method

Classification	Questionnaire Item Content	Average
1	The hivruta learning method improved my discussion competency.	4.02
2	The hivruta learning method improved my self-directed learning competency.	4.01
3	The hivruta learning method improved my creativity.	3.92
4	The hivruta learning method improved my team's (group's) creativity.	3.95
5	I would strongly recommend the havruta learning method to my juniors.	4.09

Conclusion

Under the theme "new challenge for a better future", this teaching method research group verified the effects of the havruta learning method by applying it to nursing science classes attended by all students in the third year. It was found that there was an absolute need for various teaching methods in which individual learners are taken into account. The havruta learning method was applied to nursing science classes in the first semester to derive the concept relating to the learning method's effects. The derived concept was applied to nursing science classes in the second semester to verify the learning method's effects regarding more specific content. This way, this study derived positive results regarding the application of the havruta learning method. A few suggestions can be made based on the results and implications of this study.

First, this study applied the havruta learning method, focused on paired discussion, to nursing science classes and verified its effects although the research period was short. During the research period, nursing students explored materials necessary to solve realistic problems at a time when most classes in the Nursing Department are operated in a traditional lecture style, focused on theory and cases. As a result, statistically significant results were found in the areas of self-directed learning competency, discussion competency and individual and collective creativity, and students' level of satisfaction with the havruta learning method was high. However, further research needs to be conducted by applying the havruta learning method in all college years at the same time or with continuity during students' college years.

Second, it is considered somewhat inadequate to check statistically significant changes in self-directed learning competency, discussion competency and individual and collective creativity that appear in a short period of time. Although the students had higher scores in this study than in other studies conducted on college students, it seems somewhat inadequate to generalize the results of this study. Consequently, further research is required to continuously verify the effects by extending the research period when self-directed learning competency, discussion competency and individual and collective creativity are applied in classes for one year or longer.

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Conflict of Interest: Nil

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A Meta-Analysis of the Effects of Intervention on the Prevention of Medication Administration Errors in Nurses

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ABSTRACT

Background/Objectives: Medication errors are one of the most common medical incidents occurring in hospitals and are the major health events. This study aims to perform a meta-analysis of the effects of intervention on the avoidance errors in nurses and to provide basic data for evidence-based nursing practice.

Method/Statistical Analysis: CINAHL, PubMed, EMBASE, Ovid, the Cochrane Library and relevant articles published in January 1975 and in February 2018 were searched. Randomized controlled trial and non-randomized controlled trials were included. Risk of Bias and Risk of Bias Assessment tool for Non-randomized Studies were used to evaluate quality of the selected studies. The random effects model was used considering various characteristics of the selected studies to calculate average effect size.

Findings: A total of 3538 studies were retrieved from five electronic databases, thirty studies of which were included in this study: five were randomized controlled trials and eight were non-randomized controlled trials. Interventions were medical devices and education intervention. Medical devices intervention was useful to directly reduce nurse medication administration errors (OR=0.64, 95% CI: 0.45 to 0.93. p=.020), and simulation education was effective in improving nurse medication knowledge (SMD=1.06, 95% CI: 0.07 to 2.05, p=.036).

Improvements/Applications: The results of this study can be widely used as the bias for the selection of useful moderations to increase safety of patients at nursing sites.

Keywords: *Medication administration errors, Systematic review, Meta-analysis, Nurses, Medical devices, Simulation.*

Introduction

A medication error is a type of error that occurs most frequently among medical errors caused by medical personnel [1], and it is one of major adverse events. There are about 400,000 annual injuries related to medication [2], and it was reported that 6.7% of all inpatients are led to injury or death from medication errors [3]. In the United States, 1.5 million patients suffered from medication accidents every year, among which 7,000 patients were reported to die [4]. The European Union also reported that about 8~12% of patients experience a medical accident that includes an adverse drug event in hospitals [5], and the National Health Service of the United Kingdom spends 100~250 million pounds on medical accidents including medication errors [6]. In addition, it was reported that about 7% of inpatients experienced at least one adverse medical accident during their hospitalization period [7].

Medication is an important part of nursing service and one of the most dangerous parts of nursing practice. Therefore, medication is the most frequently performed task of nurses, which consumes about 40% of overall nursing activity time [8]. Safe administration of medicines needs to be preceded by proper prescription of doctors and accurate preparation of pharmacists, but nurses play the final role of administering medicines to patients. They are required to have accurate knowledge, administer medicines according to 5-RIGHT, monitor the effects and side effects, and educate patients about medicines. Krähebühl-Melcher [9] reported that 53% of medication

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errors occur during administration by nurses, more often compared to prescription and preparation of medicines. When a medication error occurs, patients experience body injury, life threat, extension of hospitalization period and tremendous increase of medical expenses due to a waste of resources [10]. Nurses lose job satisfaction, which results in lowered work productivity [11]. As a result, reduced work productivity of nurses has an adverse effect on quality of nursing service received by patients [12].

The causes of medication errors were largely divided into personal disposition and organizational environment. Such personal disposition and organizational factors were found to affect medication of nurses [13]. Also, it was reported that 76% of medication errors were preventable and 56% of them were caused by human errors [14]. Based on these studies that correlated human medication errors with human factors, it would be necessary to examine personal factors, organizational factors and environmental factors associated with nurses who perform medication and develop an intervention method that can identify interactions among different factors to prevent medication errors.

Much time and effort are needed to develop a medication error intervention method appropriate for nursing sites. However, to make improvement on medication errors that are constantly occurring, it is necessary to combine the effects found in previous studies and compare size of the effects of different interventions, examining information about an efficient intervention based on size of the effects according to variables. Accordingly, this study aims to determine study environment, variables, intervention effects and size of effects for the study of intervention methods to prevent medication errors through meta-analysis by presenting comprehensive, reliable and consistent results. Such empirical data will present the grounds for future studies on medication error prevention programs and interventions.

Method

Inclusion Criteria and Study Selection: This study selected data according to the PICO-SD (Participants, Intervention, Comparison, Outcomes, Study Design), a systematic literature reporting guideline proposed by the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) Group. Participants are nurses in hospital where they administer medication to the patients. Interventions are implemented in order to prevent the nurse's medication errors. The comparison group is not intervened for the prevention of medication errors. Outcomes are the research that shows the error rate and knowledge score of medication administration. The study design was limited to randomized controlled trial or non-randomized controlled clinical trial.

Data Search: In this study, we conducted an online search using an academic search database and a handwriting search through reference documents for the papers published until February 2018. Five databases were reviewed: CINAHL, PubMed, EMBASE, Ovid, the Cochrane Library. Major keywords were derived from subject that constitute the core question as medication/ drug; organization/administration, pharmaceutical preparations, error/incident/near miss/adverse event/ sentinel event; nurses.

Data Extraction: The data selection process was independently performed by two reviewers (HL and research assistant).The studies excluded from the outcomes as follow: non-experimental studies such as survey and qualitative research, studies that cannot figure out the effect of preventative intervention, studies performed in the outpatient setting, abstract and case study without its original text.

Assessing the Quality of the Selected Studies: Among the final selected studies, randomized controlled trials were evaluated using the RoB (The Cochrane's Risk of Bias) tool developed by Cochrane Bias Method Group, the non-randomized controlled trials were evaluated using the RoBANS (Risk of Bias Assessment tool for Non-randomized Studies) tool developed by National Evidence-based Healthcare Collaboration Agency. The risk of bias for each study, and for each criterion, was classified as being low, high or unclear.

Data Analysis

The general characteristics of the selected studies, such as research information, research methods, subjects, interventions, and research results, were analyzed and coded. Effect sizes and homogeneity tests of the study were calculated by the use of Comprehensive Meta-Analysis 3.0 Version. Random effect model was used in consideration of heterogeneity between studies, odd ratio and standardized mean difference were used to calculate the effect size [15].

Results and Discussion

Result

Data Selection: A total of 3538 studies were searched and 2368 of them were eliminated by duplication. 87 studies of the remaining 1170 were selected in compliance with the selection criteria by reviewing the title and abstract. 75 studies were excluded from the 85 studies because of the exclusion criteria. Thus, the final 13 studies were applied to the meta-analysis [Figure 1].

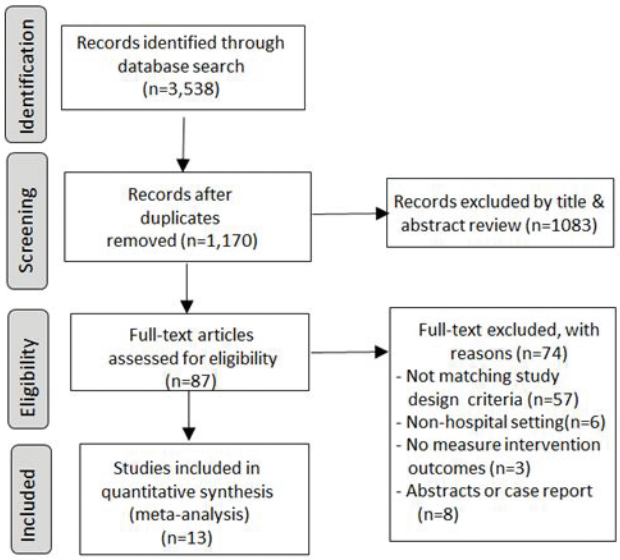

Figure 1: Flowchart of study selection

Characteristics of Studies: Five of reviewed 13 studies were classified as RCT studies and another eight as NRCT studies. The major features of the thirteen studies are summarized in Table 1. Looking at the yearly distribution of the studies, two intervention studies were conducted until 2000, seven from 2001 to 2010, and four after 2010[Table 1].

Assessing Risk of Bias in Included Studies: Characteristics of the bias risk assessment used in this study are as presented in Figures[2,3] for RCT and NRCT. Based on the risk of bias assessment on RCTs, 65% of studies showed low risk of bias in the domain of random sequence generation and allocation concealment. About 35% of studies were described as random sequence generation but were unclear because they did not describe the specific method. Sham intervention was carried out in 65% of studies for blinding of participants and personnel, and about 65% of studies showed low risk of bias in blinding of outcome assessment. All studies showed low bias in the domain of incomplete outcome data and selective reporting. Other biases were determined by intervention manual and expertise of intervention providers, and 59% of studies showed low risk of bias [Figure 2].

All studies showed low risk of bias NRCT selective of participants. Whereas about 57% of studies were confirmed with confounding variables, other 43% of studies were evaluated to be unclear. Although all studies used a standardized tool for measurement of intervention, only 29% of studies performed repeated measurement and risk of bias was high. Most studies were found to have low bias for detection bias, attrition bias and reporting bias [Figure 3].

Type of Intervention Implemented: Among the various interventions applied to prevent medication administration errors were divided into two types: medical device interventions and educational interventions. Medical device interventions are automated medications dispensing system [16,17], computerized prescribing [18], bar-code-assisted medication administration [19], Educational interventions are dedicated medication nurses [20] or pharmacist-led training [21], traditional instructor-led education [22], education using electronic devices [23-26], and simulation-based learning [27,28].

Table 1: General characteristics of included studies

No.	Author (year)	Country	Design	Setting		Intervention description	Main outcome measures
				Intervention group	Control group		
1.	Barker et al. (1984)	USA	NRCT	General surgery unit	General surgery unit	Automated bedside dispensing machine	Medication error rate
2.	Cavell and Hughes (1997)	UK	NRCT	General medical unit	General medical unit	Computerized prescribing system	Medication error rate
3.	Chapuis et al. (2010)	France	RCT	MICU	MICU	Automated bedside dispensing machine	Medication error rate

Conted…

4.	Deyoung et al. (2009)	USA	NRCT	MICU	MICU	Bar-code-assisted medication administration	Medication error rate
5.	Ford et al. (2010)	USA	NRCT	CCU	MICU	Simulation-based learning educational sessions	Medication error rate Medication knowledge
6.	Greengold et al. (2003)	USA	RCT	Medical unit, Surgical unit	Medical unit, Surgical unit	Dedicated nurses with medication safety education	Medication error rate
7.	Kim (2014)	Korea	NRCT	6 mixed ICU	4 mixed ICU	Smartphone application for medication confirmation	Medication knowledge, Medication safety activities, Certainty of knowledge
8.	Lu et al. (2013)	Taiwan	RCT	11 mixed ward	10 mixed ward	60-min Educational PowerPoint lecture	Medication knowledge
9.	Nguyen et al. (2014)	Vietnam	NRCT	ICU	PSU	Pharmacist-led training of nurses	Medication error rate
10.	Schneider et al. (2006)	USA	RCT	Medical unit Medical-surgical unit	Medical unit Medical-surgical unit	Interactive CD-ROM program on safe medication practice	Medication error rate
11.	Simonsen et al. (2014)	Norway	RCT	-	-	Interactive internet-based e-learning course	Medication knowledge, Certainty, Risk of error
12.	Sung et al. (2008)	Korea	NRCT	Medical unit Surgical unit	Medical unit Surgical unit	Blended learning program with e-learning	Medication knowledge, Self-efficacy, Medication administration ability
13.	Tsai et al. (2008)	Taiwan	NRCT	Large medical center	Large medical center	Virtual reality computer simulation	Medication knowledge

NRCT: non-randomized controlled trial, RCT: randomized controlled trial, MICU: medical intensive care unit, CCU: coronary critical care unit, PSU: post-surgery unit

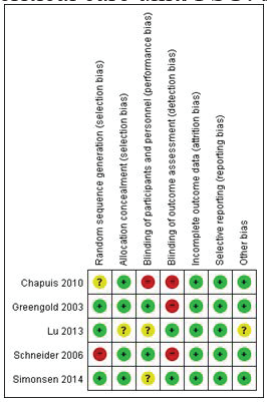

Figure 2: RoB summary

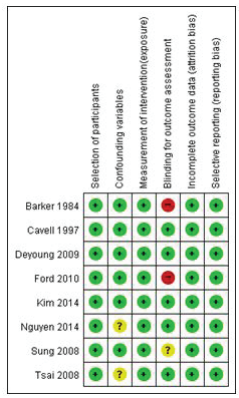

Figure 3: RoBANS summary

Effects of Interventions: As 13 studies that presented the effects of medication error interventions were found to be heterogeneous (p<.001; I^2:95%), subgroup analysis was performed to explore heterogeneity. Heterogeneity exploration was classified into outcome variables, namely the medication administration error rate and medication knowledge.

Effect size (odd ratio) of the medication error intervention carried out to reduce the medication administration error rate was 0.66 (95% CI: 0.47 to 0.93), but heterogeneity was high (p<.001, I^2:95%). To verify heterogeneity, effect size was confirmed separately for different intervention types including the medical device intervention and education intervention. Whereas the medical device intervention was effective (OR=0.64, 95% CI:0.45 to 0.93, p=.020), the education intervention was ineffective (OR=0.79, 95% CI: 0.31 to 2.02, p=.618) [Figure 4].

Effect size (standardized mean difference) of the medication error intervention carried out to improve medication knowledge was 1.57 (95% CI: 1.29 to 1.85), but heterogeneity was high (p<.001, I^2:95%). To verify heterogeneity, effect size was confirmed separately for different characteristics of the education intervention including e-learning, lecture and simulation. Simulation was effective (SMD=1.06, 95% CI: 0.07 to 2.05, p=.036) and e-learning was ineffective (SMD=0.33, 95% CI: -0.82 to 1.49, p=.573) [Figure 5].

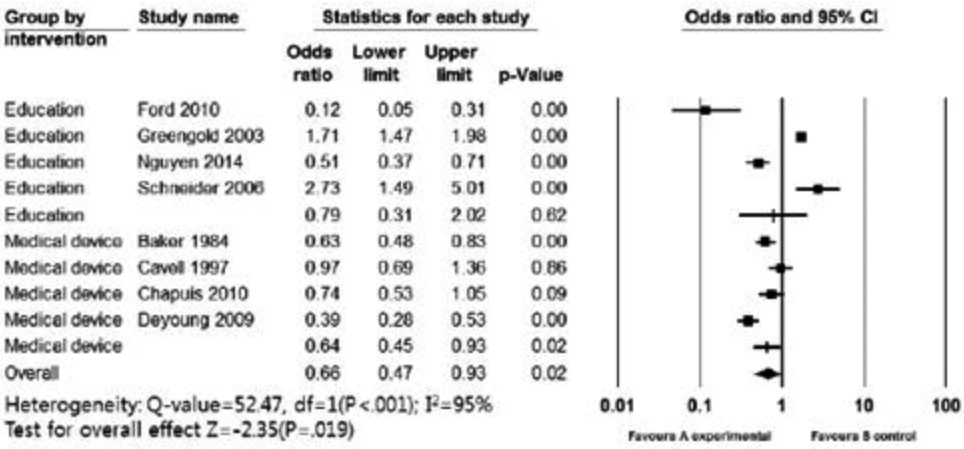

Figure 4: Effect of medication administration rate on intervention type of forest plot

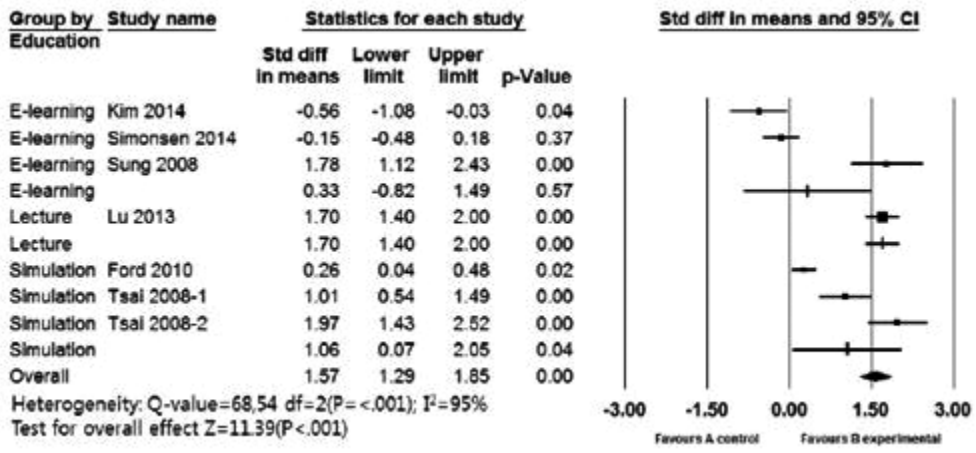

Figure 5: Effect of medication knowledge on education type of forest plot

As for the medication administration error rate, the medical device intervention (OR: 0.66, 95% CI= 0.47 to 0.93) was the only intervention type that showed statistically significant effect size. According to a preceding study, medication errors occur from the interaction of working environment and human beings [13]. The MedMARx medication error report program of the United States Phamacopeia reported that medication errors rarely occur from a single factor and are mostly related to compound systematic factors of the

organization [29]. When a computerized physician order entry and decision support system was implemented in neonatal wards to improve medication dosage errors, medication errors were reduced by 34% [30]. As such, introduction of medical devices or systems in the medication process is a useful intervention that can reduce medication errors.

Based on the analysis of medication knowledge, simulation (SMD: 1.06, 95% CI= 0.07 to 2.05) was the only education method that showed statistically significant effect size. Practical education based on simulation offers a learning environment that is more realistic and interactive than lecture education, and it is recommended as an education method appropriate for cultivating the decision-making ability, communication ability and work performance [31, 32]. In addition, it is evaluated as an effective education method that can foster practical and clinical knowledge in nurses that facilitate their adaptation to nursing practice through acquisition of core competencies in a safe educational environment that does not inflict harm on patients. Simulation develops integrative abilities to accommodate for different situations instead of simply acquiring knowledge and skills.

Strengths and Limitations: Considering strong heterogeneity among studies, the outcome variables were divided into the medication administration error rate calculated as an odd ratio and medication knowledge calculated as a standardized mean difference. This secured homogeneity among the outcome variables, setting the direction of intervention effects to agree with the direction of effect size.

Also, whereas previous studies simply reported the effects of medication error interventions, this study verified that medical device interventions are more useful than education interventions in reducing the medication error rate. Among education interventions, simulation was found to be more effective than e-learning and lecture. These results can be used as the grounds for the development of medication error prevention programs by verifying characteristics of interventions through meta-analysis.

On the other hand, this study has a limitation in determining whether the intervention effects between the intervention group and control group are purely based on interventions because there were more NRCT used for meta-analysis than RCT.

Conclusion

Medical device interventions were useful methods of directly reducing the medication administration error rate of nurses during the medication administration process. To improve medication knowledge of nurses, simulation was an effective education method of practicing situations similar to the reality. The results of this study can be widely applied to select useful interventions that can increase quality of patient safety in the nursing scene.

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Physical Activity Types Favored by Students with Developmental Disabilities: A Converging Study based on Q Methodology

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ABSTRACT

Background/Objectives: The purpose of this consumerism-theory-based study was to explore the types of physical activities favored by students with developmental disabilities using Q methodology.

Method/Statistical Analysis: This study used based on a small sample, of less than 30 participants. A total of 27 students with developmental disabilities who were aged between 13 and 18 years, attended special classes at regular schools, and lived in Y city participated in the study. The subjects were classified into 25 physical activity cards developed for this study, and their preference types were analyzed through QUANL pc program.

Findings: The results are as follows. First, students with developmental disabilities preferred four types of physical activities. Second, the characteristics of these four types were as follows: peer-centered (first type), family-centered (second type), music-centered (third type), and competition-centered (fourth type).

Improvements/Applications: Moreover, these results indicate that students with developmental disabilities are interested in various types of physical activities, and favor a variety of activities types depending on their background characteristics.

Keywords: *Q Methodology, A Converging Study based, Physical Activity, Developmental Disabilities, Types Favored*

Introduction

Increasing attention has been recently paid to self-determination as a measure of educational performance for people with disabilities in education practice. Self-determination is needed to express one's will and intentions by oneself without external intervention, and involves the ability to solve problems arising in daily life as an autonomous agent[1]. Self-determinationis valuable for people with disabilities to be able to make their own decisions, and can therefore increase their opportunities to pursue a satisfactory life[2]. In addition, many consumerism-based studies that put emphasis on humanistic values have been conducted in the field of adapted physical activity in Korea since 2000[3]. This phenomenon can be attributed to new policies based on a "tailor-made" welfare paradigm, which have come into focus due to social changes where growing attention is paid to human rights and self-realization. Such a social shift has changed the environment for people with disabilities to engage in physical activities, which has had an influence on the field of adapted physical activity in Korea. Students with disabilities, in particular, have difficulties in making reasonable decisions by themselves, as their self-determination ability is much lower compared to their non-disabled peers. Therefore, educational programs are often offered to children with disabilities who are deprived of their right to self-determination by parents or teachers who do not recognize their self-determination ability[4]. Furthermore, physical activity classes provided at schools focus excessively on education and rehabilitation, which makes students

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lose interest in the classes. This type of classes also prevents instructors from recognizing and understanding the diverse subjective viewpoints of theirstudents[5]. Kim, Kim, &Lee[1] advocated self-directed learning programs that can encourage more active participation of the students by catering to their preferences, and Park[6] emphasized that self-directed physical activity programs can achieve their educational goals while allowing children to have fun. In this regard, this study employed Q methodology, a research method to investigate individuals' subjectivity, with the aim to provide opportunities for students with disabilities, whose self-determination ability is lower than that of non-disabled students, to make their own choices and decisions. Q methodology is a process in which respondents compare and rank stimuli by themselves to establish a model and express their subjectivity[5]. That is, in Q methodology studies, hypotheses are set up from the perspective of the participants rather than the researchers. This method is used widely to explore a variety of subjectivities in the fields of psychology, sociology, education, and health science[5]. In the field of adapted physical education, Q methodology was used in an exploratory research on types of daily physical activities preferred by people with intellectual disabilities[7] and an exploratory subjectivity study on physical activities among children with developmental disabilities[3]. These studies offer meaningful research material for assessing the academic value of Q-methodology-based convergence research in the field of adapted physical education. This kind of research is significant in that it highlights the academic importance of the self-determination research that is being emphasized in current education practice, it provides a theoretical foundation for future research, and it indicates the need to conduct further studies on relevant programs. The purpose of this consumerism-theory-based study was to explore the types of physical activities favored by students with developmental disabilities using Q methodology. Research questions were as follows. Firstly, what are the types of physical activities preferred by students with developmental disabilities? Secondly, what are the characteristics of each type of physical activity preferred by the students with developmental disabilities?

Materials and Method

Research Participants (P Sample): When employing Q methodology, a large sample size may result in selection bias, which hinders the identification of differences between individual participants. The adequate sample size for Q methodology is thus around 50, which is sufficient to generate and compare factors[5]. Based on this principle, this study used a sample of less than 30 participants. A total of 27 students with developmental disabilities who were aged between 13 and 18 years, attended special classes at regular schools, and lived in Y city participated in the study. Firstly, among students diagnosed with development disabilities (but not with multiple disabilities such as visual, hearing, or physical disabilities), we selected those recommended by their homeroom teachers. Secondly, among these recommended students, we selected those with intellectual disabilities whose IQ was between 35 and 75 as measured with the Korean version of the Wechsler Intelligence Scale for Children – Fourth Edition, those with autism whose Childhood Autism Rating Scale result was between 30 and 36, and those with attention deficit and hyperactivity disorder (ADHD) whose result on the Korean version of the ADHD Diagnostic System was between 90 and 110. Thirdly, among the selected students, we selected those with a level of reading ability equivalent to that of first to third graders, able to communicate with researchers and rank picture cards appropriately, and whose parents provided written consent to participate in the research. Detailed characteristics of the participants are shown in <Table 1>

Table 1: Characteristics of research participants

Division	Male	Female	Total
Intellectual disabilities	10	7	17
Autism Spectrum Disorder	3	3	6
ADHD	2	2	4
13years old	1	3	4
14years old	3	1	4
15years old	3	2	5
16years old	3	1	4
17years old	2	2	4
18years old	4	2	6
Total	16	11	27

Research Process: This research followed the process suggested by Kim[5], which consists of four stages: Q sample development, P sample (research participants) selection, Q sort, and analysis of the Q sort.

Research tools

Q sample Development: Brown[8] suggested that there was no absolutely ideal size for the sample of items. Therefore, taking into account that the participants were students with developmental disabilities, 25 physical activities were selected as the Q sample in order to minimize the participants' burden of sorting and to raise the confidence level of their responses. Initially, physical activities were selected for Q sort by referring to physical education textbooks used in special needs schools and prior literature on physical activities[3, 6]. Subsequently, five individuals including teachers with experience in teaching students with disabilities, and postdoctoral researchers and professors in the field of adapted physical activities reduced the number of physical activities down to 25 through discussion. Selected activities were expressed in pictures easily understood by the participants, and these were printed on 10.5 cm × 14.5 cm cards, which are easy to use. The Q sample picture cards are presented in <Figure 1>.

Figure 1: Q sample picture cards

Q Sort: The Q sort method used by Combes, Hardy, and Buchan[9] with people with moderate intellectual disabilities was employed in this study. According to this method, the participants placed the Q sample, made up of 25 cards, on the sort table as shown in <Figure 2>. Enough time was given for the participants to choose physical activities during the sorting process, and interviews were conducted with the participants with regard to the sorting process, which were documented as individual interview records.

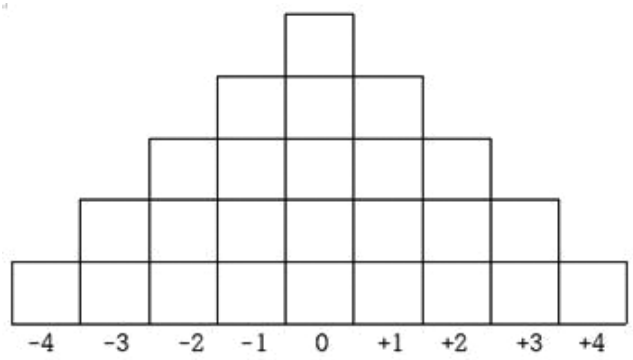

Figure 2: Q sort table and scores

Data Analysis

The collected data were coded using the QUANL PC program, developed for Q methodological analysis. A Q factor analysis was conducted on the 25 coded items by employing principal component factor analysis using the P sample as a basis. Factors that had eigenvalues greater than 1 and could capture the uniqueness of an activity type were extracted. This study sought to increase the validity of activity types by obtaining descriptions from respondents whose factor weight was high for that activity type.

Statistical Analysis

Mention the statistical details, the number of samples used, statistical tools/software used/SD/level of significance, repeatability etc.

Results and Discussion

In Q methodology studies, respondents with a high factor weight for a factor representing a corresponding

type. Considering that our study participants were students with developmental disabilities, the statements of those with relatively clearer verbal expression were interpreted in an effort to conduct a more valid analysis.

Development of Q-types: Physical activities preferred by the students with developmental disabilities were identified and are shown in <Table 2>. Only the factors with eigenvalues greater than 1 were extracted and categorized as four activity types, which explained 48% of the total variance. The first type explained 23.01% of the total variance, the second type 12.41%, the third type 6.99%, and the fourth type 5.2%. The students with developmental disabilities favored the first type of physical activities the most. The correlations between the activity types are shown in <Table 3>, and indicate the likeness between the types. The coefficients for the correlation of the first activity type with the second, third, and fourth types were .103, -.071, and .502, respectively. Those for the correlation of the second type with the third and fourth types were .349 and .095, respectively. Finally, the correlation coefficient between the third and fourth types was .051. In addition, factor weights and demographic characteristics of the participating students with developmental disabilities are presented in <Table 4>. The participant with the highest factor weight in each activity type is the person favoring the corresponding activity type the most among the other participants.

Table 2: Eigenvalues and explained variance by physical activity type

Division	Type1	Type2	Type3	Type4
Eigen values	6.2120	3.3500	1.8873	1.4028
Opercentages of total variance %	.2301	.1241	.0699	.0520
Cumulative%	.2301	.3541	.4240	.4760

A professor in adapted physical education, a teacher with experience in teaching students with developmental disabilities, and three postdoctoral researchers in adapted physical education and special education reviewed the characteristics of the four types and named each type accordingly.

Table 3: Correlations between types

Division	Type 1	Type 2	Type 3	Type 4
Type 1	1.000	-	-	-
Type 2	.103	1.000	-	-
Type 3	-.071	.349	1.000	-
Type 4	.502	.095	.051	1.000

Table 4: Factor weights and demographic characteristics of P samples

Type	Sample number	Factor weight	Gender	Age	Type of disability	School Type	Physical activity (PE classes) Experience
1Type (8people)	s01	1.0171	Male	14	Intellectual Disability Level 3	Ordinary schools	○
	s05	.7059	Female	13			○
	s10	1.1371	Male	18			○
	s11	.5698	Male	16			○
	s12	1.2947	Male	16			○
	s17	.8235	Male	14	ADHD		○
	s20	.7696	Male	15	Autism Spectrum Disorder Level 3		○
	s22	.9390	Female	17	ADHD		○
2Type (7people)	s6	.7087	Female	13	Intellectual Disability Level 3	Ordinary schools	○
	s8	1.3134	Male	18			○
	s9	.8109	Male	18			○
	s15	1.6052	Male	16			○
	s19	.7077	Female	14	Intellectual Disability Level2		○
	s26	.4344	Male	13	Autism Spectrum Disorder Level 2		○
	s27	.2987	Female	18	Intellectual Disability Level2		○

Conted…

3Type (6people)	s2	.4226	Female	13	ADHD	Ordinary schools	○
	s3	.3985	Female	16	Autism Spectrum Disorder Level 2		○
	s4	.8491	Female	18	Intellectual Disability Level 3		○
	s13	1.2077	Female	15	Autism Spectrum Disorder Level 2		○
	s23	.4029	Female	15	Intellectual Disability Level 2		×
	s24	.7249	Female	17			○
4Type (6people)	s7	1.3898	Male	18	Intellectual Disability Level 2	Ordinary schools	○
	s14	.8547	Male	17	Intellectual Disability Level 2		○
	s16	.8262	Female	15	Autism Spectrum Disorder Level 3		○
	s18	.7585	Male	14			○
	s21	.7564	Male	15	Intellectual Disability Level2		○
	s25	.9230	Male	17	ADHD		○

Characteristics of Physical Activity Types

First Type: Peer-centered Activities: The first type of activities preferred by the participants involved activities through which the students could play together with their peers. The most favored activities were badminton and soccer, as shown in <Table 5>.

> "Playing badminton relieves stress. Badminton is for two players, meaning four people can play, too. But when you run, you run alone. I like to do something with my friends." (Participant S01)
>
> "It's fun. I can have a conversation with my friends while playing, and I like that I sweat a lot when playing." (Participant S10)

Table 5: Type 1 Standard score by item

Q card	Standard score
21. Badminton 19. Football	1.68 1.60
8. Dance 2. Yoga	-1.54 -1.78
Sports with scores higher or lower than the standard score 1.5	

This result reflects the fact that the participants have fun and develop their interest in physical activities through interaction with their peers, and their confidence and self-recognition in terms of physical activities increased when engaging in this type of physical activities. In addition, it was discovered during the interviews that providing the appropriate opportunities and environment to the students with developmental disabilities to engage in playing with friends in gyms and schoolyards encouraged their voluntary participation in these playful activities. This finding is congruent with that of the study by Han[10], indicating that peer acceptance levels and social skills of male students with developmental disabilities improved through comprehensive playing programs.

Second Type: Family-centered Activities: The second type of activities favored by the students involved activities in which their family members could participate. The most favored activities were cycling and running, as shown in <Table 6>.

> "My daddy promised that he would go riding with me. I like being with my daddy. I don't like playing with friends because they like playing games at video game cafes more." (S26)
>
> "I like to ride a bike because it clears my mind. I have my bike at home. When I get stressed because of reading and writing, daddy asks me to ride together." (S06)

This result indicates that the participants relieved their mental stress related to their peers and classes by engaging in physical activities with their family, and efficient communication could be established between family members through such activities. In addition, it was found during the interviews that riding a bike was a medium through which emotional ties with parents were built, as most participants learned how to ride a

bike from their parents. This finding is in line with the result of a study conducted by Kim, Kim, Park& Lee[7], indicating that global and local motor skills of children with intellectual disabilities improved through community dance programs in which children and their parents could participate together.

Table 6: Type 2 Standard score by item

Q card	Standard score
9. Bicycle 10. Running	2.15 1.78
16. Goal ball	-1.50
Sports with scores higher or lower than the standard score 1.5	

Third Type: Music-centered Activities: The third most favored activity type involved activities where the students could move their bodies to their favorite music. As shown in <Table 7>, the most preferred activities was dancing.

> "I like songs. I also like to dance. I can lose weight when I dance, and dancing also makes me feel better. Usually I dance with my friends at lunch time. I love K-Pops music." (S04)
>
> "I like to dance because I can listen to music. But I'm actually not a good dancer. I found the choreography awesome so I danced along, but it was too hard for me." (S13)

Table 7: Type 3 Standard score by item

Q card	Standard score
8. Dance	2.07
12. Mountain climbing 18. Taekwondo	-1.51 -1.80
Sports with scores higher or lower than the standard score 1.5	

This result indicates that the participants had a stronger motivation and became more eager to participate in physical activities if they could listen to music they liked. In particular, all six participants who favored this activity type were female. With or without disabilities, dancing is something that all Korean-pop-loving girls enjoy. They teach choreographies to each other, through which communication is established. In addition, as confirmed during the interviews, participants' confidence level in physical activities was boosted as they mastered more complex dance movements, which in turn could increase voluntary participation. This result is congruent with that of Jung[11] that passive actions of children with developmental disabilities turned into more voluntary and cooperative interaction through musical activities that could increase socialness.

Fourth Type: Competition-centered Activities: This type of activities was preferred by those who enjoyed competing and winning. As shown in <Table 8>, the most favored activities were T-ball and basketball.

> "It's so much fun to watch the game between Lotte and SK. A defender caught the ball so they could win in the end." (S14)
>
> "You can jump and pass the ball to put the ball in the basket. It's fun to dribble and do pickup games with friends." (S21)

This result highlights participants' desire and hope to win when they played in competitions and club activities. T-ball, basketball, and soccer, in particular, are not played as formal games. Rather, they are played in a recreation-like situation such as after-school sports activities, where students with and without disabilities can play together. In the interviews, it was found that students with disabilities could gain a sense of achievement and confidence, which could encourage voluntary participation. This is in line with the result of a study conducted by Kim[12], which investigated the educational significance and characteristics of teaching competition activities in physical education classes.

Table 8: Type 4 Standard score by item

Q card	Standard score
17. Tee-ball 20. basketball	1.81 1.59
18. Taekwondo 11. Inline Skate 2. Yoga	-1.52 -1.57 -2.12
Sports with scores higher or lower than the standard score 1.5	

Conclusion

Based on the above discussion, the following conclusions can be drawn in this study regarding the types of physical activities favored by students with developmental disabilities. First, students with

developmental disabilities preferred four types of physical activities. Second, the characteristics of these four types were as follows: peer-centered (first type), family-centered (second type), music-centered (third type), and competition-centered (fourth type). Moreover, these results indicate that students with developmental disabilities are interested in various types of physical activities, and favor a variety of activities types depending on their background characteristics.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Context Mining based Mental Health Model for Lifecare Platform

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ABSTRACT

With the emergence of the 4th industrial revolution, IT convergence engineering based artificial intelligence and intelligent system has constantly been researched in today's society. In particular, healthcare service based on IT-BT convergence helps to improve quality of people's life and provide user-oriented healthcare contents actively. Currently, the healthcare industry has gradually changed its healthcare paradigm from conventional healthcare to mental diseases care and tries to solve the social problem with depression, one of mental disorders. This study proposes the context mining based mental health model for the lifecare platform. This study makes use of users' profiles about depression and health weather index provided by Korea Meteorological Administration to classify and define semantic ontology based context information, and to develop the context mining model for depression index service. The proposed context mining based mental health model uses personalized context information so that it is possible to provide personalized depression index service, rather than unified healthcare service. Also, the proposed one uses user-based information for modeling so that it can provide guidelines for developing data model of depression. In addition, it is possible to provide accurate and specified service for users and efficient depression index service through customized service. The result of the proposed method shows that the context mining model not only promotes the theory and practical ability but also consolidates their understanding of web engineering models and concepts.

Keywords: *Depression, Context Mining, Healthcare, Depression Index, Mental Health*

Introduction

With the start of the 4th industrial revolution, IT convergence technology has developed and today's society has become informatization. As a result, people' quality of life has been improved. The top issue in the 4th industrial revolution outstandingly arises in the healthcare area for healthy life [1-4]. In the social change, the number of chronic disease patients is on the rise, and the medical service area changes from disease treatment to personalized preventive healthcare promotion [5-6]. As mobile devices have been popular, medical life has been changed. With the development of mobile phones and tablet PCs based mobile environment, medical service applications have also been more developed. In the circumstance, consumers' demands of self-healthcare have been on the rise. In addition, with the wide distribution of internet and informatization, useful contents and services of healthcare are provided to users through their mobile devices and PCs. Such services have expanded from physical healthcare to mental healthcare. Depression, a typical one of mental diseases, is a disorder explained in the continuous line of the two extremes of emotional status and mental disorder status in everyday life [7]. Although this symptom occurs sometimes or disappears immediately, it causes an extremely stressful feeling. A repeated feeling of depression dominates one's emotion. If such a feeling

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reaches an extreme level, it leads to losing one's life. Accordingly, depression requires continuous treatment for care and prevention.

Depression is found in various age groups from adolescence to senescence. As for depression, music therapy [8], laughter therapy [9], arts therapy [10], and other therapies have continuously been researched. These studies resulted in the development of IT-BT convergence based healthcare service solution in association with the development of various IT devices [3-4]. Unlike other diseases, depression is hard to be quantified. Depending on users, there are many different types of cases. For this reason, it is difficult to efficiently provide depression care service. In order for effective depression care, mental health technology based IT convergence is needed. These days, commercialization of wireless wearable sensors, remote medical diagnosis, and health monitoring have been researched. In mobile devices or wearable devices, such health service as sensing based heart rate measure and respiratory measure is provided. However, in such healthcare service, only health measures found through physical information monitoring are displayed on screen. The service is not personalized. For this reason, simply general treatment service is offered and it is hard to manage the service [11-13].

Therefore, this study proposes context mining based mental health model for the lifecare platform. With the uses of users' context data and mining technique, the context mining model is developed, and thereby the drawn inference rules are applied to depression index service. In addition, the real-time health weather index of Korean Meteorological Administration and Living Health Index Service are applied to make possible personalized service. The composition of this study is as follows. In Section 2, we describe the healthcare models for web-engineering framework, In Section 3, we propose a context mining based mental health model for the lifecare platform. In section 4, provides a conclusion and future work.

Depression Index for Mental Healthcare: Depression as one of mental disorders is the case where more than four of psychomotor changes, including declining enthusiasm, thinking of death, desire for death, lowering thinking and concentration abilities, lethargy, a sense of guilt, fatigue, a loss of appetite, a loss of weight, sleep disorder, and a loss of sexual desire, continue to occur for more than two weeks [14]. Typical symptoms of depression are a sense of depression, declining vitality, fatigue, a loss of interest, a fall in attention, a sense of guilt, a lowering sense of self-esteem a sense of worthlessness, negative view, suicidal idea and action, a loss of appetite, and sleep disorder. According to Honkanen, living satisfaction had negative correlation with depression not only in clinical depression group but in general population group; with lower living satisfaction, a sense of depression was predicted to increase [14]. In Korean self-administrative evaluation, main symptoms of depression were classified in terms of physical, emotional, and physical aspects, and depression scale was prepared.

The scale is comprised of six dimensions: negative mind-set of the future, lack of self-esteem and self-confidence, anxiety and impatience, a sense of depression, and physical symptoms, and lack of enthusiasm. BDI (Beck Depression Scale) as a tool of measuring a level of seriousness of depression is widely used in the world [15]. Zung (Self-rating Depression Scale; SDS) evaluates depression on the basis of frequency of depression symptoms. In other words, depending on how often depression symptoms occur, a level of depression is evaluated. In this evaluation method, if a severe symptom occurs sometimes, not often, a low score can be given. Hamilton Rating Scale for Depression (HRSD) as an observer's rating scale, vis most widely used to evaluate depression symptoms. This is used for an evaluator to present one of sentences showing severity of a symptom after semi-structured interview. Center for Epidemiologic Studies Depression Scale (CES-D, Korean version) is used as the primary screening tool of depression [16]. In this method, t level of severity is measured on the basis of the time when a symptom appears. Therefore, this scale is much used in epidemiologic studies, especially comparative analysis on prevalence of depression depending on nationality, age, and sex.

Context Mining based Mental Health Model for Lifecare Platform

Pattern Analysis using Context Mining: In order to provide proper and personalized depression index service to users, it is necessary to analyze each user's environment and apply it efficiently. Accordingly, the context information which can influence a user's mental healthcare is classified and defined, and then inference rules are created through context mining. For intelligent

depression index service, a user's context information mining is performed in a functionally excellent ontology model. To find association of a user's context information, context mining analysis is conducted. For depression index service, inference rules are created. This method improves a conventional ontology model which generates service-intensive inference rules [5,17,18]. Context mining information is defined in seven groups-individual, medical sciences, service, position, device, action, and environment data-and context data are classified. The proposed context mining based mental health model uses static and dynamic context data. Based on context information, a variety of each user's information such as surroundings and tendencies is collected and analyzed. And then a personalized context mining model is developed. It includes environment data or medical data which can influence depression and is classified [3-5, 19].

Context mining creates knowledge base with the use of semantic ontology based inference engine. Context mining is applied to the context information collected by an IoT device with the use of FP-Tree algorithm. A semantic ontology based model generates a user's internal, external and service context mining relation and inference rules of knowledge base. Figure 1 illustrates the process of context mining pattern analysis based on semantic ontology. The purpose of such generation is to improve simple inference results when inference rules are created by inference engine in a semantic ontology context model. Therefore, to solve the problem, context mining is applied so as to the association of each layer context information. In the proposed context mining based mental health model, FP-Tree algorithm is applied to the context information of internal, external, and service layers in order for mining.

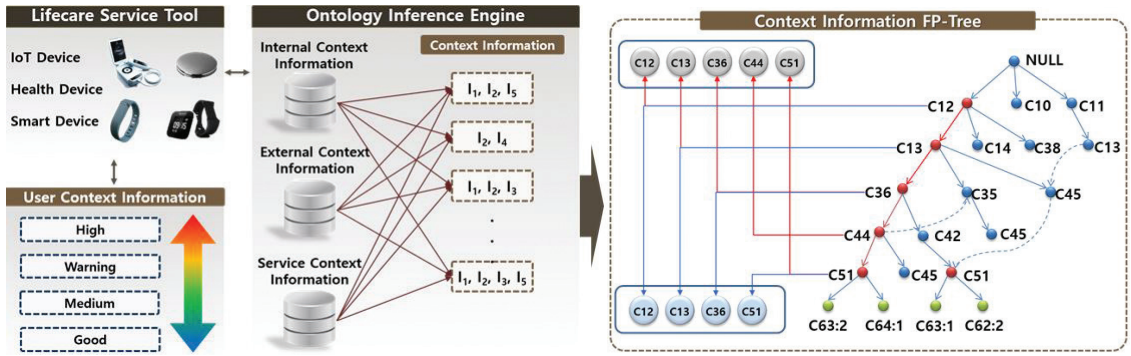

Figure 1: Process of context mining pattern analysis based on semantic ontology

Context Mining Model for Lifecare Platform: Depression index service is a user-oriented personalized index service to which context mining model is applied for a lifecare platform. On the basis of a user's context mining information, health weather index and living weather index of Korea Meteorological Administration, personalized depression index service is offered [20]. To provide depression index service, a context mining model based on personal context information is needed. The context mining model is expressed in top-down tree structure so that it is efficient at classifying, predicting, and analyzing data [21]. Therefore, with the model, it is possible to analyze the result easily, and its big data can be used in a general computing environment with stability. A context mining model is good at easily drawing rules in machine learning, artificial intelligence, ambient intelligence, information retrieval, and is much used in the areas for prediction [22]. Figure 2 presents the context mining model for lifecare platform.

In order to provide a mental health service, context mining information and significant data for depression factors are judged and then a rule based context mining model is created in the lifecare platform. In order to generate a rule based context mining model, context mining tree technique and mining technique are applied [23]. This study makes use of the improved ID3 algorithm 'C5.0' and Apriori algorithm to create a context mining model. Apriori algorithm is applied to a context mining model, and its association rule is mined with the use of context mining information and depression factor data. Support and confidence are based on the significance level 0.05, and an optimal context mining model is generated. With the use of health weather index and living weather index of Korea Meteorological Administration [24], a context mining model is additionally applied for real-time personalized service depending on a user's position and environment [25]. The inference based result can be served through a depression index in lifecare platform [26].

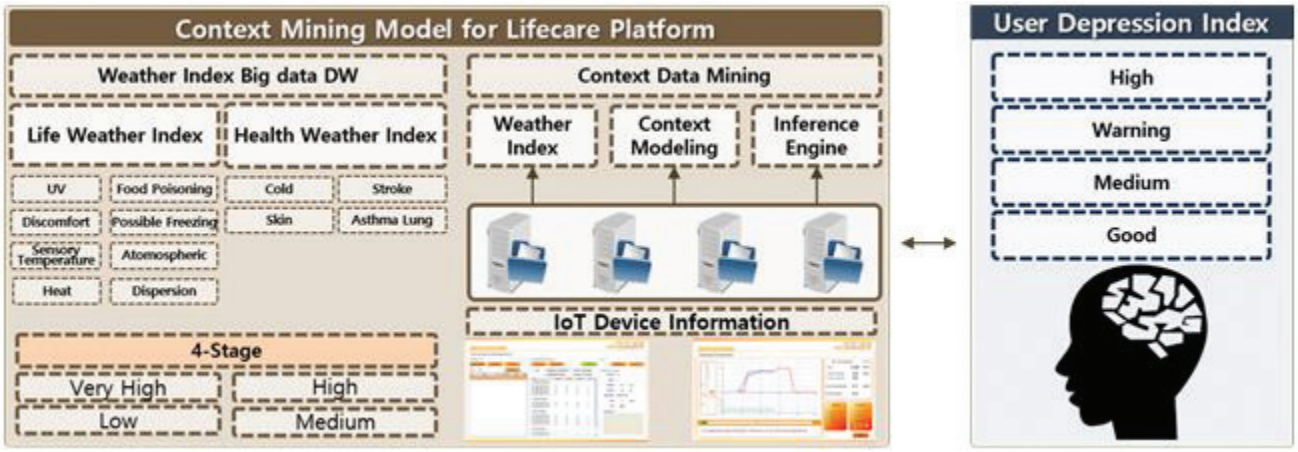

Figure 2: Context mining model for lifecare platform

Table 1: Inference rules of context mining for knowledge management

Service	Inference rules
Context Data Analysis	(?Depression_Level((?Threshold.index) ∩ (?Customer(Locations,Seoul)) ∩ (?Weather_Index(Location,Seoul,Careful)) ∩-> (?GIS ?Seoul) (?Depression_Level((?Threshold.index) ∩ (?Customer(Locations,Suwon)) ∩ (?Weather_Index(Location,Suwon,Careful)) ∩-> (?GIS ? Suwon) (?Customer hasRain ?Rain) ∩ (Environment hasTime ?Morning), (?Customer has ?DeepSleep) ∩ ((?Environment hasTime ?Minute.30) ∩ (?Environment ?hasTime ?Morning)) ∩ ((?Environment hasTime ?Minute.30) ∩ (?Environment ?hasTime ?Night))-> (?ActionGuidelineInformation ?MeasureAdvice), …
Depression Management	If(user's BMI exceeds 26 ∩ Stress Index exceeds 3) ∩ Context(Depression Lv1) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), If(user's BMI exceeds 20 ∩ Stress Index exceeds 4) ∩ Context(Depression Lv2) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), If(user's BMI exceeds 24 ∩ Stress Index exceeds 5) ∩ Context(Depression Lv3) Then ServiceContext (Depression Status, Health Weather Index, Mental Index, SDNN, Event, TRUE), …
Management Coach	If((User Status(hasBlue, TRUE)) ∩ (IntempStatus(hasIndoor)=Low Temperature) ∩ (timeStatus(hasTime)=night)) ∩ Then LowLevelContext (DepressService, NONE),-> (?ActionGuidelineInformation ?MorningRainAlam) ∩ (?ActionRecommand hasActionRecommand ?Action1_MentalHhealth), (?Customer hasStress ?Stress) ∩(Environment hasTime ?Morning) ∩ (?Environment_Weather hasTemp ?Temp >29) -> (?ActionGuidelineInformation ?MorningStressAlam) ∩ (?ActionRecommand hasActionRecommand ?Action2_Stress), (?Customer hasStress ?Stress) ∩(Environment hasTime ?Evening) ∩ (?Environment_Weather hasTemp ?Temp >32) -> (?ActionGuidelineInformation ?EveningStressAlam) ∩ (?ActionRecommand hasActionRecommand ?Action4_Stress), …

To apply the result of context mining analysis to depression index, inference rules are needed. The inference rules of context mining are classified into monitoring & position of a user's context mining information, into a region, and into personal context information. Then, the context mining information in need is drawn. After that, the inference rules of external context mining information and of internal context mining information are created, and thereby service inference rules are created. With the use of the ontology based semantic inference engine Jena 4.0, a user's health conditions are judged in the rule base and the inference rules for depression index service are generated [3, 5-6, 11]. Table 1 shows the inference rules of context mining for knowledge management.

Conclusions

With the development of IT convergence and information, today's society rapidly changes. The IT convergence is also applied to the area of healthcare area. Therefore, research on healthcare has been conducted actively. As the paradigm of healthcare research expands and changes from physical health to mental health, efficient and systematic healthcare is recognized to be the most important in the healthcare area. Conventional healthcare service fails to understand a user's situation or environmental factors. As a result, it is difficult to achieve care and service for mental diseases. In addition, although general treatment and temporary service can be provided according to medical guidelines, it is hard to find any metal disease care service in terms of disease prevention. Therefore, this study proposed context mining based mental health model for the lifecare platform in order to improve the conventional healthcare service. The proposed model used a user's context information which can be obtained in everyday life. In addition, this study developed the inference rules of context mining model which met the medical standards of healthcare and applied the service information and features of depression. Context mining was used to design a user's context information based on semantic ontology, and the rules of inference were created in a context mining model. The inference rules were applied for the context mining model for depression index service. In addition, with the use of health weather index and living weather index provided in real time by Korea Meteorological Administration, a context mining model was developed to make personalized service depending on a user's position and environment. In the future, a mobile program for depression index service will be implemented. Furthermore, based on the proposed method, the contents related to mental disease prevention and depression improvement will be additionally applied for service. This work will be very helpful for engineering research of context mining based mental health model. The proposed context mining based mental health model uses the personalized information modeling so that it can provide guidelines for developing web-engineering models of the healthcare. To clarify the developing model for a web-based health platform, the research is core knowledge for a health platform in machine learning, artificial intelligence, data mining, and health information system. This health platform makes use of the improved ID3 algorithm 'C5.0' and Apriori algorithm to suggest a context mining model. Apriori algorithm is applied to a context mining model, and its association rule is mined with the use of a health information system and data mining for web-engineering framework factors.

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Association between Teacher Efficacy and Job Burnout According to Job Stress Variables of Middle School Teachers

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Abstract

Objectives: This study is narrative research to identify the level of job stress, teach efficiency, and job burnout among middle school teachers in Gangwon-do province and to investigate the effects of job stress on teacher efficacy and job burnout.

Method: In total, samples were gained from 59 subjects who teach at middle schools in Y town in Gangwon-do province. Data was collected from April 2 to April 23, 2018.

Findings: Results showed that their job stress was significantly higher for shorter years of teaching experiences, homeroom teachers, single, and numerous classes. Although their job stress did not affect teacher efficacy, it served as a variable that gives 31.4% impacts on job burnout.

Improvements: Working environment needs to be improved through this study and follow-up research is needed to identify methods of decreasing result variables of job burnout when emotional variables such as job stress are mediated as teacher efficacy.

Keywords: *Teacher Efficacy, Job Burnout, Job Stress, Middle School Teachers, Gangwon-do*

Introduction

As 20.1% of Korean teachers who responded "I'm regretful to become teachers" among 105,000 middle school teachers, this record is 9.5% higher than the average of OCED members and 36.6% said "they would not become teacher again if they must choose this job" and it was higher than the OCED mean(22.4%). Causes such as difficulty of instructing students due to rapidly changing educational background, selfish attitudes of parents' lack of teaching understanding, social criticism on teachers, teaching subjects, and difficulty of performing official tasks were raised[1]. In addition, stress can cause burnout. It literally refers to lack of emotional and mental energy due to excessive contract with people and feeling fatigue and also encompasses losing interests in tasks and further losing vigor, confidence, and interests[2]. One study reported that teachers are fatigued by excessive interactions with students, parents, and colleagues in terms of their job characteristics.[3,4,5,6,7]

Job stress can affect teacher efficacy in terms of external and internal factors. The external factors affecting teacher efficacy include organizational characteristics, dynamic interactions among members, participation in decision-making, and relations with parents.[8] Internal factors include the level of academic education of teachers, teaching experience, and job satisfaction. Likewise, Teacher efficacy is closely associated with job stress. Based on earlier studies including a study that teacher efficacy increases as more communications with colleague teachers and frequent numbers of participating in decision-making[9] and another study on the negative association between job stress and teacher efficacy of elementary school teachers and kindergarten teachers[10,11], it can be said that teacher efficacy gets higher as job stress is reduced.

Accordingly, based on the above results from past research, job stress can cause job burnout and this can affect teacher efficacy. This study therefore aims to

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explore methods of preventing burnout and alleviation, and further provide basic data for establishing policy to boost educational efficiency by giving positive impacts on teacher efficacy.

Objective

This study intends to investigate the association between teacher efficacy and job burnout according to job stress of middle school teachers. Specific objectives are set as follows.

First, it aims to identify the correlation among job stress, teacher efficacy, and job burnout of subjects.

Second, it aims to identify the effects of job stress on teacher efficacy.

Third, it aims to identify the effects of job stress on job burnout.

Subject and Method

Subjects in this study are middle school teachers at Y town in Gangwon-do province. We collected 60 samples from them who consented to participate in this study after giving detailed accounts on this objective, the guarantee of anonymity, and the right of study participants. Data was collected from April 2 to April 23, 2018. In total, 59 questionnaires except for one were used for final analysis. Using G-Power 3.1.9.2 to see the fulfillment of the number of subject samples, test power was set to 0.95, the level of significant was set to 0.05, and the size of effect was set to 0.20. The number of minimum samples was met as the number of maximum samples were 27 needed for ANOVA, correlation, and regression analysis.

Instruments

Job Stress: A translated version by Ahn[12] from Teacher Stress scale invented by Fimian[13] was used for assessing job stress of teachers. The index consists of 29 questions including eight questions on time management, six questions on task-related concerns, five questions on professional concerns, six questions on discipline and motivation, and four questions on professional intervention. Each question is composed of five-point Likert scale ranging between 1 point "never" and 5 point "very." As score is higher, it means that stress is higher. From Ju[14], reliability was Cronbach'α=.92, while Cronbach'α=.85 was found in this study.

Teacher Efficacy: Teacher efficacy scale was developed by Gibson and Dembo[15], abbreviated by Tschannen[16], translated by Lim[17] into Korean, and used by Ju[14]. This scale consists of 21 questions ranging between 1 point "never" and 5 point "very." As score is higher, teacher efficacy gets higher. Ju[14] showed that reliability was Cronbach'α=.84. This study showed Cronbach'α=.96.

Job Burnout: Job burnout scale was adopted from MBI(Maslach Burnout Inventory) developed by Maslach & Jackson[18] and used by Ha[19]. It is composed of 22 questions ranging between 1 point "never" and 5 point "very". As score is higher, job burnout is higher. Reliability turned out Cronbach'α=.91 as shown in Ha[19]. This study showed Cronbach'α=.82.

Analysis Method: Data from this study was analyzed by using SPSS statistical program T-test and ANOVA were used to see the general characteristics, job stress, teacher efficacy, and job burnout of subjects and Scheffé post-test was also conducted. The correlation among job stress, teacher efficacy, and job burnout was identified by using Pearson's correlation coefficients. In addition, regression analysis was carried out to identify the effects of job stress on teacher efficacy and job burnout.

Results

The difference among Job Stress, Teacher Efficacy, and Job Burnout according to General Characteristics: Job stress according to general characteristics showed statistically significant difference in teaching experience (F=10.79, p=.000), position (t=-2.09, p=.040), homeroom teacher (t=-2.84, p=.006), single or married (t=-2.84, p=.006), and total number of classes (F=15.27, p=.000). Post-analysis on teaching experiences demonstrated that teachers who have little experience showed significantly higher job stress than those who have many teaching experiences. Job burnout according to general characteristics of subjects showed significant difference in position (t=-2.09, p=.040), while had no significant difference in teacher efficacy [Table 1].

Table 1: Differences among job stress, teacher efficacy, and job burnout according to general characteristics (N = 59)

Characteristics	Category	Job stress		Teacher efficacy		Job burnout	
		M ± SD	scheffé	M ± SD	scheffé	M ± SD	scheffé
Gender	Male	3.20 ± .47		2.91 ± 1.00		3.20 ± .38	
	Female	2.99 ± .69		2.78 ± 1.04		3.25 ± .68	
	t or F	1.12		.45		-.27	
	p	.265		.648		.783	
Teaching experience	Less than 10 years [a]	3.65 ± .74	a>b>c>d	2.96 ± .98		3.23 ± .72	
	11- 20 years[b]	3.05 ± .40		2.39 ± .48		3.41 ± .45	
	21- 30 years[c]	2.81 ± .41		2.79 ± 1.21		3.29 ± .69	
	More than 31 years[d]	2.65 ± .40		3.11 ± 1.15		2.99 ± .32	
	t or F	10.79***		1.12		1.06	
	p	.000		.348		.371	
Position	Deputy teacher	2.84 ± .57		2.94 ± 1.12		3.00 ± .52	
	Ordinary teacher	3.16 ± .65		2.76 ± .99		3.35 ± .61	
	t or F	-1.787		.624		-2.09*	
	p	.079		.535		.040	
Homeroom teacher	Yes	3.19 ± .65		2.77 ± 1.00		3.31 ± .60	
	No	2.79 ± .54		2.91 ± 1.10		3.10 ± .58	
	t or F	2.36*		-.48		1.28	
	p	.021		.627		.204	
Single or married	Married	2.89 ± .54		2.91 ± 1.00		3.22 ± .55	
	Single	3.36 ± .70		2.65 ± 1.07		3.27 ± .70	
	t or F	-2.84**		.92		-.26	
	p	.006		.357		.795	
Total number of classes	Less than 3 classes[a]	2.82 ± .37	d>c>b>a	2.69 ± 1.09		3.37 ± .54	
	4-6 classes[b]	2.74 ± .47		3.02 ± 1.16		3.06 ± .60	
	7-10 classes[c]	3.10 ± .27		2.79 ± 1.04		3.08 ± .52	
	More than 11 classes[d]	3.80 ± .64		2.75 ± .77		3.35 ± .70	
	t or F	15.27***		.35		1.18	
	p	.000		.788		.324	
*p<.05 **p<.01 ***p<.001							

Correlation among Job Stress, Teacher Efficacy, and Job Burnout of Subjects: Job stress of subjects showed a statistically significant and positive correlation with job burnout (r-.348, p<.01), while it was not correlated with teacher efficacy. In other words, the higher job stress is, the lower job burnout is. Teacher efficacy showed a statistically significant and positive correlation with job burnout (r=-.617, p<.01) [Table 2].

Table 2: Correlation among job stress, teacher efficacy, and job burnout of subjects (N = 59)

		Factors of job stress						G	H
		A	B	C	D	E	F		
Factors of job stress	A	1							
	B	.310*	1						
	C	.136	.143	1					
	D	.051	.180	.238	1				
	E	.120	-.025	.182	.271*	1			
	F	.748**	.646**	.413**	.535**	.378**	1		
G		.018	-.011	-.043	-.257*	-.307*	-.150	1	
H		.092	.003	.201	.491**	.473**	.348**	-.617**	1
*p<.05, **p<.01, ***p<.001		A. Time management, B. Task-related concerns, C. Professional concerns, D. Discipline and motivation, E. Professional intervention, F. Total job stress, G. Teacher efficacy, H. Job burnout							

Effect of Job Stress on Teacher Efficacy: As shown in Table 3, to test the effects of job stress on teacher efficacy, multiple regression analysis and multicollinearity test revealed that multicollinearity was not found, but significance probability was more than 0.5. This indicates that the regression line was inappropriate for the model. In other words, job stress of subjects did not significantly affect teacher efficacy.

Table 3: Effects of job stress on teacher efficacy

Predictors		B	β	t	Tolerance	VIF
Variables of job stress	Time management	.044	.057	.41	.880	1.137
	Task-related concerns	-.006	-.007	-.04	.859	1.165
	Professional concerns	.082	.046	.340	.909	1.100
	Discipline and motivation	-.194	-.196	-1.42	.861	1.162
	Professional intervention	-.265	-.269	-1.98	.889	1.125
R^2		.132				
Adj. R^2		.050				
F		1.61				
p		.172				
*p<.05, **p<.01, ***p<.001						

Effect of Job Stress of Subjects on Job Burnout: To test the effects of job stress of subjects on job burnout, multiple regression analysis and multicollinearity test found that as shown in Table 4, discipline and motivation (t=3.38, p<.01) and professional intervention (t=3.02, p<.01) as subfactors of job stress were positively associated. In other words, as discipline, motivation and professional interventions of subjects increase, so does job burnout. The regression model showed a higher correlation as R=.611 between job stress and job burnout. For 37.4% of total variations, job stress had a positive impacts on job stress (F=6.32, p<.001).

Table 4: Effects of job stress of subjects on job burnout (N = 59)

Predictors		B	β	t	Tolerance	VIF
Factors of job stress	Time management	.022	.049	.42	.880	1.137
	Task-related concerns	-.042	.060	-.69	.859	1.165
	Professional concerns	.050	.121	.41	.909	1.100
	Discipline and motivation	.230	.068	3.38**	.861	1.162
	Professional intervention	.202	.067	3.02**	.889	1.125
R^2		.374				
Adj. R^2		.314				
F		6.32***				
p		.000				
*p<.05, **p<.01, ***p<.001						

Discussion

This study aimed to identify the level of job stress, teach efficiency, and job burnout among middle school teachers in Gangwon-do province and to investigate the effects of job stress on teacher efficacy and job burnout. To perform this, a survey was conducted among 59 middle school teachers. The mean difference of variables was compared through t-test and the effects of job stress on teacher efficacy and job burnout was statistically processed by using regression analysis. Based on results from this study, discussion and conclusion associated with earlier studies are presented as follows.

Mean scores of their job stress turned out 3.06 point and job burnout showed 3.24 point, which were comparatively higher than mean score and this showed that job stress and job burnout account for major portions. Teacher efficacy recorded 2.82 point in average, which showed similar results. Job stress showed significant differences in teaching experience, position, homeroom teacher, single or married, and the number of classes. As teaching experience is low, job stress increased. This is consistent with results presented by Choi[20] that teachers who have little experience assume important tasks and feel stressful. Moreover, ordinary teachers who assume low positions show higher job burnout, which is consistent with results from Park's[21] study that higher teaching experiences correspond with increasing job satisfaction.

No effect of job stress of middle school teachers on teacher efficacy was found and Lim[17] supported that the effects of teacher efficacy on job stress is irrelevant. Job burnout was influenced by discipline and motivation as well as professional intervention as subfactors of job stress, which is consistently explained by results found in Lim[17].

Conclusion

Observing discussions in association with earlier studies and society, the disposition of parents or local demanders who force teachers to work perfectly can give negative impacts on their job stress. When positive measure is prepared to reduce their job stress and boost job satisfaction, it needs to focus on cutting performance-oriented evaluation and solving private problems.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Stress and Self-esteem on QoL in General College Students

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ABSTRACT

Background/Objectives: College students are in the transition period between adolescence and adulthood and need to lay the ground for emotional or financial independence. This study aimed to analyze the effects of general college students' stress and self-esteem on their quality of life (QoL).

Method/Statistical Analysis: This study was performed in a total of 200 students at S University in S City. With the exception of the questionnaires not returned or wrongly or not fully completed during the process of data collection (n=25), 175 questionnaires were finally analyzed. Before the survey, the participants in this study were given an explanation about the purport of the research and those consenting to participate in this study were asked to make a written consent and complete questionnaires, which were then returned. The collected data were analyzed using descriptive statistics and t-test, one-way ANOVA, Pearson's correlation coefficient, and multiple linear regression.

Findings: This study obtained the following results: first, the total score was 46.5 ± 18.4 for the socio-psychosocial well-being index (PWI), 30.2 ± 4.5 for self-esteem, and 91.0 ± 13.1 for QoL; second, QoL differed statistically significantly by the frequency of having breakfast per week (F=3.3, p=.02), and PWI (F=4.7, p=.003) and QoL (F=4.8, p=.003) differed statistically significantly by activity of daily; third, significant negative correlation was found between PWI and QoL(r=-.7, p<0.001); fourth, stress (β=-.7, p<0.001) was the factor that had the strongest negative effects on QoL.

Improvements/Applications: Stress was the factor that had the strongest effects on QoL in college students. It is therefore necessary to develop health promotion programs that can help general college students relieve stress with the objective of improving their QoL.

Keywords: *College student, Stress, Self-esteem, QoL, Health*

Introduction

College students need to prepare for adulthood. However, they actually suffer from more stress than during adolescence to adapt themselves to an unfamiliar environment, while they may have expectation of and excitement at a new campus life [1, 2]. Indeed, the 2017 Youth Statistical Survey supervised by the Ministry of Gender Equality and Family showed that 50.3% of the respondents aged 20-24 were experiencing stress in all areas of their life [3].

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In the body, if a prolonged state of stress reactions overwhelms the capability of each system to cope with them, it can cause physically and psychologically abnormal signs, such as loss of appetite, muscle tension, fatigue, insomnia, emotional turmoil, and depression, which can then lead to several types of disease: gastrointestinal disorders, cardiovascular disease, respiratory disease, and mental illness [4]. So it is probably possible to solve university students' physical and mental problems by allowing them to identify and cope properly with the causes of stress so that they can avoid being left maladjusted due to the exposure to excessive stress.

Self-esteem means thinking of oneself as a valuable being; people with high self-esteem are likely to accept, respect, and regard themselves as valuable. Positive

self-esteem may cause people to lead a positive and worthwhile life and behave with confidence, whereas negative self-esteem may cause them to become skeptical of self-value, frequently feel anxious, become depressed, have no confidence in themselves, and do unstable and passive behavior [5]. University students need to establish their self-value and become independent, the failure in which can lower self-esteem due to an excessive sense of inferiority or lower self-esteem and give severe mental stress; for this reason, adjustment status, the environment, stress, and personal lifestyle during this period are likely to have significant effects on the quality of life in adulthood as well [6-8].

The quality of life (QoL) means a subjective value judgment about daily satisfaction based on satisfaction with life as well as on physical, mental, and social well-being [9]. Research on the correlations between stress and QoL has reported that university students can experience lots of stress in all areas of campus life due to identity, interpersonal relationships, academic work, financial difficulties, and employment on entering the university and that students experiencing such severe stress can suffer mentally and physically severe maladjustment as well as problems with campus life [10-12]. A study showed that university students' stress management, satisfaction with the in-campus environment, and health practice behavior were likely to affect their QoL [13].

So this study aimed to examine the effects of college students' stress and self-esteem on their QoL and is expected to provide basic data that can help develop health promotion programs so that they can improve their QoL and prepare for happy and healthy adulthood.

This study aimed to examine the effects of general college students' stress and self-esteem on their QoL.

Materials and Method

Participants: The convenience sampling method was used to make a sample of 200 students at S University in S City. Before data collection, the participants in this study were given an explanation about anonymity, confidentiality, possibility of withdrawing from the survey any time, and the purport of the study in ethical consideration, and those volunteering to participate in this study were asked to make a written consent. The students were asked to personally complete questionnaires, which were then returned. With the exception of the questionnaires not returned or wrongly or not fully completed during the process of data collection (n=25), 175 questionnaires were analyzed after the final error detection.

Research Tools

Stress: The revision of the Socio-Psychosocial well-being Index (PWI) developed by the Korean Society for Preventive Medicine on the basis of Goldberg's GHQ-60 (General Health Questionnaire) was used [14]. PWI, which was designed to determine the level of stress in normal people, has a total of 45 items in four domains: performance of social role and the degree of self-reliance, depression, sleep disorders and anxiety, and general health and vitality. On a four-point Likert scale, scoring ≤22 in total for the level of socio-psychological health means positive well-being, 23-62 moderate distress, and ≥63 severe distress.

Self-esteem: The Korean version of the self-esteem scale developed by Rosenberg was used [15]. It had a total of 10 items—5 positive items and 5 negative ones—on a four-point Likert scale. The total score ranged from 10 to 40, with a higher total score meaning higher self-esteem.

Quality of Life (QoL): The Korean Version of WHO Quality of Life Scale Abbreviated Version (WHOQOL-BREF) was used to measure QoL [16]. It had a total of 26 items in the physical, psychological, social, and environmental domains (24), QoL in general (1), and general health awareness (1) on a five-point Likert scale. In this study, only the physical, psychological, social, and environmental domains (24 items) were used for analysis on the basis of literature review [17]. The total score ranged from 24 to 120, with a higher total score meaning higher QoL, except for 3 items processed reversely.

Statistical Analysis

Frequency analysis in descriptive statics was performed on the respondents' general characteristics; t-test and one-way ANOVA were carried out to determine the differences in stress, self-esteem, and QoL by the general characteristics; and Scheff's method was used for post-hoc analysis. Pearson's correlation coefficient was used to determine inter-variable correlation. Multiple linear regression was made on the factors for QoL. All the statistical analyses were carried out by using SPSS Window version 25.0 at the $p<0.05$ significance level.

Characteristics of the Subjects: The respondents' general characteristics—age, school year, smoking, frequency of alcohol intake per week, frequency of having breakfast per week, and exercise—are as presented in Table 1. The mean age was 21.5 years; 102 respondents (58.3%) were male, and 73 (41.7%) female. 22 students (12.6%) were smokers, and 152 (86.9%) non-smokers; 5 students (2.9%) drank everyday, 19 (10.9%) 4-5 per week, 114 (65.1%) 2-3 per week, and 37 (21.1%) didn't drink at all. 66 respondents (37.7%) had breakfast every day, 15 (8.6%) 4-5 per week, 30 (17.1%) 2-3 per week, and 64 (36.6%) skipped breakfast. As for activity of daily living, 4 respondents (2.3%) did intense activity, 54 (30.9%) moderate activity, 80 (45.7%) light activity, and 37 (21.1%) was sedentary.

Table 1: Characteristics of the Subjects (N = 175)

Characteristic	Category	n (%)
Age(yr)	21.5 ± 1.1	
Sex	Male	102(58.3)
	Female	73(41.7)
Grade	Freshman	47(26.9)
	Sophomore	45(25.7)
	Junior	40(22.9)
	Senior	43(24.6)
Smoking	Yes	22(12.6)
	No	152(86.9)
Alcohol Drinking	Everyday	5(2.9)
	4-5 times a week	19(10.9)
	2-3 times a week	114(65.1)
	Nothing	37(21.1)
Number of breakfasts per week	Everyday	66(37.7)
	4-5 times a week	15(8.6)
	2-3 times a week	30(17.1)
	Nothing	64(36.6)
Activity of daily living	Intense activity	4(2.3)
	Moderate activity	54(30.9)
	Light activity	80(45.7)
	Sedentary	37(21.1)
Values are presented as mean ± standard deviation or number (%)		

Stress, Self-esteem, Quality of Life in the Subjects: The respondents' levels of stress, self-esteem, and QoL are as presented in Table 2. In this result, the total score for the PWI was 46.5 ± 18.4, which means moderate distress. A study on university students' [18] socio-psychological health reported that university students had low levels of PWI and moderate or severe stress; the analysis of university students' stress, depression, and social support [19] showed that the majority of respondents experienced moderate or severe stress, which was consistent with the results of this study. In four domains of PWI, they scored slightly higher for performance of social role and the degree of self-reliance (16.0 ± 7.6) and depression (12.0 ± 6.4), and lower for general health and vitality (10.9 ± 3.2) and sleep disorders and anxiety (7.7 ± 5.0). This result implies that university students with moderate distress can have lots of stress related to performance of social role and a slightly higher depression index.

The respondents in this study scored slightly high for self-esteem (30.2 ± 4.5). Reportedly, high self-esteem controls problem behaviors because it positively affects stress coping [20] and the degree of perceiving, controlling, and coping with stress can depend on keeping self-esteem high [21]. It is believed, therefore, that the participants in this study felt less stress, protected themselves from psychological distress [22], and were very likely to recover [21, 23] because they had high self-esteem.

The respondents in this study scored relatively high for QoL (91.0 ± 13.1). Another research on university students' QoL also found high QoL, which was consistent with the results of this study [24]. As for the four domains of QoL, however, they scored relatively higher for the environmental (30.4 ± 4.5) and physical domains (26.2 ± 4.7) and lower for the psychological (22.7 ± 4.0) and social domains (11.7 ± 1.8). Even university students with high QoL are expected to be dissatisfied with their life to some degree in the psychological and social domains.

Table 2: Level of PWI, Self-esteem and QOL (N = 175)

Variable		M (SD)
PWI	Total Score	46.5 (18.4)
	Performance of social role and the degree of self- reliance	16.0 (7.6)
	Depression	12.0 (6.4)
	Sleep disorders and anxiety	7.7 (5.0)
	General health and vitality	10.9 (3.2)
Self esteem	Total Score	30.2 (4.5)

Conted…

QOL	Total Score	91.0 (13.1)
	Physical domain	26.2 (4.7)
	Psychological domain	22.7 (4.0)
	Social domain	11.7 (1.8)
	Environment domain	30.4 (4.5)
Values are presented as mean (standard deviation)		
PWI, Socio-Psychosocial well-being Index; QOL, Quality of life		

The difference of Stress, Self-esteem, Quality of Life according to general characteristics: The differences in the respondents' stress, self-esteem, and QoL by their general characteristics are as presented in Table 3. QoL differed statistically significantly by the frequency of having breakfast per week (F=3.3, p=.02). In particular, the students skipping breakfast showed significantly lower QoL than those having it every day. A study on the factors for QoL in university students [25] found positive correlation between health behavior practice status, including the rate of meal skipping, and QoL. This finding implies that the lower level of health behavior practice, the lower QoL, which is consistent with the results of this study.

Activity of daily living made statistically significant differences in PWI (F=4.7, p=.003) and in QoL (F=4.8, p=.003). In particular, students doing light activity and sedentary had significantly higher PWI than those doing moderate activity. Several studies [26, 27] found that physical activity of moderate or higher degree was effective in relieving stress. This finding is probably because physical activity is effective in relieving physical and mental tension and in making one less sensitive to stress [28].

Students doing moderate activity had significantly higher QoL than those doing light activity or sedentary. This study is consistent with the finding that university students with a larger amount of physical activity had higher QoL [29]. This is probably because a moderate or higher degree of physical activity can improve physical functions, mental health, social activity, etc.

Table 3: The difference of PWI, Self-esteem and QOL according to general characteristics

Characteristic	Category M(SD)	PWI		Self esteem		QOL	
		Tor F(p)	M(SD)	Tor F(p)	M(SD)	Tor F(p)	
Sex	Male	45.1(18.5)	-1.2	30.16(4.4)	-0.2	91.4(14.1)	0.5
	female	48.5(18.3)	(-0.2)	30.32(4.6)	(0.8)	90.4(11.5)	(0.6)
Grade	Freshman	45.7(19.6)	1.0	30.68(5.5)	0.2	91.9(12.8)	2.9
	Sophomore	44.2(16.4)	(0.4)	29.96(3.9)	(0.9)	91.3(13.1)	(0.8)
	Junior	50.7(18.3)		30.05(4.1)		89.4(14.4)	
	Senior	45.9(19.2)		30.16(4.2)		91.1(12.2)	
Smoking	Yes	43.6(21.7)	-0.8	31.45(4.4)	1.4	91.7(16.8)	0.3
	No	46.9(18.0)	(0.4)	30.05(4.5)	(0.2)	90.9(12.5)	(0.8)
Alcohol Drinking	Everyday a	35.6(21.0)	0.7	33.60(4.8)	1.3	89.2(21.6)	0.07
	4-5 times/week b		(0.5)	31.11(4.5)	(0.3)	90.9(10.7)	(1.0)
	2-3 times/week c	47.1(17.5)		30.0(4.2)		90.9(12.7)	
	Nothing d	45.3(20.6)		30.0(5.1)		91.7(14.3)	
Number of breakfasts per week*	Everyday a	44.1(19.8)	1.0	29.89(4.3)	0.3	93.8(13.8)	3.3
	4-5 times/week b	42.9(14.2)	(0.4)	30.40(3.6)	(0.9)	93.2(13.9)	(0.02)
	2-3 times/week c	47.9(17.3)		30.70(4.6)		92.0(11.9)	a>d
	Nothing d	49.1(18.3)		30.3(4.7)		87.1(11.9)	
Activity of daily living*	Intense activity a	32.3(11.3)	4.7	28.5(3.7)	0.4	102.3(13.7)	4.8
	Moderate activity b	40.2(17.1)	(0.003)	30.67(4.5)	(0.7)	95.4(14.0)	(0.003)
	Light activity c	49.1(17.6)	b<d,c	30.15(4.3)		89.1(12.9)	b>d,c
	Sedentary d	51.7(19.8)		29.92(4.9)		87.5(9.3)	
Values are presented as mean (SD), t-test or one-way analysis of variance. *Scheffe							
PWI, Socio-Psychosocial well-being Index; QOL, Quality of life							

Associated Factors with Quality of Life: The correlations among stress, self-esteem, and QoL in the participants are as presented in Table 4. In this study, PWI, which shows the level of stress in normal people, was significantly negatively correlated with QoL (r=-.7, p<0.001). However, no significant correlation was found between PWI and self-esteem and between self-esteem and QoL. To investigate the effects on university students' QoL, multiple linear regression analysis was made with QoL as a dependent variable and stress and self-esteem as independent variables (Table 5). The regression model analysis found that stress (β=-.7, p<0.001) was the factor that had the strongest negative effects on QoL.

These results imply that stress has the strongest effects on QoL in university students and that a higher level of stress can possibly lead to lower QoL. Research on living stress and QoL in nursing students [30] and a study on the factors for QoL in university students [14] reported that the students could improve their QoL by managing stress well. It is therefore necessary to develop and operate various health promotion programs as well as to create facilities and environments that can help university students manage their stress in campus so that they can lead a happy and healthy life.

Table 4: Correlations among Outcome Variables (N = 175)

Variables	PWI	Self esteem	QOL
PWI	1		
Self esteem	0.4(0.6)	1	
QOL	-0.7(0.000)**	-0.1(0.3)	1
PWI, Socio-Psychosocial well-being Index; QOL, Quality of life **p<0.001			

Table 5: Predictors of QOL (N = 175)

Variables	QOL					
	B	SE	β	t(p)	R2	F(p)
Constants	117.5	5.0		23.7	0.5	93.1**
PWI	-0.5	0.04	-0.7	-13.6**		
Self esteem	-0.1	0.16	-0.03	-0.6		
PWI, Socio-Psychosocial well-being Index; QOL, Quality of life **p<0.001						

Conclusion

This study aimed to analyze the effects of general college students' stress and self-esteem on their QoL and provide basic data that can help develop health promotion programs so that they can improve their QoL and prepare for happy and healthy adulthood.

The results of this study can be summarized as follows: First, the participants experienced moderate distress and showed relatively high self-esteem and QoL. Second, students skipping breakfast had significantly lower QoL than those having breakfast every day. The students doing light activity and sedentary experienced significantly more stress than those doing moderate activity; the students doing moderate activity had significantly higher QoL than those doing light activity or sedentary. Third, PWI, which shows the level of stress, was significantly negatively correlated with QoL. Fourth, stress was the factor that had the strongest negative effects on QoL.

It is therefore necessary to develop and operate various health promotion programs as well as to create facilities and environments that can help general college students manage their stress in campus so that they can lead a happy and healthy life.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effect of Private Health Insurance on Medical Expenditure and Unmet Medical Needs: Evidence from South Korea

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ABSTRACT

South Korea is experiencing increases in private health insurance (PHI). The purpose of this study is to examine the role of PHI on medical expenditure and unmet medical needs. This longitudinal study used data from the nationally representative 2011–2014 Korea Health Panel Survey (KHPS). Propensity score matching was performed to control the endogeneity from enrolling in PHI for the sake of healthcare utilization. Fixed-effects panel data analyses were performed to control for time-invariant factors. The final matched sample of 2,390 participants was retained throughout the study period. In this study, about 83.4% of the participants were covered by PHI in 2011 (fixed benefit 70.2%, indemnity 29.8%). Results from the fixed effects analysis with matched panel data showed that the impact of PHI on personal medical expenditure and unmet medical needs was not statistically significant. However, it was found that PHI had a positive and statistically significant influence on out-of-pocket (OOP) expenditure at point of use, including that for non-covered services. Particularly, indemnity type insurance plans had a large effect on OOP expenditure. The results show that PHI increased OOP expenditure but failed to decrease unmet medical needs. Additional analyses of the contribution of PHI and exploration of policy alternatives are required.

Keywords: *Private health insurance, Healthcare expenditure, Out-of-pocket expenditure, Unmet medical needs, Republic of Korea.*

Introduction

South Korea has a national health insurance (NHI) system in the form of universal public health insurance[1]. NHI was established as a public security system only recently; it involves a low healthcare expenditure level compared to GDP and has excellent health outcomes[2]. However, when NHI coverage is calculated as the ratio of public resources to individual medical expenditure, the resulting rate of 55.1% is far lower than the Organisation for Economic Cooperation and Development's (OECD) average of 73.0%[3]. Private Health Insurance (PHI) is used as supplementary health insurance to compensate for the limited coverage.

Recently, South Korea has been experiencing increases in PHI coverage due to insufficient public coverage rates[1]. The expansion of the PHI market creates the possibility of the over-consumption of medical services, that is, the possibility of moral hazard for medical consumers who have joined both public health insurance and PHI[4]. Also, the recent rapid increase in medical expenses among OECD countries has contributed to the possibility of moral hazard caused by PHI [5]. The question is whether healthcare consumers who join PHI increase their demand for real medical expenses after contracting with PHI [4]. The effect of PHI has been debated. Many studies have reported that PHI has a positive impact on outpatient expenditure, but the effect on inpatient expenditure was not consistent [6, 7]. In recent years, there have been studies analyzing the effect of indemnity PHI on the utilization of medical services due to the rapid increase in the subscription

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rate of indemnity PHI; the results differed depending on the sources and research methods [1,8,9]. Although several studies have quantitatively demonstrated the relation between PHI and medical utilization, to quantify the causality between them, it is necessary to address the issue of the endogeneity of insurance variables [9].

So far, there are few studies concerning the impact of PHI on healthcare equity[10]. PHI is expected to reduce unmet medical needs, as a supplementary role in coverage and depth, but the Korean NHI has a high incidence of unmet medical needs [11]. Unmet medical needs is an important issue to identify and improve in terms of policy, because diseases can worsen and complications can arise if a problem is not treated in a timely manner; thus, it is also important to understand the relationship between PHI and unmet medical needs[10]. Some studies used propensity score matching to counter the endogeneity issues, while others applied panel data analysis to examine the longitudinal effect of PHI on healthcare utilization and expenditure [6, 7]. One small study applied both methods to analyze the effect of PHI on medical expenditure, but no study has yet investigated the impact of unmet medical needs on PHI. The purpose of the current study was to examine the role of supplementary PHI on medical expenditure and explore the impact on unmet medical needs.

Materials and Method

Materials: The data for this study are based on the 2011–2014 data from the Korea Health Panel Survey (KHPS). The KHPS has been conducted since 2008 to provide the Korean government with data about medical expenditure and appropriate healthcare utilization rates. The representative sample of households was selected using a two-step probabilistic stratified cluster method and each household member was surveyed. Items concerning demographic characteristics, health status, and healthcare utilization were covered. Respondents' medical expense histories were retrieved from actual receipts, allowing us to identify specific costs and out-of-pocket payments. Also, survey items specifically addressed enrollment in PHI plans. The analysis excluded participants under 20 years of age, as younger citizens may have limited decision-making experience regarding healthcare utilization, and those over 65, as they have restricted private insurance enrollment.

Method

Measurements: The independent variables were enrollment in PHI (non-enrollment, enrollment) and type of insurance (non-enrollment, fixed-benefit, indemnity). We classified those enrolled in both types of insurance as having indemnity-type insurance plans, under the assumption that health service utilization will be influenced more heavily by them. Dependent variables were: (1) total medical expenditure, (2) out-of-pocket expenditure, and (3) experience of unmet medical needs. Variables (1) and (2) are annualized personal medical expenditures for outpatient services, inpatient services, and emergency services; (1) includes covered NHI expenses and out-of-pocket expenditures, and (2) refers to only out-of-pocket expenditures at point of use. This measure of medical expenditure relied on information from receipts and household accounts to mitigate problems caused by recall bias (which occurred in general surveys) or by inaccurate measurement of the overall payment (which occurred in administrative data due to non-covered expenditures). Because of the skewed nature of the distribution of medical expenditure, log transformation was applied for normalization. In (3), an unmet medical need was defined as an individual feeling that they had been unable to access treatment for medical needs experienced over the past year.

Covariates included demographic variables such as sex, age, marital status, education level (middle school graduate, high school graduate, college, and above), income (quintiles), and participation in the labor force, as well as health variables such as the diagnosis of chronic disease, physical activity, and self-rated health.

Statistics Analysis: The characteristics of the sample will be different depending on enrollment in PHI. Because enrollment in PHI is based on individual choice, the tendency for those who are more likely to utilize health services to enroll may lead to the problem of endogeneity. To overcome this problem, we utilized propensity score matching (caliper matching) techniques. Propensity score matching was carried out based on individual data from the 2011 dataset, including information on demographics (age, sex, marital status, education level, income level, labor force participation) and health status (chronic disease, smoking, physical activity, and self-rated health). Matching was done with greedy matching without a replacement option, with nearest neighbor

matching within the caliper (0.01). We 1:1 matched 7,470 individuals (6,227 with PHI and 1,243 without PHI) and extracted 2,390 individuals as our matched sample (1,195 with PHI, 1,195 without PHI).

To use an analytic model that controlled for confounding factors influencing medical expenses and the experience of unmet medical needs, we conducted both fixed-effect panel data analysis and ordinary least squares (OLS) regression with pooled longitudinal data. The panel data analysis was carried out to control for time-invariant factors. The Hausman test was applied to the fixed-effects and random-effects models for error analysis. The null hypothesis was rejected at the 1% significance level, and the fixed-effects panel model was adopted. We validated the heteroscedasticity robust Hausman-Robust test for panel data serial correlation introduced in Born & Breitung [12].

We tested for correlation between the variables and multicollinearity. Correlation among variables was not significant and the variance inflation factor was below 2, confirming that multicollinearity was not a concern. Statistical analyses were conducted using Stata (ver. 15) software.

Results and Discussion

The sample size was 7,470, with 1,243 who did not have any supplementary PHI (only NHI) and 6,227 who were enrolled in PHI plans (PHI + NHI). After matching, 50.0% of the 2,390 respondents had PHI.

Demographic characteristics of the sample are as follows. Before matching, there were a higher proportion of females among those with PHI, with 47.78% male and 52.22% female, compared to 54.79% male and 45.21% female among those without PHI. Average age was 43.7 in the PHI group and 42.6 in the non-PHI group. Among those with PHI and those without PHI, 75.96% and 51.01% were married, respectively. The proportion of those with college degrees was 36.73% in the PHI group and 28.72% in the non-PHI group. Distribution of income quartiles was higher in the PHI group (3.7 ± 1.2) than in the non-PHI group (3.0 ± 1.3). We found that 68.32% of the PHI group were still in the labor force, compared to 60.02% of the non-PHI group.

As for health-related characteristics, a higher proportion of the PHI group (50.92%) had a diagnosis of a chronic disease compared to the non-PHI group (44.49%). Among those with PHI, 81.99% participated in physical activity compared to 77.56% among those without PHI. Finally, 48.97% of those with PHI rated their health as "good" compared to 45.09% of those without PHI. After matching, there were no significant differences in demographic or health-related factors between the PHI and non-PHI group [Table 1].

We observed the effect of enrollment in supplementary PHI on personal medical expenditure. After matching, enrollment in PHI was found to increase medical expenditure in the pooled OLS model, but the effect was not significant in the fixed-effects panel model. Unlike the pooled OLS model, the panel data analysis, which controls for unobserved factors, found that total individual medical expenditure did not increase due to enrollment itself. The results were similar before and after matching.

Table 1: Basic Characteristics of Participants

		Before matching (n=7,470)			**After matching (n=2,390)**		
		Without PHI (n=1,243)	**With PHI (n=6,227)**	**p-value**	**Without PHI (n=1,195)**	**With PHI (n=1,195)**	**p-value**
		%	**%**		**%**	**%**	
Gender	Male	54.79	47.78	<.001	52.72	52.97	0.902
	Female	45.21	52.22		47.28	47.03	
Age	mean ± SD	42.6 ± 14.0	43.7 ± 11.8	0.005	44.5 ± 14.0	44.3 ± 13.7	0.724
Marriage	No	48.99	24.04	<.001	43.6	47.03	0.092
	Yes	51.01	75.96		56.4	52.97	
Education	Middle school	24.30	18.18	<.001	27.28	27.45	
	High school	46.98	45.09		44.18	45.86	
	University	28.72	36.73		28.54	26.69	

Conted…

Income	mean ± SD	3.0 ± 1.3	3.7 ± 1.2	0.220	3.0 ± 1.3	2.9 ± 1.2	0.220
	1st quintile	13.77	4.15		13.05	11.63	
	2nd quintile	24.96	15.17		25.1	28.7	
	3rd quintile	26.49	22.53		27.45	25.86	
	4th quintile	17.95	27.59		17.99	22.26	
	5th quintile	16.83	30.58		16.4	11.55	
Employment status	Economically active	60.02	68.32	<.001	63.51	61.76	0.375
	Inactive/ unemployed	39.98	31.68		36.49	38.24	
Chronic disease	Yes	44.49	50.92	<.001	48.03	48.28	0.902
	No	55.51	49.08		51.97	51.72	
Smoking status	None-smoker	60.05	62.84	0.024	60.17	60.08	0.908
	Ex-smoker	12.82	13.77		13.31	12.8	
	Current smoker	27.12	23.39		26.53	27.11	
Physical activity	No	22.44	18.01	<.001	21.92	21.51	0.804
	Yes	77.56	81.99		78.08	78.49	
Self-rated health	Good	45.09	48.97	<.001	44.72	46.93	0.303
	Fair	41.94	41.94		42.08	41.9	
	Bad	12.97	9.09		13.21	11.17	
Total medical expenditure	Log	7.8 ± 5.9	9.7 ± 5.0	<.001	8.3 ± 5.8	9.0 ± 5.4	0.002
Out-of-pocket expenditures	Log	3.0 ± 5.1	4.1 ± 5.6	<.001	3.3 ± 5.2	3.9 ± 5.2	0.005
Unmet medical needs	No	86.89	83.82	0.013	87.21	81.86	0.001
	Yes	13.11	16.18		12.79	18.14	
PHI: private health insurance							

As Table 2 shows, aside from PHI enrollment, those who were older, married, or had a chronic disease or a lack of physical activity had increased medical expenditure. In addition, no significant relationship was found between the type of PHI (non-enrollment, fixed-benefit, indemnity) and individual medical expenditure, with similar trends in statistical significance before and after matching, as shown in Table 2.

Next, we analyzed the effect of supplementary PHI on OOP expenses. After matching, the effect of enrollment in PHI on OOP expenditure was found to be statistically significant in the pooled OLS model. Enrollment in PHI had a significant impact on OOP expenditure in the panel data analysis as well, but the regression coefficient was smaller in the panel data analysis model than in the OLS model, as shown in Table 3.

Table 2: Effect of Private Health Insurance on Total Medical Care Expenditure

		Pooled OLS model		**Fixed effect panel model**		**Pooled OLS model**		**Fixed effect panel model**	
		β	**p-value**	**β**	**p-value**	**β**	**p-value**	**β**	**p-value**
PHI (ref. without PHI)	With PHI	0.979***	<.001	0.059	0.752				
PHI types (ref. without PHI)	Fixed-benefit type					0.728***	<.001	0.189	0.325
	Indemnity type					1.242***	<.001	0.214	0.277
Gender (ref. Female)	Male	1.437***	<.001	(omitted)		1.413***	<.001	(omitted)	

Conted…

Age		0.040***	<.001	0.135***	<.001	0.042***	<.001	0.132***	<.001
Marriage (ref. No)	Yes	1.309***	<.001	1.643***	<.001	1.314***	<.001	1.638***	<.001
Education (ref. Middle school)	High school	-0.347***	<.001	0.94	0.551	-0.367***	<.001	0.944	0.55
	University	-0.305**	0.001	1.23	0.439	-0.322***	0.001	1.229	0.439
Income (ref. 1st quintile)	2nd quintile	0.138	0.3	0.042	0.784	0.123	0.355	0.039	0.796
	3rd quintile	0.376**	0.004	0.233	0.152	0.352**	0.007	0.231	0.155
	4th quintile	0.485***	<.001	0.098	0.574	0.447***	0.001	0.096	0.581
	5th quintile	0.729***	<.001	0.237	0.209	0.689***	<.001	0.235	0.214
Employment status (ref. Economically active)	Inactive/ unemployed	0.276***	<.001	-0.16	0.137	0.293***	<.001	-0.16	0.137
Chronic disease (ref. Yes)	No	-2.958***	<.001	-0.533***	<.001	-2.950***	<.001	-0.532***	<.001
Self-rated health (ref. Good)	Fair	0.469***	<.001	0.111	0.076	0.482***	<.001	0.111	0.077
	Bad	1.383***	<.001	0.217	0.054	1.387***	<.001	0.216	0.055
Physical activity (ref. No)	Yes	-0.078	0.32	-0.265**	0.001	-0.075	0.337	-0.265**	0.001
Constant		6.492***	<.001	1.972	0.234	6.470***	<.001	2.005	0.23
	sigma_u			3.8106926				3.8018073	
	sigma_e			3.276563				3.2765463	
	rho			0.57493915				0.57380027	
	Hausman test			448.95	<.001			454.51	<.001
PHI: private health insurance; * p<.05; ** p<.01; *** p<.001									

The effects on OOP expenditure varied by type of PHI. The following are results from the matched fixed-effects panel model. Compared to those without supplementary PHI plans, OOP expenditure increased by 58.6% (Coefficient=0.586, p-value=0.033) for those enrolled in fixed-benefit type insurance plans, and by 108.2% (Coefficient=1.082, p-value<.001) for those enrolled in indemnity-type insurance plans. Both types contributed to an increase in OOP, but the degree of contribution was greater for indemnity-type insurance plans. Covariates associated with increased OOP expenditure in the matched panel data analysis were older age, marriage, chronic disease, and poor self-rated health [Table 3].

Finally, we analyzed the impact of PHI on the experience of unmet medical needs. One of the important benefits that we expect from PHI is improved access to healthcare services when one needs them. The cases where healthcare was necessary but not utilized were considered to represent unmet medical needs. In the matched fixed-effects panel model, no significant relationship was found between enrollment in PHI and unmet medical needs. Table 4 illustrates that the type of health insurance also did not have any impact on unmet medical needs, and the same results were found in pooled OLS regression results and non-matching analysis [Table 4].

In this study, 83.4% of the participants were covered by PHI in 2011. In the preceding study, the PHI coverage rate was 60% on an individual basis in 2008 [13]. The above analysis found that PHI had a positive and statistically significant influence on OOP expenditure, and this finding implies that there is a moral hazard for PHI subscribers in medical utilization. Indemnity-type insurance plans, in particular, had a large effect on OOP expenditure. This result is consistent with previous studies in which PHI

adoption was associated with higher healthcare utilization, and specifically, with an indemnity plan [9, 13]. In Korea, there is a large deviation in PHI coverage depending on income, the presence of disease, and age [14]. In this situation, the increase of medical demand due to the moral hazard of PHI subscribers may have a negative impact on NHI finances [4]. The present study also showed that older age, marriage, chronic illness, and poor subjective health status increase OOP expenditure. These results correlate with previous findings suggesting that the higher the age of a patient with chronic disease, the higher the OOP expenditure, outpatient visits, and inpatient days [4].

Table 3: Effect of Private Health Insurance on Out-Of-Pocket Expenditure

		Pooled OLS model		Fixed effect panel model		Pooled OLS model		Fixed effect panel model	
		β	p-value	β	p-value	β	p-value	β	p-value
PHI (ref. without PHI)	With PHI	1.056***	<.001	0.658*	0.014				
PHI types (ref. without PHI)	Fixed-benefit type					0.732***	<.001	0.586*	0.033
	Indemnity type					1.525***	<.001	1.082***	<.001
Gender (ref. Female)	Male	1.592***	<.001	(omitted)		1.552***	<.001	(omitted)	
Age		0.048***	<.001	0.399***	<.001	0.051***	<.001	0.382***	<.001
Marriage (ref. No)	Yes	0.644***	<.001	1.068*	0.012	0.632***	<.001	1.037*	0.014
Education (ref. Middle school)	High school	-0.443***	<.001	1.641	0.468	-0.480***	<.001	1.618	0.474
	University	-0.655***	<.001	2.126	0.35	-0.687***	<.001	2.092	0.358
Income (ref. 1st quintile)	2nd quintile	0.412*	0.018	0.18	0.407	0.383*	0.027	0.173	0.424
	3rd quintile	0.842***	<.001	0.346	0.138	0.799***	<.001	0.336	0.149
	4th quintile	1.152***	<.001	0.227	0.364	1.087***	<.001	0.213	0.393
	5th quintile	1.466***	<.001	0.386	0.154	1.396***	<.001	0.37	0.172
Employment status (ref. Economically active)	Inactive/ unemployed	0.507***	<.001	-0.156	0.309	0.535***	<.001	-0.157	0.306
Chronic disease (ref. Yes)	No	-2.439***	<.001	-0.548**	0.006	-2.427***	<.001	-0.545**	0.006
Self-rated health (ref. Good)	Fair	0.559***	<.001	0.163	0.07	0.578***	<.001	0.164	0.068
	Bad	2.213***	<.001	0.403*	0.012	2.225***	<.001	0.402*	0.012
Physical activity (ref. No)	Yes	-0.049	0.629	-0.193	0.099	-0.046	0.652	-0.189	0.107
Constant		1.310***	<.001	-15.576***	<.001	1.234***	<.001	-14.850***	<.001
	sigma_u			5.539799				5.3845681	
	sigma_e			4.6934805				4.6921483	
	rho			0.58214075				0.5683919	
	Hausman test			386.34	<.001			376.06	<.001

PHI: private health insurance; * p<.05; ** p<.01; *** p<.001

On the other hand, this study provides little evidence of a positive association between PHI and unmet medical needs. In a system such as Korea's, where universal health coverage is provided by the public sector, PHI's supplementary nature does not contribute greatly to the reduction of unmet medical needs. This result is consistent with previous studies which reported that there is no significant correlation between PHI and unmet medical needs [15] but is not consistent with an earlier study which suggested that those who have PHI are less likely to experience unmet healthcare needs, particularly for those who have financial barriers [11, 16]. However, the results of the present study seem to be more credible because we used propensity score matching to reduce the endogeneity issues,

and a panel data analysis to examine the longitudinal effect of PHI on healthcare utilization and expenditure. The results show that supplementary PHI increased OOP expenditure but failed to decrease unmet medical needs, which implies that rather than providing coverage for essential services, PHI increases healthcare utilization rates at the point of use. Additional analyses of the contribution of supplementary PHI and exploration of policy alternatives are required to address Korea's rapid increase in medical expenditure. Some of the study limitations are as follows. First, due to the matching procedures, the sample size has been reduced by around half to match the number of those without PHI. Also, there may be errors due to missing medical expenditure values or input errors. However, the matching procedure was essential to control for endogeneity between enrollment in PHI and healthcare utilization. Medical expenditure information was collected from objective data sources, such as receipts, which reduces the risk of recall bias and implies more reliability than survey response-based data. Also, despite the variety of PHI plans and products with a wide spectrum of coverage based on contracting types, we simplified PHI plans into three types: non-enrollment, fixed-benefit, and indemnity. Careful analysis of the results is required because we grouped both fixed-benefit and indemnity types of insurance together as, simply, indemnity-type insurance.

Table 4: Effect of PHI on Unmet Medical Needs

		Pooled OLS model		Fixed effect panel model		Pooled OLS model		Fixed effect panel model	
		OR	**CI**	**OR**	**CI**	**OR**	**CI**	**OR**	**CI**
PHI (ref. without PHI)	With PHI	1.054	[0.952,1.166]	1.083	[0.759,1.546]				
PHI types (ref. without PHI)	Fixed-benefit type					1.074	[0.969,1.190]	1.194	[0.831,1.716]
	Indemnity type					1.069	[0.956,1.194]	1.04	[0.715,1.512]
Gender (ref. Female)	Male	1.198***	[1.105,1.299]	1	[1,1]	1.197***	[1.104,1.299]	1	[1,1]
Age		0.997	[0.993,1.002]	0.885***	[0.845,0.927]	0.997	[0.993,1.002]	0.888***	[0.847,0.931]
Marriage (ref. No)	Yes	0.95	[0.860,1.049]	0.578	[0.320,1.042]	0.949	[0.860,1.048]	0.584	[0.324,1.054]
Education (ref. Middle school)	High school	0.884*	[0.791,0.987]	(omitted)		0.884*	[0.792,0.987]	(omitted)	
	University	0.868*	[0.765,0.985]	(omitted)		0.868*	[0.765,0.985]	(omitted)	
Income (ref. 1st quintile)	2nd quintile	0.789**	[0.673,0.926]	0.887	[0.680,1.158]	0.787**	[0.671,0.924]	0.885	[0.679,1.156]
	3rd quintile	0.731***	[0.625,0.856]	0.913	[0.686,1.216]	0.729***	[0.623,0.854]	0.912	[0.685,1.214]
	4th quintile	0.636***	[0.542,0.746]	0.822	[0.604,1.119]	0.633***	[0.539,0.743]	0.824	[0.605,1.121]
	5th quintile	0.560***	[0.476,0.659]	0.783	[0.557,1.099]	0.557***	[0.474,0.656]	0.784	[0.558,1.101]
Employment status (ref. Economically active)	Inactive/ unemployed	0.698***	[0.638,0.764]	0.989	[0.801,1.221]	0.698***	[0.638,0.764]	0.99	[0.801,1.222]
Chronic disease (ref. Yes)	No	1.039	[0.951,1.137]	0.922	[0.707,1.203]	1.04	[0.951,1.138]	0.922	[0.707,1.202]
Self-rated health (ref. Good)	Fair	1.924***	[1.766,2.097]	1.745***	[1.539,1.977]	1.925***	[1.767,2.098]	1.746***	[1.540,1.978]
	Bad	3.416***	[3.031,3.849]	2.403***	[1.986,2.907]	3.417***	[3.032,3.850]	2.403***	[1.986,2.908]
Physical activity (ref. No)	Yes	1.132*	[1.018,1.258]	1.222*	[1.046,1.427]	1.132*	[1.018,1.258]	1.223*	[1.047,1.429]
	Hausman test			15.51	0.0166			15.51	0.0166

PHI: private health insurance; * p<.05; ** p<.01; *** p<.001

Conclusion

This study is an empirical analysis of the effects of PHI (enrollment and type) on medical expenditure and the experience of unmet medical needs after adjusting for health status confounders and time-variant factors. The effects of PHI on total medical expenditure and unmet medical needs are not significant after controlling for endogeneity issues. However, it was found that PHI had a significant effect on the increase of OOP payment at point of use, including payments for non-NHI covered services.

The result reflects that the moral hazard under PHI exists partially, and at the same time, PHI does

not contribute to improving access to necessary care. Therefore, we need to closely monitor the impact of PHI on healthcare expenditure and try to find a way to meet unmet medical needs through reforming NHI with PHI.

Based on the results of this study, it is necessary to look closely at the interactions between PHI subscriptions and medical utilization, and to continuously monitor how the effect of PHI on unmet medical needs and medical utilization changes in such situations. In addition, it is necessary to merge the information about the subscribers held by PHI insurance companies with the information accumulated by NHI, to clearly demonstrate the relationship between PHI coverage and medical expenditure.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Effects of Cognitive Stimulation Task on Cognitive State and Activity Participation in Elderly People with Mild Cognitive Impairment (MCI)

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ABSTRACT

Background/Objectives: To investigate the effect of cognitive stimulation task for community living elderly people with MCI on cognitive function and activity participation.

Method/Statistical Analysis: Subjects were 15 community-dwelling elderly persons. The cognitive behavior therapy included the warming up, cognitive stimulation program, cognitive activity program, and cooling down. MMSE-DS to evaluate the cognitive state, and K-ACS to evaluate the activity participation level were conducted with all subjects before and after the intervention in the same method. All statistical analysis method were performed using SPSS version 21.

Findings: Among all participants, men were 4(26.67%) and women were 11(73.33%). significant difference of cognitive state was found between the pre and the post-test. A number of studies have shown that cognitive stimulation program can help maintain opposite to cognitive decline. K-ACS was significant differences between leisure (p=0.034) and social activities(p=0.028). The mean instrumental activities score increased, but this was not significant. This is similar to the result of a study that meaningful activities through the intervention are an important factor on the life of elders.

Improvements/Applications: This research provide useful information for designing efficient interventions and identifying their good influence for progress of community involvement. Future research should examine the effects of community activities on the social impact of the elderly.

Keywords: *Activity participation, Cognitive stimulation program, Cognitive state, Elderly person, MCI*

Introduction

Dementia due to aging around the world has become one of the major diseases affecting public health and has become a social problem. The prevalence of dementia is expected to double by in 2020 and triple in 2050[1]. Mild cognitive impairment (MCI) is a transitional phenomenon between naturally aging and neurocognitive disorder[2]. The concept of MCI has come to the knowledge in the United States, where large-scale research projects have been studied. There is an ultimate view that provides treatment, and thus reduces the risk of developing senile dementia[3]. MCI symptoms refers to a condition other than dementia, such as cognitive dysfunction or disability, decreased community activities, or difficulty in performing regular life living activities[4]. In the case of a typical MCI, cognitive decline or memory impairment does not impair the daily life of the elderly, but maintains a function lower than expectations for the individual's age and educational level[5-7]. However, impaired cognitive ability can have a negative impact on social, functional, and vocational activities.

Cognitive behavior therapy (CBT) was considered the most preferred researched psychological therapy methods, and more than 300 studies on CBT have been published until now. CBT is being applied to a variety of disorders and problems[8]. The main goal of CBT is to train cognitive and behavioral abilities efficiently to cope

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with mental stress and abnormal situations[9]. Cognitive treatment programs consist of cognitive stimulation task, orientation, memory, and concentration training. The universal cognitive stimulation task refers to a program that is applied to group therapy and designed to improve cognitive function and social communication function. Cognitive program involves individually composed sessions centered on specific activities that use brain and body together (e.g. calculation through market play) [10, 11].

Participation is included in the context of life or in a variety of activities, and is described in the International Classification of Functioning, Disability and Health (ICF)[12]. Participation is made up of one of three elements of function in the ICF. Successive activity participation has been shown to positively affect physical, mental, social health and well-being and quality of life. However, when participation is limited, social interaction is reduced and work life, community activities, mobility, and communication decline[13]. Therefore, participation level is very important for the life of the elderly.

Previous research on group therapy has shown that various nonpharmacological treatments improved the cognitive function of elderly people with MCI. However, there is a shortage of research on the effects of cognitive functioning on individual participation. Thus, the goal of this research was to examine the effect of cognitive stimulation task for community living order people with MCI on cognitive function and activity participation.

Materials and Method

Subjects: The study was for 4 months, on from March 2017 to June 2017 at the J City Community Health Center in Republic of Korea. Subjects were 15 community-dwelling elderly over than 70 years old. Incluion criteria for subject required willingness to the study, walk independently, no diagnosed with dementia, ability to communicate about basic action and understand the program's object. All participants understand and signed the informed agreement to join in the experiment in according to the ethical principles. This study methods were acknowledged by the Semyung University Ethics Committee. Among all participants, men were 5(33.3%) and women were 10(66.7%). Average age was 77.93 ± 3.97 years old and average of educational years was 6.53 ± 3.58.

Procedures: All researchers completed the regular curriculums of certified institutions and participated in the program. This study used a pre and post-test design of a one group. The cognitive behavior therapy included the following activities: warming up for 10 minutes, cognitive stimulation program for 30 minutes, cognitive activity program for 40 minutes, and cooling down for 10 minutes. The subjects also had a rest time for about 10 min in the middle of the program depending on their conditions [Table 1]. The cognitive stimulation activity involved numbers, shapes, depths, memories, and cognitive activities that could stimulate the subjects' brains. For the cognitive activity program, the subjects used their hands to make things or participated in a simple sports game. An experienced occupational therapist performed the cognitive behavior therapy on all participants for 1 hour and a half sessions per week, for 15 weeks.

Table 1: Cognitive Behavior Therapy

Time	Contents
10Minute	Greeting, Gymnastics for Dementia Prevention
30 Minute	Cognitive Stimulation Program
40 Minute	Cognitive Activity Program
10 Minute	Joint Movement, Notices

Outcome Measures: All assessments were performed by the staff of occupational therapy and trained student of the occupational therapy. The assessment battery included the Korean version of the Mini-Mental State Examination for Dementia Screening (MMSE-DS), which is a brief cognitive status screening test. This scale is a total of 19 items, ranging from 1 to 5 depending on the item. The range of the score is from 0 to 30, and the higher the score, the better the cognitive state. To interpret the results with MMSE-DS scores, you need to know your gender, age, and academic background. Based on these three criteria, the cognitive decline is judged based on the score interpretation table[14].

Baum and Edwards developed the Activity Card Sort(ACS) to evaluate the activity participation level of the elders aged 65 or more who were hospitalized or living in the community[15]. Based on the photographs, the Korean Activity Card Sort (K-ACS) was revised by Lee et al., and collected information on social, instrumental and leisure activities according to the living environment[16]. The K-ACS consists of establishment versions, recovery and community living versions. In this study, community living version was used for assessment. The community

life version shows 67 pictures of activities, and the subjects should be classified into four levels (instrumental activity of daily living, low-intensity physical activity, high-intensity physical activity, and social activity). The scoring method is to calculate the possession rate of participating activities = current activity level/past activity level × 100, where the current activity level for each of the instrumental activities, social activities, and leisure activities = 'activities that they do now in the same level as before' + 'activities that they do less than before' + 'new activities that they began after 60' and the past activity level = 'activities that the participant did in the past'. The test-retest of the reliability of the K-ACS recorded .87 for community older people[17].

Statistical Analysis: All statistical analysis was done using Win SPSS (version 21 ; SPSS Inc, Chicago, IL, USA). We analyzed gender with frequency analysis, age and years of education with descriptive statistics. Cognitive status and levels of participation in activity were compared by Wilcoxon signed-rank tests before and after the intervention. The $p < 0.05$ was considered to be statistically significant.

Results and Discussion

Subjects: In total, 15 subjects completed this study. Among all participants, men were 4(26.67%) and women were 11(73.33%). Average age was 77.93 ± 3.97 years old and average of educational years was 6.53 ± 3.58 [Table 2].

Table 2: Characteristics of Participants

		Subject (%)
Sex	Male	4(26.67%)
	Female	11(73.33%)
Age (M ± SD)		77.93 ± 3.97
Education in Years (M ± SD)		6.53 ± 3.58
Living Arrangement	Alone	10(66.67)
	Couple	4(26.67)
	Children	1(6.66)
Maid	Full Time	0(0.00)
	Part Time	9(60.00)
	Without Maid	6(40.00)

47.5 million people are living with neurocognitive disorder worldwide and the prevalence is expected to double every 20years[17]. Healthy elderly people are also at swelled risk of developing neurocognitive impairment (20%–50% over a period of 2–3years), and the fact that the drug is not the best treatment in the case of symptoms emphasizes the importance of nonpharmacologic early intervention[18, 19].

Cognitive State and Activity Participation: Table 3 shows the changes in cognitive state, and activity participation after the intervention. The MMSE-DS was used for the evaluation of cognitive state. A statistically difference was showed between the pre and the post-test(p=0.011). Many previous studies have reported that cognitive stimulation activity helps prevent cognitive decline in the elderly. These programs provide positive effects of keeping or enhancing cognitive function and may stave off or slow the advance to neurocognitive impairment[20, 21]. In a study that used CBT as intervention, the MMSE score of the experimental group significantly increased, which agreed with the result of this study[22].

Table 3: Comparison of Activity Participation by Area in Pre and Post-test

Variable		Pre-test	Post-test	p
		Mean ± SD	Mean ± SD	
MMSE-DS		22.00 ± 1.51	23.87 ± 1.35	0.011*
K-ACS	IADL	68.21 ± 3.12	69.76 ± 2.31	0.383
	Leisure	70.32 ± 4.11	80.98 ± 2.12	0.034*
	Social Activities	65.04 ± 4.82	78.18 ± 6.34	0.028*

*p<0.05. MMSE-DS: Mini-Mental State Examination for Dementia Screening, K-ACS: Korean Activity Card Sort, IADL: Instrumental activities.

The K-ACS examines the activity participation level. According to the results, there were significant differences between leisure (p=0.034) and social activities(p=0.028). The mean instrumental activities score increased, from 68.21 ± 3.12 to 69.76 ± 2.31, but this was not significant (p=0.383). This is similar to the result of a study that meaningful activities through the intervention are an important factor on the life of elders. However, the instrumental activities score showed no statistically significant differences. This result seems to be due to lack of the area related to daily life in the intervention program. Most of the instrumental activities are dependent on the guardians, and the elders with mild cognitive impairment could not do them by themselves. Furthermore, it is difficult to directly train instrumental activities during CBT. Baek et al. assessed the ACS for three subjects after

individual home occupational therapy, all three of them showed improvements in the ability of living, two of them showed improvements in leisure activities, and only one of them showed improvement in social activities[23]. This is different from the result of this study because the study design, intervention method, and the number subjects are different. Many previous studies acknowledged the importance of activities in the quality of life of the elders and researched the patterns, levels, and frequencies of the activities because "the fact that people are involved in activities means that they are alive." In particular, ACS is used in many countries as an assessment tool for the performance level of activities of the elders. The ACS is often used as an assessment tool for the degree of involvement of the subject in rehabilitation areas. However, there were no previous studies that provided CBT as treatment for subjects with MCI or neurocognitive impairment and assessed their ACS.

This study has several possible limitations. First, the number of subjects was small size to generalize the results to a larger population of participants. Second, the K-ACS has a simple advantage that it is a self-measuring tool, but it has the disadvantage that it can not accurately determine or measure the actual participation. Because this study was conducted with group therapy activities, there are limitations in providing individualized intervention to individual subjects. In the future, personal care services provided to patients with mild cognitive impairment should help individuals participate in activities rather than housework.

Conclusion

Participation in activities is an ideal ways of sustaining physical and mental functioning and feeling happiness in life. However, limiting activity is a matter of a realistic elderly person who negatively affects individuals by their personal and social impacts. Therefore, in this study, we analyzed the difference of activity by providing intervention to MCI whose activity decreased. Using the results of this study as basic data, it is necessary to promote social participation of the senior citizens living in the community so that the senior citizens are not bored and alienated at home. These results will be linked to the job creation and community care of the elderly that the Korean government is currently pursuing.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Grid Recognition among Radiological Technologists in South Korea

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ABSTRACT

This research was to examine how radiological technologists use and perceive grids. The study entailed a survey of 201 radiological technologists working in Korean medical institutions (general and specialty hospitals and a clinic). Its aim was to improve their use of grids and to provide basic data about grids. A survey was conducted of 201 radiological technologists working in Korean medical institutions regarding the relationships between grid ratio and dose and between grid ratio and video quality as well as differences in video quality and in dose between mobile and fixed grids. There were also five questions on respondents' sociodemographic characteristics. There were significant differences in recognition of adequate grid ratios and of the relationship between grid ratio and dose among radiological technologists working indifferent types of medical institutions ($p<0.01$) technologists at the clinic level showed the highest recognition that their currently installed grid ratios were adequate. There were also significant differences in recognizing the differences in video image and dose between mobile and fixed grids depending on the different types of medical institutions and differing work durations ($p< 0.05$). To improve image quality and reduce patients' exposure doses, it is desirable that there be proper education on grids.

Keywords: *Grid, Grid ratio, Adequacy, Recognition, Radiological technologists*

Mathematics *Subject Classification: 92C15, 92C55*

Journal of *Economic Literature (JEL) Classification : I19*

Introduction

Modern medicine has made much progress. Development of diagnostic radiation devices has brought about synergy effects that enable precise diagnosis in the medical field while improving the quality of medical treatments at the same time. In particular, as part of information technology developments, signal systems were developed that receive and develop images from diagnostic radiation devices.[1] As the image receptors of the film in film-screen systems and existing analogy systems were replaced by computed and digital radiography, image quality improved greatly.[2] Image quality is determined by the software processing in digital radiography systems and by grids and filters that eliminate scattered rays. In particular, grids can improve image contrast by first removing the scattered rays generated when passing through the subject.[3] High grid ratios greatly reduce scattered rays, which improves images but also increases attenuation of the primary rays, which necessarily increases patients' exposure doses.[4] Companies that sell diagnostic radiation devices often use high grid ratios to highlight the superior quality of their images. In the past, the grid ratios of diagnostic radiation devices were 8:1–12:15 but now the ratios are 14:1–16:1 and the devices have set values.[6,7] Despite the importance of selecting and using appropriate grid ratios, there is little research on the subject. The aim of this study, by offering adequate grid ratios and highlighting

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changes in image quality depending on grid changes and evaluation, was to reduce exposure doses in not only patients but also radiological technologists. Toward that end, this research entailed conducting a survey of radiological technologists working in various medical institutions in Korea to analyze current grid usage and recognition. The specific intent was to improve technologists' grid use and provide basic data on grids.

Research Target and Method

Research Objects: The target of this questionnaire survey was Korean radiological technologists working in general, university, or other hospitals or in clinics. The period for data collection was from August 1, 2017, to December 31, 2017, and the surveys were distributed by e-mail and paper mail. Two hundred and one technologists returned their surveys, and all surveys were used for statistical analysis. The average age of the respondents was 33.91 years old, with the majority, 47.5%, in their 30s. Just under half 49.3 were technical college graduates, and another 44.8% were university graduates. Average work experience was 8.30 years, and the majority of technicians, 57.2%, worked in general hospitals. Average age of respondents was 33.91 years old, and, among the respondents, those in their 30s took the largest proportion (47.5%). Technical colleges graduates were 49.3%, and university graduateswere 44.8%. Average work years were 8.30 years. The majority of them (57.2%) were in general hospitals(Table 1).

Table 1: Characteristics of Research Subjects

Sortation		N	%
Gender	Man	150	74.6
	Woman	51	25.4
Age	20s	65	32.8
	30s	94	47.5
	40s	33	16.7
	50s	6	3.0
Academic background	Associate degree	99	49.3
	Bachelor	90	44.8
	Master	7	3.5
	Doctor	5	2.5
A hospital career	~3 years	50	24.9
	4 ~ 7 years	60	29.9
	8 ~ 10 years	37	18.4
	11 ~ 15 years	29	14.4
	16 years over	25	12.4
The type of medical institutions	clinic	3	1.5
	general hospital	23	11.4
	university hospital	60	29.9
	hospital	115	57.2

N= Number of persons, %=Percent

Measuring Tool: To assess the radiological technologists' grid recognition, a five item questionnaire was developed to evaluate their knowledge on appropriate grid ratios, the relationships between grid ratio and dose and between grid ratio and image, and the image and dose differences between moving and stationary grids. The face validity of the five items was obtained from a supervising professsor and from doctoral students majoring in radiation. The questions were rated on 5-point Likert scales where higher scores indicated better grid knowledge. For the analyses, individual questions were used, but they were not scaled

Method of Data Analysis

To verify the validity of the questionnaire, data analysis consisted of frequency, mean difference, and crossover analyses using SPSS for Windows ver. 21.0. First, frequency analysis was carried out to identify sociodemographic and career characteristics. Second, t tests and one-way ANOVA were performed to identify the differences in grid recognition based on the participants' sociodemographic and career characteristics.

Results

Recognition of Adequate Grid Ratios: There were significant differences in recognition of adequate grid ratios in diagnostic radiation depending on the type of medical institution [$F = 4.837$, $p < 0.01$]. Because the differences between groups were not significant in ex-post analysis, average values were analyzed, and there were differences. The proportion of those who perceived that grid ratios were adequate was the highest among clinic technicians, followed by those working in general and specialty hospitals(Table 2).

Table 2: Recognition of Adequate Grid Ratios

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	146	2.79	.483	-.370	-
	Woman	51	2.82	.478		
Age	20s	62	2.81	.568	.209	N.S
	30s	93	2.77	.445		
	40s	33	2.85	.442		
	50s	6	2.83	.408		
Academic Background	Associate Degree	98	2.81	.490	.042	N.S
	Bachelor	87	2.79	.486		
	Master	7	2.86	.378		
	Doctor	5	2.80	.447		
A Hospital Career	~3 years	47	2.85	.551	1.115	N.S
	4 ~ 7 years	60	2.70	.497		
	8 ~ 10 years	36	2.89	.398		
	11 ~ 15 years	29	2.83	.468		
	16 years over	25	2.80	.408		
The Type of Medical Institutions	Clinic	3	3.00	.000	4.837**	a
	General Hospital	23	2.96	.367		
	University Hospital	60	2.62	.524		
	Hospital	111	2.86	.457		
**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of the Relationship between Grid Ratio and Dose: The technologists' differences in recognizing that higher grid ratios entailed higher doses differed significantly by type of medical institution ($F = 4.073$, $p < 0.01$), (Table 3).

Table 3: Recognition of the Relationship between Grid Ratio and Dose

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.28	.625	-.587	-
	Woman	50	2.34	.626		
Age	20s	65	2.31	.610	2.137	N.S
	30s	93	2.32	.628		
	40s	33	2.27	.626		
	50s	6	1.67	.516		
Academic Background	Associate Degree	99	2.28	.686	.454	N.S
	Bachelor	89	2.33	.560		
	Master	7	2.29	.756		
	Doctor	5	2.00	.000		
A hospital Career	~3 years	50	2.36	.631	.932	N.S
	4 ~ 7 years	59	2.32	.628		
	8 ~ 10 years	37	2.22	.672		
	11~ 15 years	29	2.38	.561		
	16 years over	25	2.12	.600		

Conted…

The Type of Medical Institutions	Clinic	3	1.67	.577	4.073**	a
	General Hospital	23	2.17	.778		ab
	University Hospital	60	2.50	.537		b
	Hospital	114	2.23	.610		ab
**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of the Relationship between Grid Ratio and Image Quality: There were significant differences in recognizing that higher grid ratios resulted in higher image quality, also by type of medical institution (F = 5.304, p < 0.01), (See Table 4).

Table 4: Recognition of the Relationship between Grid Ratio and Image Quality

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.23	.699	-1.449	-
	Woman	51	2.39	.603		
Age	20s	65	2.32	.640	.978	N.S
	30s	94	2.27	.691		
	40s	33	2.24	.751		
	50s	6	1.83	.408		
Academic Background	Associate Degree	99	2.19	.724	1.723	N.S
	Bachelor	90	2.39	.612		
	Master	7	2.14	.900		
	Doctor	5	2.00	.000		
A Hospital Career	~3 years	50	2.32	.621	1.005	N.S
	4 ~ 7 years	60	2.27	.686		
	8 ~ 10 years	37	2.19	.776		
	11 ~ 15 years	29	2.45	.572		
	16 years over	25	2.12	.726		
The Type of Medical Institutions	Clinic	3	2.67	1.155	5.304**	a
	General Hospital	23	2.04	.706		
	University Hospital	60	2.53	.596		
	Hospital	115	2.17	.666		
**p<0.01 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of Dose Differences between Mobile and Fixed Grids: There were significant differences in the radiological technologists' recognition of the dose differences between mobile and fixed grids by type of medical institution (F = 2.770, p < 0.05), (Table 5).

Table 5: Recognition of the Dose Differences between Mobile and Fixed Grids

Sortation		N	M	S.D	t/F-value	Duncan
Gender	Man	150	2.63	.871	-.237	-
	Woman	50	2.66	.823		
Age	20s	65	2.52	.687	.835	N.S
	30s	94	2.73	.941		
	40s	33	2.58	.902		
	50s	6	2.67	1.033		

Conted…

Academic Background	Associate Degree	99	2.65	.884	1.770	N.S
	Bachelor	89	2.62	.805		
	Master	7	3.14	1.215		
	Doctor	5	2.00	0.000		
A Hospital Career	~3 years	50	2.52	.614	.788	N.S
	4 ~ 7 years	60	2.60	.764		
	8 ~ 10 years	37	2.84	1.214		
	11 ~ 15 years	28	2.61	.832		
	16 years over	25	2.68	.900		
The Type of Medical Institutions	Clinic	3	3.00	1.732	2.770*	b
	General Hospital	23	2.17	.834		a
	University Hospital	60	2.65	.709		ab
	Hospital	114	2.71	.890		ab
*p<0.05 N= Number of persons, M=Mean, SD=Standard Deviation						

Recognition of the Differences in Image Quality between Mobile and Fixed Grids: There were significant differences in the technologists' recognition of the differences in image quality between mobile and fixed grids by duration of work experience ($F = 3.020$, $p < 0.05$) and by type of medical institution ($F = 3.761$, $p < 0.05$), (Table 6).

Table 6: Recognition of the Differences in Image Quality between Mobile and Fixed Grids

Sortation		N	M	S.D.	t/F-value	Duncan
Gender	Man	150	2.59	.876	.047	-
	Woman	50	2.58	.810		
Age	20s	65	2.52	.664	.541	N.S
	30s	94	2.64	.926		
	40s	33	2.48	1.004		
	50s	6	2.83	.983		
Academic Background	Associate Begree	99	2.55	.884	1.419	N.S
	Bachelor	89	2.61	.778		
	Master	7	3.14	1.215		
	Doctor	5	2.20	1.095		
A Hospital Career	~3 years	50	2.58	.702	3.020*	ab
	4 ~ 7 years	60	2.37	.663		a
	8 ~ 10 years	37	2.97	1.166		b
	11 ~ 15 years	28	2.61	.737		ab
	16 years over	25	2.52	1.005		a
The Type of Medical Institutions	Clinic	3	3.67	1.528	3.761*	b
	General Hospital	23	2.17	.717		a
	University Hospital	60	2.68	.725		
	Hospital	114	2.59	.900		
*p<0.05 N= Number of persons, M=Mean, SD=Standard Deviation						

Discussion and Conclusion

In radiologic imaging, grids improve image contrast primarily by removing the scattered rays generated when X-rays pass through patients during normal scanning. However, high grid ratios lead to greatly reduced scattered rays and increased attenuation of the primary rays, which results in higher patient exposure doses.[8] Specifically, grid functions vary depending on the first ray transmittance, scattered ray transmittance, and total dose transmittance; transmittance can be broader or narrower depending on grid ratio. However, as grid ratio increases, grid function decreases, and exposure rate necessarily increases.[5] The grid ratio is the ratio of the height of the lead foil to the distance between the lead foils.[9] High grid ratios increase the removal rate of the scattered rays, but it also increases the absorption of the primary rays in the grid, which increases the number of shoots. Additionally, the higher the grid ratio, the greater the contrast.[10] However, because the dose increases at low tube voltage, which in turn increases the exposure dose, the grid should be selected based on tube voltage.[4] The current standard is that during high tube voltage shooting, the grid ratio should be 10:1 or 12:1, during low tube voltage shooting, the ratio should be 8:1, and when shooting the head, spine or abdomen, the ratio should be 6:1 or 8:1.[6] Because of the high radiation exposure doses with grids, radiological science departments are currently teaching students to use non-grid devices to examine thin subjects.[11] However, the digital radiography equipment for clinical use does not allow non-grid examination because grids are attached, and thus, patient exposure doses are increasing. Also, despite the fact that the grids are easily attached and detached, technologists do not remove the grids during examinations because they are not aware of non-grid examinations.[12] In this study, the technologists' scores for recognizing the relationship between grid and dose averaged 2 points on a 5-point scale ($p < 0.05$), which was very low. In this study, the Korean radiological technologists averaged a score of 2 on a 5-point scale for grid recognition, which was considered somewhat low. There were significant differences in recognizing grid ratio adequacy as well as recognizing the relationships between grid ratio and dose and between grid ratio and image quality depending on the technologists' personal characteristics and type of medical institution.

Based on the findings of low grid recognition among the Korean radiological technologists in this study, it appears that better education on grids is needed in order to enhance image quality while reducingpatients' radiation exposure doses.

Ethical Clearance: Not Required

Source of Funding: Self

Conflict of Interest: Nil

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Automatic Exposure Control in Chest Radiography

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ABSTRACT

Recent advances in medical imaging technologies have led to the increased use of automatic exposure control (AEC) in digital X-ray equipment. This study is an attempt to measure the dose of exposure based on AEC use and to evaluate the image quality in chest radiography where AEC is used most frequently. We measured the dose of radiation using three (3) units of digital radiation generators for diagnosis in conditions that are frequently used in chest radiography (110kVp, 115kVp, 120kVp, 125kVp). We placed the dosimeter in front of a chest phantom while varying the distance of FID to 110 cm, 140 cm, and 180 cm depending on whether or not AEC was used. The CNR and SNR of the images obtained by setting the lung to signal, 5 regions of Interest (ROIs), and 5 places of media sternum to noise, were measured using the Image J Program. To determine the dose difference based on AEC use, we conducted a t-test, which revealed a significant difference. When AEC was used at FID 110 cm, a high dose of 11.98% appeared. When AEC was used at FID 140cm, a high dose of 8.64% appeared. When AEC was used at FID 180 cm, a high dose of 6.74% appeared. In the t-test for the difference in CNR and SNR based on AEC use, no significant difference was detected. As the distance of FID increased, high values of CNR and SNR were measured.The results of this study show that there is no difference between CNR and SNR regardless of the use of AEC, and the dose was high when using AEC. Therefore, chest X - ray examination should not be based on AEC only. Under appropriate radiological settings, it is possible to reduce unnecessary radiation exposure to the patient.

Keywords: *Automatic exposure control, Chest radiography, Exposure doses, CNR, SNR*

Mathematics Subject Classification: *92C55, 92C50.*

Journal of Economic Literature (JEL) Classification : *I19*

Introduction

In the medical field, radiology equipment and facilities are evolving rapidly due to advances in science[1,2]. Advances in computer technology facilitate dose determination for radiation based on factors such as the examination area of the patient, body shape, and the status of adult or child. However, in reality, it is impossible to determine the most appropriate conditions for patient examination. Several medical institutions introduced Automatic Exposure Control (AEC), first introduced by Morgan in 1942. AEC is a device that allows automatic adjustment of the appropriate radiation dose for the concentration of the image using an ionization chamber[3]. Even when it is an identical examination or identical area in normal radiology, examination conditions are tailored to the patient. However, in many hospitals, it is impossible to consider the patient's body shape or condition each time the examination is performed. Therefore, AEC is used to automatically set the required test conditions, most commonly used in chest radiography[4–8]. The use of AEC has expanded the area of diagnosis by facilitating the examination of the mediastinal region that was not possible in the analog system, despite the poor reliability[3,7]. In the case of AEC, three ionization chambers are used. If the position of the ionization chamber and the position of the patient do not coincide with each other, an error occurs in the calculation of the radiation dose, resulting in an increase in the exposure dose. To correct this situation, equipment companies

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install AEC inside an Image Detector (Table Detector, Stand Buck), although many medical institutions do not use this equipment[3]. The purpose of this study is to analyze the radiation doses based on AEC use in chest radiography in order to provide directions for improved AEC use and to provide basic data for AEC study.

Materials and Method

Measuring Instrument: We used a Global 1 Platform (R-150-800, GE Healthcare, USA), FDR AcSelerate (R-150-1000, Fuji film, Japan), and DRX-Evolution (R-150-800, Carestream, USA), digital radiation generators for diagnosis of A hospital that is located in S city of Korea (Fig1, 2, 3). As the phantom for image acquisition and dose measurement, a human-body shaped multi-purpose Chest Phantom N1 "LUNGMAN" (Kyoto Kagaku, Japan) was used (Fig4). Dose measurement was performed using Unforce Thin X RAD Dosimeter (Raysafe, Sweden), (Fig 5).

Figure 1: Global 1 Platform

Figure 2: FDR AcSelerate

Figure 3: DRX-Evolution

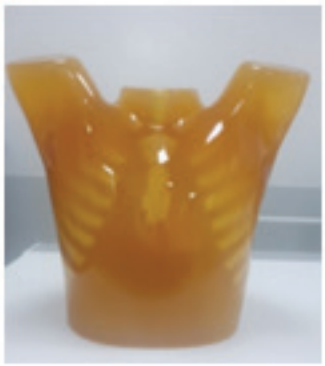

Figure 4: Chest Phantom N1

Figure 5: Unforce Thin X RAD

Experimental Method: To acquire images for dose analysis, a chest phantom was placed in front of the detector, and AEC mode was selected while varying the distance between the detector and the tube, the distance of FID to 180 cm, 140 cm, and 110 cm, under conditions commonly used in chest radiography (110kVp, 115kVp, 120kVp, 125kVp). In order to compare exposure doses based on AEC use, images were acquired under the same chest examination conditions without selecting AEC mode, and the dose was analyzed. Radiation doses were measured by placing the dosimeter in front of the chest phantom.

Image Evaluation: For image evaluation, Signal-to-Noise Ratio (SNR) and Contrast-to-Noise Ratio (CNR) of the images obtained using a chest phantom were measured by setting the lung part to signal, 5 places of ROI, and 5 places of medial sternum to noise using the Image J Program. The obtained images were evaluated with SNR and CNR based on whether or not AEC was used and the variation of FID distance (180 cm, 140 cm, and 110 cm), (Fig 6).

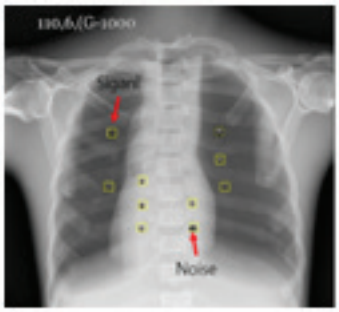

Figure 6: Image Evaluation Point

For measurement values of ROI, we obtained the minimum, maximum, average, and standard deviation values respectively, and based on these values measured SNR and CNR[9].

Results

Dose Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out. When AEC was used, the average dose was measured as 182.33μGy at FID 110 cm, 143.67μGy at 140 cm, and 128.17μGy at 180 cm. In the absence of AEC, the average dose was 162.83μGy at FID 110 cm, 132.25μGy at 140 cm, and 120.08μGy at 180 cm. The dose difference was statistically significant based on AEC use: It was 11.98% higher when using AEC at FID 110 cm ($p < 0.01$). When using AEC at FID 140cm. the dose difference based on AEC use was 8.64% higher, which was statistically significant again ($p<0.01$). When using AEC at FID 180cm, the dose difference based on AEC use was 6.74% higher, which was a statistically significant difference ($p<0.05$). The dose difference based on AEC use was measured higher as FID was closer (Table 1).

Table 1: Dose Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	182.33(61.364)	3.768**
	Not Use	12	162.83(47.551)	
140cm	Use	12	143.67(56.269)	3.921**
	Not Use	12	132.25(51.879)	
180cm	Use	12	128.17(53.349)	2.386*
	Not Use	12	120.08(46.424)	
N=Number of Samples, M= Mean, SD=Standard Deviation				

CNR Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out as shown in table 2. CNR based on AEC use was measured as 5.59 when AEC was used at FID 110 cm, and it was measured as 5.57 when AEC was not used, and there was no statistically significant difference. CNR based on AEC use was 5.96 when AEC was used at FID 140cm. CNR was 5.95 when AEC was not used, and there was no significant statistical difference. CNR based on AEC use was 6.44 when AEC was used at FID 180cm, and it was 6.45 when AEC was not used, and there was no statistically significant difference. As FID increased, CNR value remained elevated. There was no difference in CNR value between the times when AEC was used and when AEC was not used (Table 2).

Table 2: CNR Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	5.59(.087)	1.362
	Not Use	12	5.57(.077)	
140cm	Use	12	5.96(.167)	.581
	Not Use	12	5.95(.162)	
180cm	Use	12	6.44(.103)	.804
	Not Use	12	6.45(.117)	
N=Number of Samples M= Mean SD=Standard Deviation				

SNR Based on AEC Use: To determine dose difference based on AEC use, an independent t-test was carried out as shown in table 3. SNR based on AEC use was 7.50 when AEC was used at FID 110 cm, and it declined slightly to 7.48 when AEC was not used, without any statistically significant difference. SNR based on AEC use was 7.92 when AEC was used at FID 140cm, and it was 7.91 when AEC was not used, and no statistically significant difference was noted. SNR based on AEC use was 8.48 when AEC was used at FID 180cm, and it was 8.44 when AEC was not used, suggesting lac of ant statistically significant difference. As FID increased, the SNR value increased. No difference in SNR value was observed with or without AEC(Table 3).

Table 3: SNR Based on AEC Use

Distance	AEC Use	N	M(SD)	t-value
110cm	Use	12	7.50(.128)	1.362
	Not Use	12	7.48(.134)	
140cm	Use	12	7.92(.266)	.581
	Not Use	12	7.91(.267)	
180cm	Use	12	8.48(.172)	.804
	Not Use	12	8.44(.155)	
N=Number of Samples M= Mean SD=Standard Deviation				

Discussion and Conclusion

The International Commission on Radiological Protection states that all medical exposures should be justified just like occupational exposures. As Low As Reasonably Achievable (ALARA) exposures are recommended according to the principle of optimization. The principle of justification should remain as low as reasonably achievable based on the frequency of individual radiation exposure, and the economic and social factors determining the exposure of individuals and groups[10]. As medical exposures increase, the principle of optimization is further emphasized. In the case of medical radiation, the patient should be evaluated under appropriate examination conditions based on the patient's body shape and condition. In a report entitled "Reduction of patient dose in X-ray chest radiography based on AEC use," Jung et al. stated that the dose variation depended on the position of the ionization chamber that is an AEC sensor[4]. They also reported that the function of AEC, which is widely used in chest radiography, should not be unconditionally relied on, and that the position of the sensor in ionization chamber must match the position of the examination area in order to minimize and optimize exposure. Our results of the patient dosage based on AEC use varied depending on the distance. At a distance of 110 cm, the doses were 182.33μGy and 162.83μGy, respectively. At a distance of 140cm, the doses were 143.67μGy and 132.25μGy, respectively, and at a distance of 180 cm, the doses were 128.17μGy and 120.08μGy, respectively. Therefore, it was possible to identify a higher dose under AEC compared with the lack of AEC. Lee et al. reported that as sensitivity increased, the dose of exposure decreased, and better image quality was obtained[7,11]. In the present study, image evaluation based on whether or not AEC was used showed CNR was 5.59 and 5.57, respectively at a distance of 110 cm. At a distance of 140cm, CNR was 5.96 and 5.95, respectively, and at a distance of 180 cm, CNR turned out to be 6.44 and 6.45, respectively. Similarly, SNR was 7.50 and 7.48, respectively, at a distance of 110 cm. At a distance of 140cm, SNR was 7.92 and 7.91, respectively, and at 180cm, SNR scored 8.48 and 8.44, respectively. Therefore, in the cases of both CNR and SNR, similar images were obtained regardless of whether AEC was used or not. The results were similar to those reported by Lee et al. Hence, it is believed that the findings of this investigation will facilitate the determination of the use of AEC depending on patient characteristics using diagnostic radiation generators with AEC of each medical institution. It is also expected that our findings will lead to reduced exposure of patients and the radiation workers by providing quality imaging data and accurate dose information. Ultimately, our findings will contribute to the reducing the exposure dosages for the entire nation.

The study facilitated the determination of dose generation when using AEC. CNR and SNR did not show any difference in terms of image quality regardless of AEC use. We also identified that quality images can be obtained in chest X-ray examination when FID was 180 cm. Therefore, it appears that needless radiation exposure to patients can be reduced by manually setting appropriate examination conditions instead of relying exclusively on AEC.

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Development of a New Compression Paddle for Enhanced Image Acquisition During Mammography

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ABSTRACT

In this study, the shape and function of a mammography compression paddle was revised and investigated with regard to contrast and image quality in patients with pectus carinatum.

The center of the novel compression paddle surface had a radius of curvature of the contact area with the chest wall. The double structure of the compression paddle frame provided sufficient contact with the chest wall and reduced pain.. Springs in the back allowed an open space of 30 mm. we compared the increasing rate of total area and posterior nipple line (PNL) and the image surface plot.

With the newly developed compression paddle, the averaged increasing rate of the total area in 10 patients with pectus carinatum was 9.65% and 6.96% in the craniocaudal (CC) and mediolateral-oblique (MLO) directions, respectively; the averaged increasing rate of the PNL was 9.18% and 4.55% in the CC and MLO directions, respectively; and the averaged increasing rate of the breast length side chest wall was 3.97% in the CC direction. The newly developed compression paddle appeared to contain more breast tissue without degradation in image contrast and quality.

The novel breast compression paddle was streamlined, thereby reducing friction with the chest wall. It also contained substantial breast tissue because the springs make it possible to move back and forth to match breast chest size.

The developed compression paddle will provide a wider diagnostic range for mammography.

Keywords: *Mammography, Device, Compression paddle, Carinatum, Caraniocaudal (CC), Mediolateraloblique (MLO)*

Mathematics Subject Classification: *51M25, 92C50*

Journal of Economic Literature (JEL) Classification: *l119*

Introduction

It is important to treat breast cancer at an early stage before symptoms appear; therefore, the importance of mammography is rising. In the past, mammography was conducted only for the diagnosis and management of patients with symptoms. However, it is important to monitor changes over time because breast diseases are more likely to develop into cancer. For this reason, clinicians need to conduct screening tests universally and systematically for women with and without symptoms[1,2].

Mammography is divided, based on its purpose, as a screening test or a diagnostic test. A screening test is a basic test conducted in the craniocaudal (CC) and mediolateral-oblique (MLO) directions[3].

Pressure on the breasts in mammography improves resolution by holding the image receptor and breasts

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closely together, and increases the quality of the image by reducing the thickness of the breasts. Additionally, it can make the image clear by separating the image from folded breast tissues, enhancing the contrast, and reducing the exposure dose[4,5].

However, the end of the image recipient and the compression paddle has straight lines. As a consequence, patients with pectus carinatum complain of pain because of friction from the compression paddle, and the image fails to include the inside and outside of the breast tissue.

Pectus carinatum is characterised by excessive protrusion of the chest wall. Hippocrates called the condition "pointed chest," and its frequency is 0.06%[6]. However, this statistic was derived only from women who have been diagnosed with pectus carinatum. More women are expected to have pectus carinatum as it becomes frequently seen in mammography.

Breast cancer tests are conducted using sonography, magnetic resonance imaging, and computed tomography (CT). Magnetic resonance imaging has the highest sensitivity for women in their 30s, but its high cost and false-positive results prevent it from being applied to the average woman. For conditions that breast cancer testing is recommended at least once a year, CT is inappropriate as a screening test because of the large radiation exposure dose. However, sonography is inexpensive and does not have a large exposure dose; but its detectability of calcification, which is a marker of malignant breast cancer, is lower than that of mammography, which uses radiation. For a breast cancer test, it is therefore most appropriate to recommend mammography using general X-ray imaging as the screening test. The development of a new compression paddle is needed to expand the value and diagnostic area of the image.

In this study, compression paddles were developed that can be applied to women with pectus carinatum and normal people. The end of the compression paddle is round, somewhat like the chest, to depict the breast tissues as much as possible, and the frame of the compression paddle is devised to move back and forth to fit the form of an individual's chest. This study aimed to develop compression paddles with high diagnostic utility by obtaining images through applying conventional compression paddles and the newly developed compression paddles to patients with pectus carinatum form of normal. This study also aimed to evaluate the newly developed compression paddles, after comparing the increasing rate of the total area and posterior nipple line (PNL) and image surface plots of the newly developed compression paddle with those of the conventional paddle in mammography.

Materials and Method

Materials

Mammography: Images of the breasts of women with pectus carinatum were obtained using the newly developed compression paddle. A digital X-ray mammography unit (Alpha ST; GE Healthcare, Milwaukee, Wisconsin, USA) was the equipment used. The target/filter combination of the equipment was Mo/Mo, and the computed radiography type of field of view was 18×24 cm.

Utility Evaluation: After obtaining images using the currently used compression paddles and the newly designed compression paddles through a Digital Imaging and Communications in Medicine (DICOM) file, the images were evaluated using Image J (version. 1.49h, Wayne Rasband, National Institutes of Health, USA), a digital image analysis program provided by the United States National Institutes of Health (NIH, Bethesda, MD, USA). With the Image J program, the utility of the obtained images were evaluated by measuring the whole area of the breasts and the length of the breast on the chest side and the PNL.

Method

Study Participants: The target of the study was female patients with pectus carinatum who were requesting mammography. They were recruited from five hospitals in Seoul, Korea from August 20, 2014 to September 30, 2014. The patients were in their 30s to 40s and weighed more than 50 kg. The study received approval from our Institutional Review Board. A test with the conventional compression paddle was conducted first. After obtaining the patients' written agreement to participate in the study, two images were tested, which included one image in the craniocaudal direction and the second image in the mediolateral direction, using the newly developed compression paddle.

To acquire images of female patients with pectus carinatum who visited the hospital, we conducted a test using the same amount of pressure for the craniocaudal direction and mediolateral direction. We acquired the images through a DICOM file and Joint Photographic

Experts Group (JPEG) file. We measured, compared, and evaluated the size of the whole breast area, the surface plot, and the length of the PNL using Image J software (NIH).

Statistical Analysis: To evaluate significance, based on the effective area of the pressed area through the compression paddle, SPSS statistical software (ver. 22; SPSS, Chicago, IL, USA) was used. The Wilcoxon signed-rank test, a nonparametric test, was conducted as a paired t-test to analyse the pressure effective area obtained by the developed compression paddle. P value less than 0.05 was considered to be statistical significance.

Results

Development of the new compression paddle for mammography

The plan and design of the new compression paddle for mammography: The conventional breast compression paddle is rectangular with flat sides that press the breasts in parallel with the grid sides of the chest. However, the actual model of the human body is a bit convex, which makes the inner and outer parts of the breasts out of the sight of the pressed area on an image when pressing. Therefore, we curved the part that touches the chest side of the compression paddle and applied a spring to make it move back and forth automatically by giving mobility through the protrusion side of the chest wall.

As show figure 1, to determine the size of the curve, CT images of 10 people—five people with a slim body type and five people with a large body type—were used for measurements. The size of the protrusion depends on the size of the ribcage. Two CT specialist radiological technologists and one radiologist comprised the radiological team. For measurement, the spot from the second rib to the sixth rib, which is the anatomical position of the breast, was the reference point. We drew a vertical line from the centre of the body to the end of the body surface to get the chest height of Rib 2 and Rib 6, respectively. Rib 2 had a thickness of 115–175 mm and Rib 6 had a thickness of 155–215 mm, an average difference of 40 mm. There was a 5 mm margin of error, depending on the body type. The end of the breast compression paddle was accordingly constructed with a 10 mm curvature radius and a 30 mm curvature radius. To correct for differences in the chest walls of between individuals, 40–50 mm of mobility was secured by inserting a spring to allow the breast compression paddle to move back and forth.

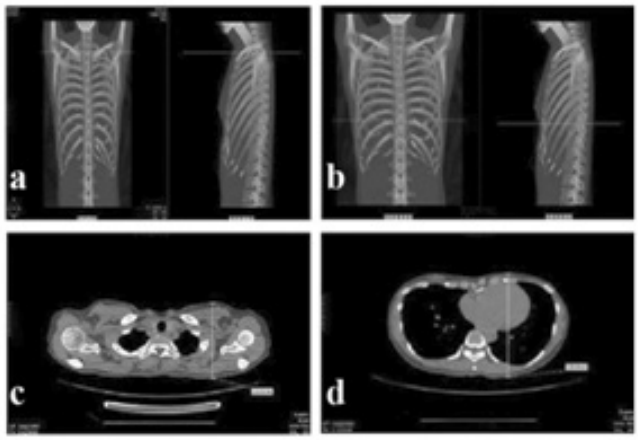

Figure 1: Measurement of the chest length at rib 2 (a and c) and rib 6 (b and d) using computed tomography

Production of the compression paddle for mammography: The length of the receptor of the mammography units was 180×240 mm, and the side size of the breast starting from the nipple of the chest phantom on chest CT was 172.3 mm. Based on this information, 40 mm was spaced out from both ends of the side that touches the chest wall side of the compression paddle, and the length of the radius of curvature was 160 mm. The thickness of the compression paddle was 30 mm, which is like that of the conventional compression paddle and meets the standard of less than 40 mm that the Ministry of Food and Drug Safety (Seoul, Korea) regulates. To prevent the breast tissue from going up on the compression paddle when pressing, it was raised vertically against the surface of the compression paddle with 55 mm of height.

The radius of curvature of the compression paddle surface on the chest wall side of the compression paddle was 10 mm and 30 mm. For the compression paddle with a size of 30 mm, too much of the breast tissue was missing. It therefore had a greater loss of breast tissue, compared to the conventional compression paddle. As a result, the radius of curvature of 30 mm was excluded and 10 mm was used instead. The conventional compression paddle frame has the simple role of supporting and fixing the compression paddle, whereas the developed compression paddle frame adds mobility to the chest side by allowing vertical movement. As show figure 2 and figure 3, this is to supplement the degree to which

the compression paddle is pushed out to correct the difference of 40 mm in the chest because of individual differences in the size of the chest. In addition, two compression paddle frames were made and placed inside and outside; the inner frame extended from the outer frame by 30 mm, and the inner frame and outer frame were interlocked to move back and forth through a grove cut between them.

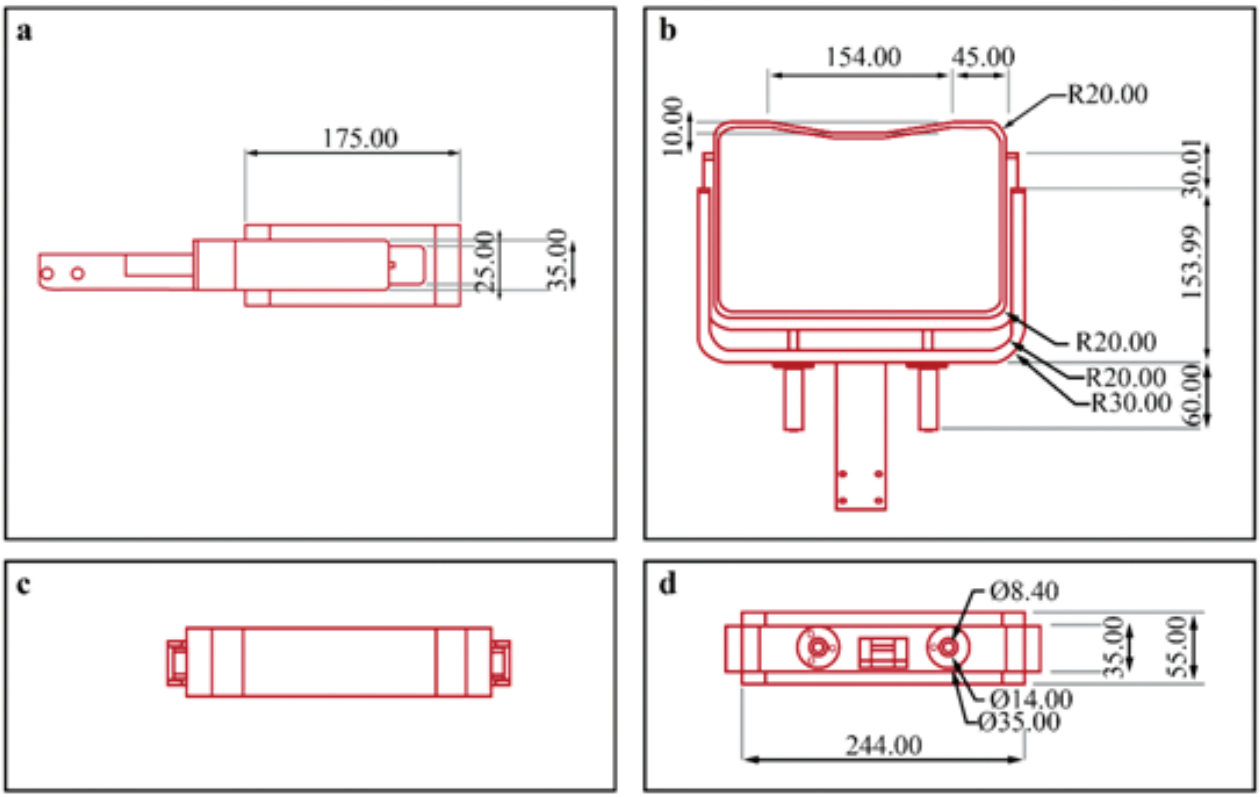

Figure 2: A planar image of the newly developed compression paddle as viewed from the front (a), laterally (b), and from below (c)

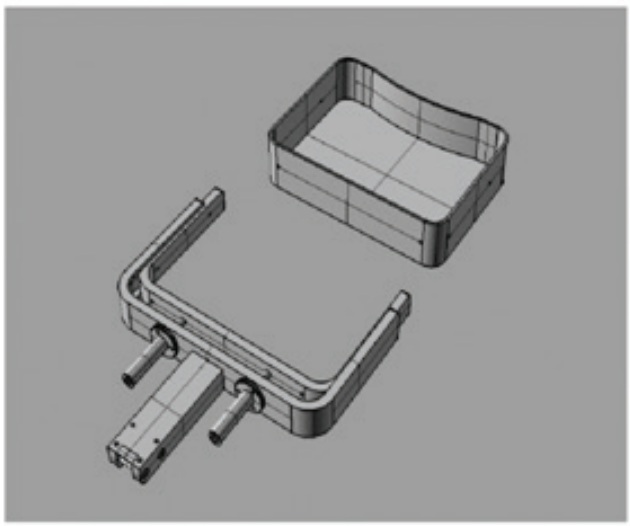

Figure 3: The planar figure of the entire newly developed compression paddle.

Utility evaluation of the new compression paddle for mammography

Utility evaluation of image by Image J: As show table 1, the measured values of the breast area in the images in which the developed compression paddle was applied were all higher than those obtained with the conventional compression paddle. The whole area of all 10 people increased 9.65% on average in the CC image and increased 6.96% on average in the MLO image. The PNL increased 9.18% on average in the CC image and 4.55% in the MLO image. The breast length on the chest wall side increased 3.97% in the CC image.

Table 1: The Increase Rate of the Breast Area in All Patients

Case	Measurement list					
	Item	Area (%)		PNL (%)		Breast length side chest wall (%)
		CC	MLO	CC	MLO	CC
Case 1	Increase rate	12.71	7.17	5.89	1.49	2.57
Case 2	Increase rate	1.07	10.92	6.03	23.65	10.42
Case 3	Increase rate	26.35	6.40	15.94	5.19	11.76
Case 4	Increase rate	4.15	3.30	3.90	0.65	2.98
Case 5	Increase rate	9.56	7.17	5.89	1.49	1.89
Case 6	Increase rate	29.65	9.96	28.50	3.06	4.13
Case 7	Increase rate	0.91	2.32	4.62	0.28	0.75
Case 8	Increase rate	2.46	7.75	4.69	1.96	3.55
Case 9	Increase rate	3.13	6.91	9.03	3.63	0.99
Case 10	Increase rate	6.51	7.66	7.35	4.12	0.67
Average		9.65	6.96	9.18	4.55	3.97

As show figure 4, based on the results of the comparisons of the surface plots, all images of the 10 targets had a similar form of surface outline without the degradation of the image quality and contrast.

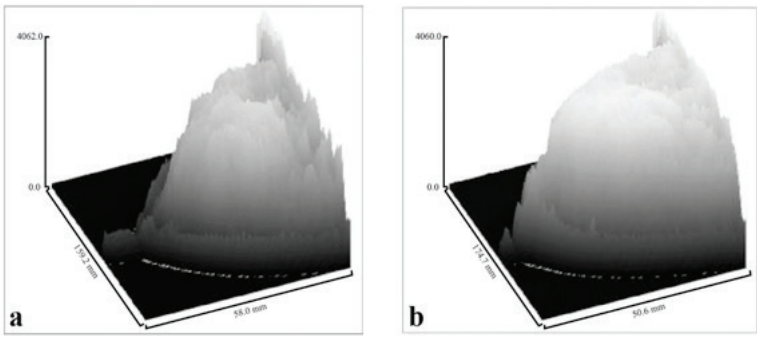

Figure 4: The flatness images. The conventional compression paddle (a) and the newly developed compression paddle (b)

Evaluation of Significance: As show table 2, the Wilcoxon signed-rank test, a nonparametric test, showed a significant difference in all comparisons, and that the measured values of the images in which the newly developed compression paddle was used were higher on average than those of the conventional compression paddle ($p<0.05$).

Table 2: Wilcoxon signed-rank test

Test statistics[a]					
	CC_new_area-CC_ori_area	CC_new_PNL-CC_ori_PNL	CC_new_wall-CC_ori_wall	MLO_new_area-MLO_ori_area	MLO_new_PNL-MLO_ori_PNL
Z	-2.599[b]	-2.803[b]	-2.191[b]	-2.090[b]	-2.701[b]
Asymptotic p-value (both sides)	0.009	0.005	0.028	0.037	0.007
a Wilcoxon signed-rank test.					
b Rankings are based on the negative.					
CC, craniocaudal; MLO, mediolateral-oblique; PNL posterior nipple line.					

Discussion

Breast cancer has had the highest cancer incidence rate for women since 2001, and it is rapidly increasing because of the decreased birth rate and increased avoidance of breast feeding[7]. Mammography is a very important diagnostic method for the early diagnosis of breast cancer and has strong clinical utility as a screening test for micro calcification of breast lesions[8]. However, patients tend to avoid mammography because of the pain incurred on account of pressure applied during the test. Pressure is necessary in mammography to reduce the exposure dose and improve image quality[9].

Measurements of adult women between 20 and 59 years old indicate that women in their 40s and 50s have a greater tendency of having droopiness and obesity horizontally in their breasts, compared to women in their 20s and 30s. One report[10]. Indicated that the area and volume of the bottom of breasts increases with aging. In particular, the breasts of adult women with subcutaneous fat have greater changes, compared to other parts of body as they age, and protrude in a curve on the front of the upper body[11]. In this respect, pressing the breasts fastens drooped breasts and thins the thickened breast tissues caused by obesity, which are important in reducing the exposure dose and improving the quality of breast images.

In the human body, aging is accompanied by regression, which causes scoliosis. Functional scoliosis appears with secondary symptoms caused by external reasons, whereas structural scoliosis is caused by problems with the spine itself and has no specific reason[12]. Women with scoliosis have several limitations in mammography. For example, when a protruded chest caused by a bent spine presses the breasts, it can cause friction against the surface of the compression paddle on the chest wall side and not all of the breast tissue is included in the images. It is because the model of the conventional compression paddle is rectangular to fit the size of the receptor, and the edges of the rectangle are curved. The part that touches the chest wall is a straight line parallel with the end of the receptor, which does not fit a round chest, and is eventually pushed out by the chest. This prevents the inner and outer parts of the breasts from being included in the images. This is noticeable in patients with pectus carinatum or in patients with scoliosis whose chests are protruded. The chest of patients with pectus carinatum is naturally excessively protruded and these patients are likely to have a malformation in their spine.

Pectus carinatum is more common in male individuals, although it is not difficult to find female patients with pectus carinatum who visit hospitals for mammography. This is because scoliosis caused by regression, which occurs in women in their 40s and 50s, is accompanied by pectus carinatum. If too much breast tissue is pulled and placed on the receptor to include as much breast tissue of the patients with pectus carinatum, patients will complain of severe pain because the compression paddle will press the chest together. There is a report of a method in which semipermeable pads are used to reduce the pain of pressure; however, the structural problems of the compression paddle are not fully resolved, although the pain diminishes a little[13]. When applied to patients with scoliosis, the new compression paddle developed in this study is expected to reduce the compression and reduce the image quality, thus broadening the scope of diagnosis.

Dustler[14] et al. suggested a method in which images are acquired through partial pressure, excluding the chest part that prevents pressure and causes pain. This method can mitigate pain by removing pressure deterrents, but unstable factors that hinder breast cancer detectability increase because 1 cm of tissue cannot be obtained from the images. In the current study, the pain of pressure is reduced and 1 cm of tissue is visible.

There is an ongoing effort to improve the compression paddles because of pain in mammography and because the pressure is not evenly applied to all parts of the breasts. In particular, the pressure is not evenly applied to whole parts of breasts because of breast parenchymal tissues; therefore, it is recommended to correct the slope of the compression paddle to supplement[15,16]. References show that, Kallenberg and Karssemeijer and Kallenberg[17,18] et al. corrected the slope of the compression paddle by making the breast compression paddle movable, and on comparing it with the conventional compression paddle, they showed that images had more even concentration for the whole breast, compared to images made using the conventional compression paddle. References show that Liberman et al., Kirstein et al. and Burkholder et al. reported the difficulty of pressing the open window when locating a lesion before surgery and obtaining good quality of images[19,20,21]. Reference shows that Blane et al. devised a new compression paddle that can apply pressure in wire localization, and succeeded in achieving substantially improved images than those with the conventional paddle[22]. However, he could not improve

the phenomenon in which portions of breast tissue were missing because of friction against the compression paddle caused by the structure of the human body.

Pressing the breasts in mammography is important for image quality and with regard to the exposure dose to patients[23]. References show Dibble et al., Coryell and Jaeger et al. reported that pressing the breast tissues on top of the radiolucent cushion can reduce the pain of patients and enhance the quality of images[24,25,26]. However, Hendrick and Hall reported that, although using a radiolucent cushion can increase image quality and can include as much breast tissue as possible, the exposure dose increases with increasing thickness[27]. Using the compression paddle for the tests conducted in this study can include as much breast tissue as possible without causing the problem of the exposure dose because its thickness is the same as that of the conventional paddle.

Conducting tests using the compression paddle developed in this study can solve the problem of pain experienced when the compression paddle presses on the chest as much as the protruded chest pushes out the compression paddle. The surface of the compression paddle that touches the chest is round; therefore, it allows more of the inner and outer parts of the breasts to be placed on the receptor and more tissue is included in the images. Therefore, the newly developed compression paddle is expected to resolve the problems better than the conventional compression paddles used in clinical practice.

This was a study on a compression paddle that was used for accurate diagnosis in mammography. A compression paddle model was developed to improve the imaging of breast tissues adjacent to the chest, which are difficult to include in images obtained with the conventional compression paddles, and its utility was evaluated. The newly developed compression paddle acquired images from 10 patients with pectus carinatum and evaluated the whole area of breast tissue, the length of the PNL, the length of breast on the chest wall side, and image flatness.

Conclusion

The necessary form of the compression paddle in mammography is a structural problem and some parts of the breast tissues adjacent to the chest wall can be missing in images. However, the newly developed breast compression paddle has a streamlined shape, which reduces the friction against the chest wall and includes the parts that could not be included previously, which allows testing of a broader area. The newly developed compression paddle has mobility with the spring equipment installed and moves back and forth to adjust to the size of the chest wall, which allows more breast tissue to be included. This study involved 10 patients with pectus carinatum. Therefore, the newly developed paddle may cause problems when applied to patients with different body types. Based on the result of this study, further research is needed to make effective use of the newly developed compression paddle.

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Comparative Study of MRI Images in Accordance with Gradient Power Changes

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ABSTRACT

However, many hospitals conduct examinations based on the initial setting of gradient applied to the equipment, without altering the gradient setting for the area under examination based on its characteristics. Accordingly, this study measures the signal intensity and changes in imaging according to changes in MRI gradient power appropriate for T1 and T2 examination, for possible utilization as basic data for gradient power research and studies in MRI. Bottle Phantom was positioned inside the head & neck coil, and the T1-T2Brain Sequence was used for measurement. In the case of T2, the Repetition TR was fixed at 4,500 msec, and changes were applied to the TE in five incremental steps to obtain the measurement. In addition, for T1, TR 500 msec was fixed, and changes were applied to the TE in four incremental steps in obtaining the measurement. For SNR and CNR, Image J was used and the standard deviation. Matlab was used to measure PSNR and UACI. Image evaluation in accordance with the change in gradient power at T2. In the case of SNR,normal SLT was the highest at TE 60 msec with 581.4 for Fine SLT, at TE 60 msec with 623.1, in the case of Low SAR, at TE 80 msec with 610.2was the highest. It was evident that SNR decreased with TE increase. 4 Image evaluation at T1 in accordance with the change in gradient power SNR for normal SLT was found to be the highest at TE 40 msec with 495.5, and TE 30 msec was found to be the lowest. Fine SLT was found to be the highest at TE 30 msec with 485.6, and low SAR was found to be the highest at TE 40 msec with 503.0. In the case of PSNR, for Normal SLT, it was the largest at TE 40 msec with24.1, without anysignificant difference from TE 10 to 30 msec. Determination of MRI signal intensity in accordance with changes in gradient power suggests that in the case of T2, the intensity of all the signals decreased when the TE was 80msec and above. In addition, the intensity of all the signals varied after changing the gradient power. In the case of T1, the signal intensity appeared to be strong at TE 40 msec. In T2, the intensity of all of the signals varied with the gradient power.

Keywords: *Gradient Power, Turbo Spine Echo, Repetition Time, Echo Time, Gradient field.*

Mathematics Subject Classification: *92C50,92C55*

Journal of Economic Literature (JEL) Classification: *I19*

Introduction

Radiation is utilized as an aid to diagnose and treat illness in patients. Computed Tomography (CT), a general radiography examination utilized in medical institutions, uses ionizing radiation[1,2].However, Magnetic Resonance Image(MRI) uses radio frequency, which is non-ionizing radiation based on the hydrogen nucleus inside the patient's body to produce medical images without exposure to ionizing radiation. MRI medical image is created via a number of factors including gradient field, slice selection, slice thickness, frequency encoding, phase encoding, and Fourier transformation among others[3]. Among these additional factors, gradient has an effect on the time of pulse sequence. Each time gradient is generated, the MRI equipment supplies power until

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the maximum amplitude is reached, and the gradient remains for a fixed amount of time and is reversed during the same time. Thus, each time gradient is generated, several msec of dead time result. Accumulation of such dead time increases the examination time for the patient triggering artifacts associated with patient's movement. Therefore, conducting the MRI by changing the gradient decreases the time and prevents movement artifacts[4, 5]. However, many hospitals conduct examinations based on the initial setting of gradient applied to the equipment, without altering the gradient setting for the area under examination based on its characteristics. Accordingly this study measures the signal intensity and changes in imaging according to changes in MRI gradient power appropriate for T1 and T2 examination, for possible utilization as basic data for gradient power research and studies in MRI.

Measuring Instrument and Method

Measuring Instrument: We MRI images were measured utilizing Superconducting System1.5T MRI and Head & Neck Coil(Fig 1). The Bottle(2,000cc) Phantom was used to measure the image(Fig 2). Furthermore, Image J, which was developed by the US National Institutes of Health for the purpose of research analysis, was used to measure the Signal-to-Noise Ratio(SNR) and Contrast-to-Noise Ratio(CNR) in the image obtained from the MRI.Matlab was used for the measurement of Peak Signal-to-Noise Ratio(PSNR) and Unified Average Changing Intensity(UACI).

Figure 1: Head & Neck Coil **Figure 2: Bottle Phantom**

Method of Research

Method of Measurement: Bottle Phantom was positioned inside the head & neck coil, and the T1-T2 Brain Sequence was used for measurement. In the case of T2, the Repetition Time(TR) was fixed at 4,500msec, and changes were applied to the Echo Time(TE) in five incremental steps(60, 70, 80, 90, and 100msec) to obtain the measurement. In addition, for T1, TR 500 was fixed, and changes were applied to the TE in four incremental steps(10, 20, 30, and 40msec) in obtaining the measurement. Each gradient power was changed to Fine SLT, low SAR, and normal SLT, to determine the changes in image intensity. The parameters used for measurement were FOV 240×240, 1NEX, 1 slice, 1mm slickness, and 256×256 matrix.

Image Evaluation: SNR, CNR, PSNR, and UACI were measured using the obtained image. For SNR and CNR, Image J was used to set up 5 signal and 5 noise areas to measure the mean, minimum, maximum, and the standard deviation(Fig3). The following formula was used to measure SNR and Matlab was used to measure PSNR and UACI, CNR (Fig 4).

$$SNR = \frac{\text{Backgroung Avg} - \text{Signal Avg}}{\text{Backgroung SD}}$$

$$CNR = \frac{\text{Backgroung SI}_{\text{Avg}} - \text{Signal}_{\text{Avg}}}{\sqrt{\text{Backgroung SD}^2 + \text{ROI SD}^2}}$$

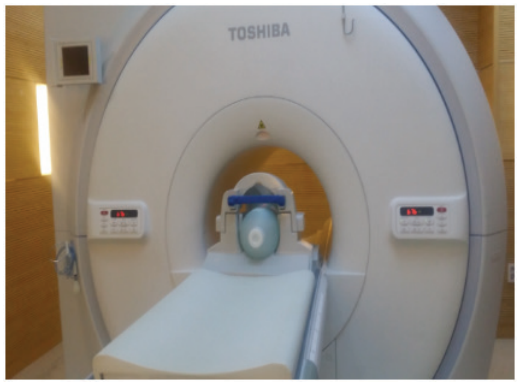

Figure 3: Image measurement

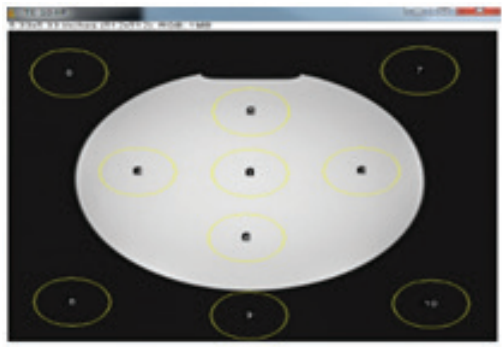

Figure 4: Signal, Noise measurement

Results

Signal and Noise measurement in accordance with changes in gradient power in T2: Normal duration of the spin-lock pulse (SLT) was the highest at TE 60 with 230.4msec, and was the lowest at TE 80 with 227.8

msec. Noise was the lowest at TE 60 with 21.6msec, and it increased with increase in the TE value. Fine SLT was the highest at TE 60 with 224.8msec, and the signal decreased as the TE value increased. Noise was the highest at TE 60 with 23.6msec, and the noise value decreased with increased TE value. In the case of low Specific Absorption Rate (SAR), it was the highest at TE 100 with 229.6 W/kg, and the lowest at TE 60 with 228.5 W/kg. Noise was the highest at a TE 60 of 23.4msec, and lower as the TE value increased(Table 1).

Table 1: Signal and Noise measurement in accordance with changes in gradient power

Gradient Power			TE 60	TE 70	TE 80	TE 90	TE 100
Normal Slt	Signal	Max	230.4	228.6	227.8	228.4	228.6
		Min	212.0	211.2	210.6	211.4	211.6
		Mean/S.D	222 ± 4.6	221 ± 4.4	220 ± 4.4	220 ± 4.4	221 ± 47.3
	Noise	Max	21.6	23.0	23.2	23.8	23.4
		Min	17.4	19.0	19.6	20.0	20.0
		Mean/S.D	21.0 ± 0.4	21.7 ± 0.4	22.3 ± 0.4	22.5 ± 0.4	22.5 ± 0.4
Fine Slt	Signal	Max	224.8	222.8	224.2	224.8	224.0
		Min	209.2	207.6	208.6	208.6	208.0
		Mean/S.D	217.7 ± 4.0	216.0 ± 4.0	217.0 ± 3.9	217.5 ± 4.0	216.7 ± 3.9
	Noise	Max	23.6	22.4	21.2	21.0	21.4
		Min	19.4	18.0	17.0	17.0	17.0
		Mean/S.D	22.0 ± 0.3	22.1 ± 0.4	19.7 ± 0.4	19.7 ± 0.4	19.9 ± 0.4
Low Sar	Signal	Max	228.5	229.4	229.4	228.6	229.6
		Min	210.7	212.0	212.0	210.8	211.8
		Mean/S.D	220.0 ± 4.7	221.1 ± 4.5	221.1 ± 4.4	220.1 ± 4.5	221.5 ± 4.5
	Noise	Max	23.4	23.6	22.4	21.8	22.6
		Min	20.4	20.4	19.8	19.0	20.0
		Mean/S.D	22.6 ± 0.4	22.8 ± 0.3	21.8 ± 0.3	21.0 ± 0.3	21.9 ± 0.3

Signal and Noise measurement in accordance with the change inGradient Power in T1: For Normal SLT, the signal was the highest at TE 30 with 229.8msec, and was the lowest at TE 10 with 224.2 msec. In the case of noise, it was found to be the highest at TE 40 with 27.6msec, and was the lowest at TE 10 of 25.4 msec. In the case of Fine SLT, it was the highest at TE 20 of 214.6msec, and the lowest at TE 10 of 211.4 msec. In the case of noise, it was the lowest at TE 30 with 20.8msec, and the highest at TE 10 of 29.6 msec. In the case of Low SAR, the signal was the highest at TE 20 with 226.6 W/kg, and was the lowest at TE 30. The noise was the highest at TE 20 with 27.6msec, and was the lowest at TE 40 of 20.6 msec(Table 2).

Table 2: Signal and Noise measurement in accordance with the change in Gradient Power

Gradient Power			TE 10	TE 20	TE 30	TE 40
Normal Slt	Signal	Max	224.2	225.6	229.8	227.6
		Min	206.6	207.8	210.0	210.4
		Mean/S.D	216.3 ± 4.4	217.2 ± 4.6	220.8 ± 4.9	219.5 ± 4.2
	Noise	Max	25.4	26.2	26.8	27.6
		Min	21.0	21.8	22.2	23.2
		Mean/S.D	23.7 ± 0.4	24.5 ± 0.4	25.0 ± 0.4	25.8 ± 0.4

Conted…

Fine Slt	Signal	Max	211.4	214.6	211.3	212.9
		Min	203.2	204.4	201.8	204.2
		Mean/S.D	211.4 ± 3.3	214.6 ± 4.2	211.3 ± 4.0	212.9 ± 4.0
	Noise	Max	29.6	23.8	20.8	21.2
		Min	16.4	19.6	18.8	19.0
		Mean/S.D	21.4 ± 0.8	22.3 ± 0.4	20.1 ± 0.4	20.3 ± 0.4
Low Sar	Signal	Max	224.4	226.6	221.6	222.2
		Min	206.8	209.4	205.2	205.6
		Mean/S.D	216.2 ± 4.6	218.4 ± 4.2	214.2 ± 4.1	214.4 ± 4.0
	Noise	Max	25.2	27.6	20.8	20.6
		Min	20.8	23.2	17.6	18.2
		Mean/S.D	23.5 ± 0.4	26.0 ± 0.4	20.0 ± 0.4	19.4 ± 0.4

Image evaluation in accordance with the change in gradient power at T2: In the case of SNR, normal SLT was the highest at TE 60 with 581.4 for Fine SLT, at TE 60 with 623.1, in the case of Low SAR, at TE 80 with 610.2 was the highest. It was evident that SNR decreased with TE increase. For PSNR at normal SLT, it was found to be the highest at TE 60 of 24.09msec, and the Fine SLT was found to be the largest at TE 90 with 24.09 msec, without significant change even with the increases TE. In the case of CNR, normal SLT was the highest at TE 100 with 45.7, and the lowest at TE 60 with 43.9. The Fine SLT was the highest at TE 100 with 50.7 and thelowest at TE 60 with 43.9. In the case of UACI, the normal SLT was the highest at TE 80 with 1.98,and as the TE increased, UACI decreased. In Fine SLT, UACI was the highest at a TE 80with 5.33 and as TE increased,UACI decreased. In the case of low SAR, it was the highest at TE 90 with 4.0 and as TE increased,UACI decreased(Table 3).

Table 3: Image evaluation in accordance with the change in gradient power at T2

	Gradient Power	**TE 60**	**TE 70**	**TE 80**	**TE 90**	**TE 100**
SNR	Normal Slt	581.450	542.949	552.046	507.288	505.230
	Fine Slt	623.197	505.064	500.526	517.246	479.005
	Low Sar	548.416	592.893	610.203	592.094	575.312
PSNR	Normal Slt	24.092	24.086	24.084	24.084	24.083
	Fine Slt	24.086	24.086	24.093	24.094	24.092
	Low Sar	24.085	24.084	24.086	24.088	24.085
CNR	Normal Slt	43.900	45.300	44.400	45.280	45.770
	Fine Slt	49.190	48.670	50.320	49.420	50.780
	Low Sar	42.210	44.030	44.880	43.870	44.710
UACI	Normal Slt	1.000	1.311	1.985	1.648	1.189
	Fine Slt	1.000	2.791	5.333	4.771	5.238
	Low Sar	1.000	0.217	1.772	4.007	1.677

Image evaluation in accordance with the change in gradient power at T1: SNR for normal SLT was found to be the highest at TE 40 with 495.5, and TE 30 was found tobethe lowest. Fine SLT was found to be the highest at TE 30 with 485.6, and low SAR was found to bethe highest at TE 40 with 503.0. In the case of PSNR, for Normal SLT, it was the largest at TE 40 with 21,without any significant difference from TE 10 to 30. Fine SLT was the largest at TE 30 with 24.09, andeven in case of other TE values, there was no significant difference. In case of l- ow SAR, the

PSNR was the largest at TE 10. However, even in other TE values, there was no significant difference. In thecase of CNR, for Normal SLT, it was the highest at TE 40 with 46.0, and fine SLT was the highest at TE 30 with 44.8. Low SAR was the highest with TE 40 at 48.5. In the case of UACI, normal SLT was increased at TE 40 with 21.8. Fine SLT was the highest with TE 30 at5.4. Low SAR was the highest at TE 30 with 20.6(Table 4).

Table 4: Image evaluation at T1 in accordance with the change in gradient power

	Gradient Power	TE 10	TE 20	TE 30	TE 40
SNR	Normal Slt	474.948	462.214	451.954	495.574
	Fine Slt	236.418	459.141	485.615	459.417
	Low Sar	485.665	496.560	470.298	503.006
PSNR	Normal Slt	24.083	24.083	24.083	24.122
	Fine Slt	24.088	24.088	24.090	24.084
	Low Sar	24.841	24.083	24.090	24.098
CNR	Normal Slt	43.880	41.830	39.770	46.090
	Fine Slt	42.210	44.030	44.880	43.870
	Low Sar	42.030	45.430	47.060	48.570
UACI	Normal Slt	1.000	0.301	0.149	21.880
	Fine Slt	1.000	0.489	5.430	3.662
	Low Sar	1.000	0.100	20.600	18.560

Discussion

MRI yields outstanding resolution compared with CT, ultrasound, and general radiography. The high contrast resolution can be used to easily distinguish even the softtissue in the human body via imaging, and facilitates examination anatomical crosssections of the human body in various directions[6]. The MRI technician can control the MRI sequence to adjust various parameters.TR, flip angle, TE and others can be adjusted depending on the area of examination, to obtain highly valuable images for diagnosis[7,8]. Lee Young Dae The relative signal intensity of MRI increases following changes in TE, however, the signal intensity of the image remained unchanged[9,10]. In this study, measurements of changes in TE in4 phases for T1 and T2, showed no major changes in SNR, PSNR and CNR of T2 despite increased TE. However, when the TE was above 80, the values decreased, and in thecase of T2, it was considered not to exceed 80. Similar to T2, in the case of T1, even when the TE value increased by the same amount, no major changes in SNR, PSNR and CNR, occurred, consistent with theresults of Lee Young Dae. According to the report of various MRI techniques by Lee Seung Pil, if the Turbo Spine Echo: TES is used, the signal intensity of the joint cartilage was approximately 30% lower, and accurate selection of pulse sequence in MRI examination enables elucidation of the disease or anatomical structure[11,12]. In this study, the results obtained by changing the gradient power that controls the signal intensity in T2 were as follows: with fine SLT, SNR 623, PSNR 23.09, CNR 50.32, and UACI 5.33 which was found to be the largest, and a normal SLT yielded SNR 581, PSNR 24.092,CNR 45.3, and UACI 1.98. A low SAR yielded SNR 548, PSNR 24.08, CNR 44.8, and UACI 1.77. In the case of T2, the largest fine SLT signal intensity corresponded to normal SLT, and low SAR. In the case of T1, under low SAR, the values were: SNR 503, PSNR 24.09 CNR 48.5, UACI 18.5 whichwas found to be the largest. In the case of T1, the signal intensity was large in the order of low SAR, normal SLT, and fine SLT respectively, consistent with previously reported results.

MRI equipment used currently pre fersa stronger magnetic field with 3.0T rather than 1.5T, using equipment with high magnetic field due to short examination time and high resolution. However, with low magnetic field, short examination time and high resolution image can be obtained if the gradient powerand additional factors are adjusted appropriately to assist with the patient's disease. The study limitation relates to inability to determine the frequency of gradient power.

CONCLUSION

The followings are conclusions upon the measurement results of MRI signal intensity depending on changes of gradient power.

1. In case of T2, all the signal intensities of SNR were decreased with normal SLT of 47, fine SLT of 21, and low Sar of 45 if TE 80 or more. PSNR showed similarity with 24 for all, while all the signal intensities of CNR and UACI showed differently after change of gradient power.
2. In case of T1, signal intensity of SNR at TE 40 showed the strongest with normal SLT of 495,fine SLT of 459, and low Sar of 503. PSNR showed with 24 for all, while all the signal intensities of CNR and UACI showed differently after change of gradient power.

Based on the results of this study, it is considered that the patients should be tested with different setting of gradient power by the areas of test and purposes when MRI sequence is prepared

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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The Factors Related to the Smartphone Addiction of Undergraduate Students

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ABSTRACT

Background/Objectives: College students have a potential for addiction of smartphone. This study was to ascertain the influence of perceived stress and motivation for using a smartphone on the smartphone addiction for them.

Method/Statistical Analysis: The participants were 339 students who enrolled at S University in Korea. The smartphone addiction scale (15 items) developed by Kim et al., perceived stress scale (14 items) developed by Cohen et al. and the motivation scale (24 items) for using a smartphone developed by Kang were measured. SPSS/WIN 22.0 was used to analyze hierarchical multiple regression, Person correlation coefficients, one-way ANOVA, Scheffe test and independent sample t-test.

Findings: Gender (t=-4.15, $p< .001$), academic achievement (F=9.34, $p< .001$) and smartphone use time per day (F=6.56, $p< .001$) were significant differences in smartphone addiction. The smartphone addiction was a significant correlation with perceived stress (r=.366, $p< .001$), social interaction (r=0.119, $p=.029$), entertainment (r=0.330, $p<.001$) and passing time (r=0.226, $p<.001$) in motivation for using smartphone. Hierarchical multiple regression analysis indicated that perceived stress (β=0.284), entertainment (β=0.241) and passing time (β=0.158) in the motivation for using smartphone were identified as significant factors of smartphone addiction for college student, after adjusting for gender, academic achievement.

Improvements/Applications: The prevention of smartphone addiction for college students requires not only diminishing perceived stress but also examining a motivation for using a smartphone and gender difference in using a smartphone.

Keywords: *College student, Smartphone, Addiction, Perceived stress, Motivation.*

Introduction

According to the report from the National Information Society Agency, the rate of smartphone overdependence increased from 16.2% in 2015 to 18.6% in 2017. 3.6% of adolescents, 2.8% of adults were a high-risk group for the smartphone [1]. The smartphone use rate of the twenties including college student is 99.7%, it shows more use rate than other age groups [2]. Excessive smartphone use for young adults may encounter many problems such as the difficulty of school life [3,4], depression [5,6], sleep disturbance [7,8], psychological distress [8,9] and smartphone addiction [10]. Studies [3,5,8,9,10] have demonstrated that social-environmental and psychological factors are related to smartphone addiction. Smartphone addiction was closely related to stress and smartphone over user tends to experience more stress [11]. In particular, the college student has various kinds of stress such as academic stress and job stress and they lead to smartphone addiction [5,6,9,11]. Recently, it was reported that diverse motivations for using smartphone lead to smartphone addiction [12]. It has shown that information seeking, convenience, social interaction, entertainment, and passing time of motivation for using smartphone were related to smartphone addiction [12,13].

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It is important to understand using motivation which reflects characteristics in the smartphone to prevent smartphone addiction. This study is to identify the relation between perceived stress, the motivation for using a smartphone and smartphone addiction and to determine factors connected with smartphone addiction and to provide basic data for preventing smartphone addiction of college students.

Research Method

Design and Participants: A cross-sectional descriptive survey was performed to verify factors influencing smartphone addiction of college students. The participants used for the study consisted 339 university students from one university in J. city. Questionnaires were distributed to 350 students, of which 339 questionnaires were returned (Response rate of 96.8 %).

Research instrument

Smartphone Addiction: Smartphone addiction scale developed by Kim et al. [14] was used to measure the smartphone addiction of college students. It is composed of 15 items with a 4-point Likert scale and overall scores range from 15 to 60. A higher total score means a more addictive use of a smartphone. The total score of smartphone addiction is categorized as follows: College students with under a total of 39 points of smartphone addiction belong to a general group, a total score from 40 to 43 points of smartphone addiction means a potential risk group and a total of 44 points or more of smartphone addiction correspond to a high-risk group. The reliability of internal consistency was .88 by Cronbach's alpha coefficient

Perceived Stress: Perceived stress scale developed by Cohen et al. [15] was used to measure the perceived stress. It is composed of a 5-point Likert scale with 14 items and overall scores range from 14 to 70. A higher total score means higher perceived stress. The reliability of internal consistency was .75 by Cronbach's alpha coefficient.

Motivation for Using a Smartphone: The motivation of using smartphone consisting of 24 items developed by Kang [16] was used to measure the smartphone usage motivation. It is sorted by 5 subcategories which consist of information seeking, convenience, social interaction, entertainment, passing time. This subcategory score ranges from 1 to 7 and the Cronbach's alpha reliability coefficient was .92.

Data Analysis

The SPSS/WIN 22.0 was used to analyze data. General characteristics, smartphone addiction, perceive stress and motivation for using a smartphone were analyzed using descriptive statistics. Independent sample t-test and one-way ANOVA were used to measure the difference of smartphone addiction according to the general characteristics. The relationships between smartphone addiction, perceived stress, and motivation for using a smartphone were calculated using Person correlation coefficients. The related factors of smartphone addiction were analyzed using hierarchical multiple regression.

Results and Discussion

As recorded in table 1, the age distribution of participants (N=339) was from 18 to 28years (mean 21.47; SD1.86). There were 142 males (42.0%) and 196 females (58.0%). Gender (t=-4.15, $p< .001$), academic achievement (F=9.34, $p< .001$) and smartphone use time per day (F=6.56, $p< .001$) were significant differences in smartphone addiction. The results of previous studies [17,18,19] reported that female students had more addictive to a smartphone than male students and they frequently use a smartphone to maintain their social relationship. The earlier studies [4,20] showed that the students with smartphone addiction have low grades and may encounter difficulty with academic performance. Smartphone addiction was a significant difference by daily smartphone using time. This means that who had longer time using a smartphone, would be more likely to be higher smartphone addiction. Bian et al. [10] reported that the higher levels of smartphone addiction, the longer daily using time of smartphone.

Table 1: Smartphone addiction based on the characteristics of the participants (N = 339)

Variables	Categories	N(%)	M(SD)	t or F	Post hoc
Gender†	Male	142(42.0)	31.80(6.94)	-4.15***	
	Female	196(58.0)	34.94(6.79)		

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Age(years)	≤19	56(16.5)	35.17(7.10)	1.86	
	20-23	232(68.4)	33.46(6.69)		
	≥24	51(15.0)	32.72(8.15)		
Grade	1st	52(15.3)	35.36(6.73)	2.36	
	2nd	70(20.6)	34.48(6.21)		
	3rd	123(36.3)	32.59(6.02)		
	4th	94(27.7)	33.40(8.59)		
Major††	Humanities & social sciences [a]	162(47.8)	33.70(7.39)	1.98	
	Natural science [b]	89(26.3)	32.53(6.75)		
	Health & medical sciences[c]	76(22.4)	34.69(6.31)		
	Physical education & art	12(3.5)	34.00(7.48)		
Residence type†	Dormitory etc.	294(87.0)	33.82(7.15)	1.27	
	One's house	44(13.0)	32.38(5.97)		
Academic achievement	Good [a]	191(56.3)	32.29(6.92)	9.34***	ab, c
	Moderate [b]	113(33.3)	34.91(6.76)		
	Poor [c]	71(20.9)	34.08(7.65)		
Economic status	Good	83(24.5)	32.74(7.48)	0.90	
	Moderate	185(54.6)	33.85(6.52)		
	Poor	71(20.9)	34.08(7.65)		
Duration of using smartphone (month)	<60	64(18.9)	33.28(7.09)	0.20	
	60-120	232(68.4)	33.63(7.10)		
	>120	43(12.7)	34.16(6.49)		
Daily smartphone using time (minute)	<120 [a]	30(8.8)_	29.43(6.80)	6.56***	a c, d
	120-300 [b]	172(50.7)	33.12(6.70)		
	301-600 [c]	86(25.4)	34.90(7.27)		
	>600 [d]	51(15.0)	35.66(6.58)		

Note: † :No response was excluded; ††:Physical education & art was excluded from ANOVA analysis.

*** p<.001

Such as shown in table 2, the perceived stress (r=.366, p< .001), social interaction (r=0.119, p=.029), entertainment (r=0.330, p<.001) and passing time (r=0.226, p<.001) in motivation for using smartphone were significant correlation with smartphone addiction. In this study, smartphone addiction was positively associated with perceived stress. This result corresponds to other studies [11,18, 21] that smartphone addiction of college students showed increased levels of perceived stress and was closely related to stress. It is causing college students a great deal of stress because they should be designing lives. Thus, identifying students with having a high level of perceived stress and providing them with appropriate services may help them to prevent a smartphone addiction. In this research, the motivation for using a smartphone was identified as a significantly related factor to smartphone addiction among college students. It is consistent with the result of Kang [16] and Choi [22] which reported that entertainment oriented type, relationship oriented type and time pass of motivation for using smartphone were significantly correlated with smartphone addiction. Lee [23] suggested that motivation for using a smartphone is directly connected with frequency in use and prolonged time for a smartphone.

Table 2: Correlation between perceived stress, motivation of using a smartphone and smartphone addiction (N = 339)

	Smartphone Addiction	Perceived Stress	Motivation of Using a Smartphone
Smartphone addiction	1		
Perceived stress	.366***	1	
Motivation of using a smartphone	.220***	-.013	1
Information seeking	.012	-.074	
Convenience	.051	-.048	
Social interaction	.119*	-.075	
Entertainment	.330***	.113*	
Passing time	.226***	-.014	

*: p< .05, ***: *p*< .001

As appeared in table 3, the factors influencing the smartphone addiction were analyzed by using a hierarchical multiple regression analysis. In Model 1, the smartphone addiction was significantly influenced by gender (β=0.183), academic achievement (β=0.149～0.163). In Model 2, perceived stress (β=0.284), entertainment (β=0.241) and passing time (β=0.158) in the motivation for using a smartphone, gender (β=0.102), academic achievement (β=0.100～0.107) were significant predictors of smartphone addiction. These five factors explained 24.3% of the variance in the smartphone addiction. The general F score of multiple regression in Model 2 was significant (F=11.828, *p*<.001). Perceived stress was found to be the most effective factors of smartphone addiction. The results of prior studies [11,18,21] reported that college students who experience more stress are immersed in a smartphone to get away from their stressful situation and it leads to smartphone addiction. In motivation for using a smartphone, entertainment and passing time were identified as significantly influencing factors to smartphone addiction. It indicates that motivation to pursue entertainment through smartphone would like to increase the risk of collegians' smartphone addiction. Also, using a smartphone as a source of spending time might be accompanied by a reduced their sense of volitional control and induces them to use smartphone constantly. It is consistent with the result of Park and Shin [12,16,22] which reported that entertainment and passing the time of motivation for using smartphone make an impact on the overuse of the smartphone. Recently, advanced researches [12,13] showed that diverse motivations of using a smartphone-related to smartphone addiction. To prevent smartphone addiction early, it is necessary to check the motivation of using a smartphone, which reflects the unique characteristics of the smartphone of students.

Table 3: Predictors on the smartphone addiction (N = 339)

Variables	Model I		Model II	
	β	t	β	t
Constant		49.20***		2.20*
Gender	.183	3.42***	.102	2.06*
Academic achievement (moderate)	.149	2.79**	.107	2.15*
Academic achievement (poor)	.163	2.94**	.100	1.96*
Perceived stress			.284	5.64***
Entertainment in the motivation of using a smartphone			.241	4.23***
Passing time in the motivation of using a smartphone			.158	2.31*
	R^2=.074, F=7.69***		R^2=.243, F=11.82***	

Note: Dummy variable: Gender (0: male, 1: female)

*: *p*< .05, **: *p*< .001, ***: *p*< .001

Conclusion

This study is an attempt to make an offer a basic data for making strategies to check the smartphone addiction among college students by examining the relationship of smartphone addiction with perceived stress and motivation for using a smartphone and identifying factors related with smartphone addiction. This study showed that perceived stress and entertainment, passing time in the motivation of using a smartphone are significant influencing factors of smartphone addiction for college students. These findings suggest that preventing smartphone addiction among collegian requires not only diminishing perceived stress but also examining a motivation for using a smartphone. Also, it needs to identify that gender differences in using smartphone such as smartphone activities.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Convergence Study on the Stress Response and Life Satisfaction of a Workplace Worker -Focused on Regular and Non Regular worker-

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ABSTRACT

Background/Objectives: The purpose of this study is to compare the stress response and the satisfaction of life to regular workers and non - regular workers.

Method/Statistical Analysis: Data collection was conducted from July 1 to 31, 2017 for 600 workers of K company. Analysis was performed using the SPSS 23.0 version program and analyzed by χ^2-test, t-test, ANCOVA and Pearson's correlation coefficient.

Findings: The results showed that the stress response was higher in the irregular workers than in the regular workers (f=11.09, ρ=.001). In the stress response, the irregular workers showed higher somatic symptoms (f=6.18, ρ=.013), depression (f=13.70, ρ=.001) and anger (f=6.15, ρ=.013) than the regular workers. Stress response and life satisfaction showed significant negative correlation (r= -. 387, ρ <.001).

Improvements/Applications: Workplaces need to pay attention not only to regular workers but also to the stress of non-regular workers, and to programs that improve their life satisfaction and alleviate stress reactions.

Keywords: *Stress, Life Satisfaction, Workers, Regular Workers, Non-Regular Workers*

Introduction

As of the end of August 2016, there are 64,444,000 non-regular workers among 19,627,000 total wage workers in Korea, accounting for about 32.8% of the total wage workers[1]. Non-regular workers are widely used terms in Korea and Japan. Employment types are atypical, informal, non-standard, or non-permanent, and these non-regular workers are special types of work that are outside the characteristics of regular regular workers [2]. These non-regular workers show a special difference from regular workers in terms of duration of employment, hours worked and the way of providing work[3]. The characteristics of non-regular workers are temporary workers (term, contract, daily, casual, and appointment) because they are not continuous, and working hours and labor contract periods are fixed Non-regular workers experience stress due to job insecurity caused by uncertainty due to instability in the contract period which may create other stressors[4]. Unlike the regular workers, various job stress factors such as unemployment experience, turnover experience, and job insecurity have a negative impact on the social and psychological health of workers [5]. In addition, due to job autonomy, job instability, and inadequate compensation due to work characteristics, irregular workers have higher job stress than regular workers [6], which has serious effects on the physical and mental health status of workers [7]. These workers' health status was at a higher risk of worsening health status when they were in low income or when their employment status was irregular [8]. In addition, non-regular work has been shown to reduce health-related behaviors and quality of life for workers, and their quality of life has been shown to

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affect mental health [9]. Job stress of workers affects job performance in the workplace [10], while high job stress negatively affects life and lowers satisfaction with life. And negative effects were observed [11]. We are trying to prevent and prevent the health effect factors that occur in the working conditions experienced by irregular workers in the workplace. We also have to activate many studies according to the employment type of the workplace [12]. However, it is difficult to find a study that uses variables such as stress response and life satisfaction, which can affect health, by comparing the regular and non - regular workers in the form of workplace employment. The purpose of this study was to compare the stress response and life satisfaction of regular and non - regular workers in the workplace.

Materials and Method

Study Design: This study is a descriptive research study to investigate the difference of stress response and life satisfaction centering on regular and non - regular employment types of workplace workers.

Selection Process of the Subject: Data collection was conducted from July 1, 2017 to July 31, 2016, among 600 workers who understood the purpose of this study and agreed to participate. Out of the questionnaires, the final 580 data were used for the analysis except for the unsubstantiated data. The tools used in the study were obtained after obtaining the consent of the final modifier and the applicant.

Data Analysis

All data were analysis using SPSS statistics version 23.0 program. The personal characteristics and job characteristics of the subjects were analyzed by χ^2-test and t-test. The stress response (somatization, depression and anger) and the degree of life satisfaction were analyzed by descriptive statistical analysis. The ANCOVA analysis was conducted to examine the differences in the stress response and life satisfaction according to the employment type of the subjects. Correlation between the subject ‘s stress response (somatization, depression and anger) and life satisfaction was assessed using the Pearson correlation method.

Results

General Characteristics of the Subject: Table 1 shows general characteristics and job characteristics according to the employment type of the subject. The total number of subjects included in the analysis was 580, of which 149 (25.7%) were males and 431 (74.3%) were females, and both regular and irregular workers were female workers. The average age was 33 in regular workers compared to 30.3 in irregular workers (ρ <.001). The average working period was 59.5 months for regular workers and 32.7 months for non-regular workers (ρ <.001). The number of non - regular workers was 26 (7.9%), which is higher than that of regular workers (3.6%). In the average salary, 223 regular employees (89.2%) were over 3 million won and 292 (88.8%) were less than 2 million won (ρ <.001). However, there was no difference between spousal living level, education level, and religion.

Table 1: General Characteristics of the Subject

Variables	Regular	Non-regular	χ^2 or t	ρ
	n = 250(43.1%)	n = 330(56.9%)		
Age(year)	33.0 ± 7.5	30.3 ± 7.8	8.57	<.001
Gender				
Female	200(79.7)	231(70.2)	6.68	.010
Male	51(20.3)	98(29.8)		
Marital Status				
Married	91(36.3)	90(27.4)	5.34	.069
Single	153(61.0)	227(69.0)		
Others	7 (2.7)	12 (3.6)		
Education Level				
College	115(45.8)	167(50.8)	1.88	.390
University	55(21.9)	72(21.9)		
Master	81(32.3)	90(27.4)		

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Religion				
Protestant Christian	64(25.5)	93(28.3)	4.79	.309
Catholic Christian	29(11.6)	24 (7.3)		
Buddhism	27(10.8)	33(10.0)		
None	130(52.1)	180(54.4)		
Period of employment (month)	59.5 ± 41.6	32.7 ± 33.8	4.42	<.001
Working Style				
Day work	242(96.4)	303(92.1)	4.68	.031
Shift work	9 (3.6)	26 (7.9)		
Annual Salary (10,000 won)				
<200	7 (2.8)	292(88.8)	5.80	<.001
200≤ <300	20 (8.0)	30 (9.1)		
≥300	223(89.2)	7 (2.1)		

Stress Response and Life Satisfaction Score: Table 2 shows the stress response and life satisfaction scores. The stress response of the subjects was 52.86 ± 17.99 points on the scale of 110 points, and the physical symptoms were 22.65 ± 8.93 points on 45 points, 17.83 ± 6.62 points on 40 points, 12.37 points on 25 points ± 5.18 points. Life satisfaction was 42.34 ± 11.11 points out of 70 points.

Table 2: Stress Response and Life Satisfaction score

Variables	Min	Max	Mean ± SD
Stress response	22	110	52.86 ± 17.99
Somatization	9	45	22.65 ± 8.93
Depression	8	40	17.83 ± 6.62
Anger	5	25	12.37 ± 5.18
Satisfaction with life	10	70	42.34 ± 11.11

Stress Response and Satisfaction of Life According to Employment Type: Table 3 shows the results of the stress response and life satisfaction according to employment type. Variables that showed a difference between regular and non - regular workers were covariates. There was a statistically significant difference in the subscales of the stress response, body reaction, depression, and anger score. Compared with regular workers, irregular workers showed higher stress response (f=11.09, ρ=.001) By subdivision The scores of somatization (f = 6.18, ρ= .013), depression (f = 13.70, ρ= .001) and anger (f = 6.15, ρ=.013)

Table 3: Stress Response and Satisfaction of Life according to Employment Type

Variables	Regular (n = 251)	Non-regular (n = 329)	f	ρ
	Mean ± SD			
Stress response	50.15 ± 18.00	54.93 ± 17.74	11.09	.001
Somatization	21.55 ± 8.64	23.49 ± 9.06	6.18	.013
Depression	16.74 ± 6.53	18.67 ± 6.58	13.70	.001
Anger	11.86 ± 6.53	12.76 ± 5.14	6.15	.013
Satisfaction with life	42.93 ± 11.45	41.89 ± 10.84	2.07	.151

Relationship between Stress Response and Satisfaction of Life: Table 4 shows the subject's stress response and life satisfaction. There was a statistically significant negative correlation (r = -. 387, ρ <.001) with the stress response in the subjects' life satisfaction, and the somatization (r = - 277, ρ <.001), depression (r = -. 442, ρ <.001), and anger (r = -. 302, ρ <.001) were found to be statistically significant. That is, the higher the stress response, the lower the satisfaction of life.

Table 4: Relationship between stress response and satisfaction of life

Variables	1.	2.	3.	4.	5.
	r(ρ)	r(ρ)	r(ρ)	r(ρ)	r(ρ)
1. Stress response	1				
2. Somatization	.889 (<.001)	1			
3. Depression	.885 (<.001)	.641 (<.001)	1		
4. Anger	.812 (<.001)	.544 (<.001)	.690 (<.001)	1	
5. Satisfaction with life	-.387 (<.001)	-.277 (<.001)	-.442 (<.001)	-.302 (<.000)	1

Discussion

Compared with regular workers, irregular workers showed a higher total score of stress response. The results were similar to those of high job stress due to job instability and high job demands at workplaces where 50.2% of the workers were irregular workers [13], and the stress of non-regular workers who were employed in the form of part- Was a result that was in contrast to the study [9]. This is because, as seen from the general characteristics, it is thought that the irregular workers are highly likely to have job demands for irregular workers at workplaces where most of the daytime employees work like regular workers, and the job instability due to the employment characteristics of irregular workers. In the study of occupational characteristics of irregular workers [5], stress was found to affect social psychological stress, and it was found that job culture due to differences in work culture and salary in the workplace Stress factors have a significant impact on workers' mental health and have been shown to increase the risk of mental health high-risk workers [14]. The subjects' stress response and life satisfaction were inversely correlated, indicating that higher stress responses lowered life satisfaction. In the workplace, workers' stress was increased due to lack of autonomy, differences in salaries, job demands, and job instability [15]. The daily stress of female nursery teachers affected the psychological state such as anxiety, and the better the psychological state, the higher the satisfaction of life [16]. In the study of local public servants [17], overall satisfaction with job satisfaction was high. In other studies, the higher the expectation of life satisfaction, the less stress and well-being [18].

Conclusion

The purpose of this study is to provide basic data on the health promotion of workers by analyzing the relationship between stress response and life satisfaction in regular and non - regular employment types. According to the results of the study, a health promotion program is needed to improve the health of the workplace and to provide differentiated approach according to the type of employment and to alleviate the stress reaction of non - regular workers and to improve life satisfaction. Also, based on the results, the following suggestions are made. First, there is a need for comparative and repeated research on stress and life satisfaction that may affect worker 's health, focusing on regular and non - regular workers in various workplaces. Second, through this study, it was found that non - regular workers had higher stress response and lower life satisfaction than regular workers. Therefore, it is necessary to study the application of stress reduction program to non - regular workers.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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What is the 'Good Nurse'?: An Integrative Literature Review

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ABSTRACT

Background/Objectives: This study aimed to investigate the attributes of the 'good nurse' from patients' and nurses' perspectives in the literature.

Method: A total of 11 studies were identified from literature search. The data relevant to the characteristics of good nurses was extracted and categorized into two subsets of personality traits and professional competence according to conceptual distinction.

Finding: The characteristics of regardful, humanistic, supportive, and faithful were the most frequently identified personality trait of 'good nurses.' The attributes of professional manner, practical competence, patient-centered care, and communication were regarded as the essential professional competence for 'good nurses.'

Improvements/Applications: The characteristics of 'good nurses' identified in this study, including not only the professional competence but also the personality traits, indicate the need to make comprehensive and balanced approach of nursing education for training 'good nurses.'

Keywords: *character, nurse, perceptions, patient preference, systematic review*

Introduction

The social recognition and role expectations for the profession of nursing have changed since the beginning of nursing history[1]. The essentials of a good nurse early in the twentieth century included the traditional roles of being a diligent observer and loyal assistant to the doctor[2.] Conventional wisdom, that all women had a calling in life to take care of others, was associated with the idea of the nurse-as-woman and pervaded society in earlier times[3]. Until the end of the twentieth century, in the public mind, theoretical knowledge or university-based education was not necessary for nurses, as more importance was placed on nurses' technical skills[4]. However, recently, nurses' roles have greatly expanded from the direct bedside care-giver to the healthcare manager, including acting as a researcher, educator, and healthcare policy participant in promoting patients' health and well-being[1].

While the role of a nurse has changed and developed over the past few decades, intrinsic concepts, such as having respect for life, being an advocate for human rights, promoting health, and relieving suffering, remain unchanged as the core obligations and missions of a nurse[5]. To fulfill those values, a nurse is required to possess inherent personality traits and qualities. According to Park[6], a nurse who had a desirable personality was usually referred to as a good nurse, and it was important to possess not only practical proficiency but also moral and ethical values. Pfefferkoron[7] stressed that a nurse who had excellent technical skills could be a good technician but not a good nurse, and asserted the importance of having gracious courtesy in order to be a good nurse.

However, a discussion of what makes a good nurse has not been highlighted in recent years when considering that consumer-oriented nursing services

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have been greatly emphasized within the profession of nursing. Several previous studies mainly explored the level of patient satisfaction regarding nursing services, patient care needs and priorities, or differences in patients' and nurses' perceptions of nursing care[8,9]. In determining the essential requirements necessary for quality nursing care, the discourse surrounding *good nurses* will play a significant part as a key factor. Patients are experiencing nursing care service within the context of direct nurse-patient relationships and in that, nurses' inherent personal traits can be a remarkable factor that affects patients' satisfaction level with nursing care services[10,11].

Therefore, it is important to clarify professional competence and personality traits that are required for nurses in accordance with the changing needs of the society in addition to the unique fundamental characteristics of nurses that do not change over time. Clinical environments in recent years have become more complex, and an increasing dependency on medical technology has taken root in the contemporary healthcare system. By investigating patients' and nurses' perceptions of a good nurse, nurses' qualifications that meet the needs of changing society can be identified. Accordingly, this study aims to identify the specific characteristics and qualifications of a good nurse through an integrative review, using the method by Whittemore and Knafl[12]. The research question of this study was as follows: What are the personality traits and professional competence needs of a good nurse as perceived by patients and nurses?

Method

Literature Search: We conducted a literature search to identify articles published between 2000 and 2017 using databases of PubMed, CINAHL, MEDLINE, research Information Sharing Service. We performed a wide range of search with combinations of key words based on the research questions: *patients, good nurse, nurse, professionalism, character, characteristic, trait, perception, patient preference, perspectives, view, description, and expectations*. Inclusion criteria were as follows: studies that (a) focused on *good nurse* or the characteristics of good nurse from patients' and/or nurses' perspectives; (b) were published in peer-reviewed journals between January 2000 and June 2017, and (c) were published in English or Korean. We excluded studies about patients' satisfaction, service evaluation, theses or dissertations. We retrieved 76 studies from the databases search and removed 10 studies for duplicates. By reviewing the title and abstract, we removed the irrelevant studies and selected 8 studies for satisfying inclusion criteria by reading the full text of the studies. We added two studies by searching the references manually and selected a total of 11 studies for the systematic review [Figure1].

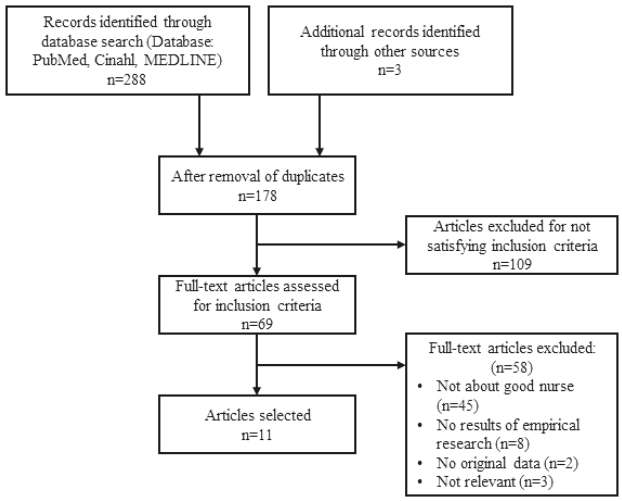

Figure 1: Flow chart of study selection

Data Evaluation: We appraised the study quality using the Mixed Method Appraisal Tool[13]. The answers to the four criteria applied for each type of study design were summed and converted into a score ranging from 0% to 100%. The final evaluation results were derived from adjusting of the results from the two researchers.

Data Analysis and Presentation

From the final list of selected studies (n=11), we extracted relevant data and categorized them into personality traits and professional competence. This categorization was based on Sumner's description of the nurse self, which is separated into personal self and professional self. [14] In this study, personality trait was defined as a person's inherent nature or unique characteristic. Professional competence was defined as the ability and power to do something successfully within a profession by using a large amount of experience and knowledge[15]. We created four subcategories under each of the two groups of data using conceptual similarity. Concepts from each group of data relevant to personality traits and professional competence was depicted using Wordle, which generates an image giving greater prominence to words that appear more frequently in the source text [Figure 2].

Results

Of the 11 included studied, eight studies were conducted on patients while only two studies on nurses. Regarding the study design, eight studies used qualitative study designs, two studies used quantitative study designs, and one study used a mixed method study design. The quality assessment score ranged from 50% to 100%, in which all except two studies had score ≥ 75%[A1-A3, A5-A6, A8-A11].

Personality Traits of Good Nurse: Personality traits of a good nurse described in a total of 11 studies were categorized as *regardful* (n=11), *humanistic* (n=9), *supportive* (n=8), *faithful* (n=7). *Regardful* was mentioned most frequently as personality trait of a good nurse and it was described in 11 of the studies [Figure 2]. The attributes of a *regardful* nurse were identified as *respectful*[A1-A11], *considerate*[A3,A4,A7,A10], *courteous*[A1,A3], and *polite*[A1]. *Humanistic* was important personality trait of a good nurse in nine of the studies. The attributes of a *humanistic* nurse were described as *compassionate* [A2-A4,A8,A10,A11], *warm*[A1-A4,A7,A11], *kind*[A1-A3,A8,A10], *caring*[A2,A6,A8,A11], *empathetic*[A1,A2,A10,A11], *selfless*[A2,A7], *accepting*[A11], *intimate*[A2], *friendly*[A1], sincere[A10], sympathetic[A3], and *willing to help* [A2].

The attributes of a *supportive* nurse were described as *cheerful*[A1-A4,A10], *humorous*[A1-A4,A6], *helpful*[A1,A2,A11], *positive*[A2,A10,A11], *fun*[A1,A6], *reassuring*[A1,A11], *courageous*[A2, A6], *giving hope*, and *giving praise*. *Faithful* was represented as personality trait of a good nurse in seven of the studies. The attributes of *faithful* were described as *responsible*[A2,A3,A8,A9], *honest*[A1,A2,A9], *trusty*[A1,A10], *ethical*[A2,A8], *virtuous*[A4], and *loyal*[A2].

Professional Competence of Good Nurse: Professional competence of a good nurse described in a total of 11 studies were categorized as *professional manner* (n=11), *practical quality* (n=10), *patient-centered care* (n=10), and c*ommunication* (n=9). Of the subcategories of professional competence, participants emphasized the subcategory *professional manner* most frequently as it appeared in all 11 studies. The attributes of profession manner identified were *calmness*[A1,A2,A4,A6,A11], *pride*[A2,A6,A11], *patience*[A3, A4,A10], *cleanliness*[A1,A5,A7], *gentleness*[A1,A3], *dressing in appropriate attire*[A1,A5], *being a role model*, and *following standards of profession's code of ethics*.

Practical quality was derived from ten studies and included attributes in this category were *knowledge*[A1-A10], *technical skill*[A1-A4,A6-A8,A11], *experience*[A2,A4,A6], and *critical thinking*[A2,A8]. *Knowledge* was most frequently mentioned above all other attributes as it appeared in all 10 studies [Figure 2]. "Critical thinking" was reported in two studies conducted on nurses only [A2,A8].

Patient-centered care was elicited from 10 studies and identified attributes of patient-centered care were *fulfilling patient's needs*[A2-A4,A8,A11], *explaining* [A4,A7,A9-A11], *providing timely care*[A4-A6,A9], *providing patient education*[A4,A8,A9], *providing empowerment* [A9,A11], and *preserving patient's rights* [A6,A7].

Communication was reported as professional competence in nine of the studies, and its specific attributes were identified as *listening*[A1,A6-9,A11], *having conversation*[A1-A3,A7,A9,A11], *establishing rapport*[A2,A5,A6,A9], and *communicating among healthcare team*[A3,A5,A9].

Personality traits **Professional competence**

Figure 2: Characteristics of good nurses perceived by patients and nurses

Discussion

Personality Traits of Good Nurse: The personality trait of a good nurse that carried the most emphasis was *regardful,* and the most important attribute of a *regardful* nurse was *respectful*. Patients stated that they had experienced the loss of identity and existence in hospitals, expressing their strong desire to be respected as a human being[16]. They felt respected when nurses did not see them as the disease itself and classify them by numbers or symbols, but acknowledged the diversity of individual culture and guaranteed patients' participation in the decision-making process. This is consistent with the fundamental principles of nursing, that the respect for patients is respect for dignity and fundamental rights to life, suggesting that the respect for patients is a moral right granted to patients and a concept that must be upheld in the field[17].

The second most emphasized trait of a good nurse was *humanistic* and the most important attributes of a *humanistic* nurse were identified as *warm, compassionate*

and *kind*. As the concept of marketing increasingly applies to hospital services in recent years, *kindness* is often requested from nurses[18]. Unlike others in the service sector from whom simple *kindness* is required, being *warm-hearted* and *compassionate* seem to be the more essential and significant qualities for nurses who customarily deal with patients and human lives at work. Patients are exposed to an unfamiliar hospital environment to overcome their medical conditions, and satisfying their basic needs is ensuring psychological stability, which also affects the extent of recovery [19].

Meantime, the attribute of *ethical* within the category *faithful* was commented by nurses only. This seems to be because nurses are subject to basic training on the principles, concept, and rules of ethics as part of the university curriculum and their compliance with professional ethics is emphasized via code of ethics. Nurses are required to participate as professionals in the decision-making process that can affect the life of patient and be responsible in their actions as the actual advocate for patients[20].

Professional Competence of Good Nurse: Within professional competence of a good nurse, most emphasis was given to *professional manner* and its representative attribute was *calmness*. A cancer patient indicated that nurses who stayed calm and rational despite the patient's state of panic reassured that the patient could trust the nurses. This implies that patients may be negatively influenced if nurses are emotionally affected by patients or guardians, fail to control their emotion or show anger or tears in their presence[21], or fail to restrain emotional response by both patients and themselves because they are excessively steered by positive or negation emotions[19]. To help patients who experience various diseases and instability, nurses will need to find a balance between humanitarianism, *compassion for patients* and *calm, professional manners.*

Practical quality was the second most important competence of a good nurse, only except for a study conducted on psychiatric patients. The representative attribute within *practical quality* was nursing knowledge and skills. This supports today's phenomena[22] in which nursing education underlines the importance of nursing students acquiring the knowledge and skills. In a study on psychiatric patients, however, it was found that the professional competencies of a *good nurse* included *explanation, ensuring patient participation in the treatment process, attentiveness*, and *conversation*[23].

Patient-centered care was identified as professional competence of a good nurse and its specific attributes were *fulfilling patient's needs*, and *explaining*. For patients whose independence has been compromised by the disease, demands for daily life assistance were as important as their demands for professional nursing skills. *Fulfilling patient's needs* was closely related to another attribute, *timely care*. Patients considered it a professional competency when nurses responded immediately to their minor/major demands and were willing to resolve issues.

Of many nursing care activities that fall under patient advocacy, patients prioritized nurses' explanation. Explanation by nurses also ranked top in a study in 1979 on general demands made by inpatients[24]. The findings of the studies conducted in the 1970s are consistent with those of this study based on recent studies, indicating that patient demands for nurses' explanation have been important to this day.

Lastly, *communication* was derived as professional competence of a good nurse and *listening* was reported as important attribute within *communication*. While many patients wished to engage in personal communication or wanted nurses to expose their personal stories in the process of engaging in patient-nurse conversation or building rapport, the same was not mentioned by nurses. This was similar to previous studies[15] that reported how nurses believed it to be safe to not reveal their personal stories or life to patients. If nurses could enhance their skills[25] to take advantage of self-exposure and demonstrate humanitarian empathy and communication for treatment purposes, it could be possible to provide a therapeutic environment in which nurses can build rapport with patients.

Based on the findings of this study, *good nurses* will need to find balance between their character and professional competency and have a mix of nursing qualities, perceived differently by nurses and patients. Therefore, introducing an organic framework for nursing education covering character-building and professional classes in the curriculum is the most important. Meanwhile, the chronic shortage of nurses and other such constraints in Korea prevent nurses, even the ones with all the required qualities, from practicing what they learn in real life. It is therefore imperative that studies be performed to explore the range of practical character-

building education and system and the structural aspect of the clinical settings that undermines the quality of nursing care. Further studies are also required, considering that the perception of a *good nurse* may change by the severity of disease or cultural background.

The limitations of this study are as follows: the number of nurses studied in this paper was smaller than that of the patients, which necessitates additional studies on the comparison between nurses' and patients' perceptions. Additionally, it is necessary to conduct an in-depth study on the comparison of nurses' and patients' perceptions regarding what makes a good nurse by their disease and department as there are only a few studies on this particular topic. Despite its limitations, this paper comprehensively reviewed the studies conducted on participants with specific diseases or in specific wards or departments to better understand the concept of *good nurses* as perceived by patients and nurses. The findings are direct attention to the general trends in the expectations and demands of society and the qualities unique to nurses who deal with patients with specific diseases or in specific wards/departments.

Conclusion

Our study indicated the personality traits and professional competence needs of a good nurse as perceived by patients and nurses. For being a good nurse, it is important to balance personality traits and professional competence. These findings of our study provide a better understanding of the direction of nursing education as well as the structural environments of clinical nursing field.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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Appendix 1: Reviewed Paper List

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ECG Biometrics in Forensic Application for Crime Detection

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ABSTRACT

The physiological property of the human being is unique for each individual. This provides the identity of specific human. Biometric features are used with the help of engineering through machines in recent years for better operation. Similar features can be used for crime detection and security purpose. The biometric features provides information and useful in forensic science. Unlike many methods, heart signal is considered in this work. In different mental condition ECG is collected experimentally in our laboratory using cardio track device. The experiment is carried with eighty subjects. The age range is between nineteen to twenty one years. The data is verified for frighten boy committed some mistakes related to academic environment. Spectral analysis using Fractional fourier transform (FFT) and Wavelet transform (WT) has been performed for R peak detection. The wavelet coefficients are considered as the weights of neural network model for detection purpose. The standard neural network structure multi layer perceptron (MLP) is utilized with wavelet coefficients. The result found excellent as compare to earlier method and exhibited in result section

Keywords: *Biometric Identification; ECG; R peaks; Wavelet; Neural Network.*

Introduction

Biometric data for identification in forensic science backs to 20*th* century. Forensic science refers to the applications of scientific principles and technical methods to an investigation in relation to criminal activities, in order to establish the existence of a crime, to determine the identity. It is thus logical that this area was a fertile ground for the use of physiological or behavioral data to sort and potentially individualize protagonists involved in offences.

Biometric identification system is one of the innovative techniques in the field of identity management system. It is an improved technology for personal data storage system and highly secured as compared to traditional security mechanism like pin and password system. This method is similar to pattern recognition technique where unique and discriminative features (biometric samples or recognition data) are extracted and then matching of these features with previously enrolled data takes place.

Biometrics is inherent behavioral or physiological properties of living beings. In other words, biometrics describes our appearance, *what* and *how* we are. Biometric traits include physiological properties like body height, face or fingerprint, as well as behavioral properties like voice, gait or signature. The main advantages of biometric authentication, including usability, availability, security and portability are directly inferred from this bond.

The complete procedure for biometric identification system is displayed in **Figure 1**. Generally in this identification technique different biological data are used for identifying someone as being him/herself. These data can be face, iris, fingerprint, ECG, and EEG as presented in **Figure 2**. While the use of biometrics for authentication purposes offers many advantages, there are also security and privacy concerns arising. Biometrics contains personal and possibly sensitive information. System, service or authentication providers shouldn't gain access to biometrics, as the information contained in biometric signals could be abused or lost.

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- Understanding the correct processes and the legal parameters can make the difference between having a suspect's confession accepted as evidence by the court or not. With the above in mind, this chapter will focus on several salient issues, including:
- The progression from interviewing to questioning to interrogating, and how this progression relates to investigative practices
- The junctures that demonstrate the need to change from interviewing a witness to questioning a detained suspect to interrogating an arrested suspect
- The issues of physical and mental distress, and how to avoid the perception of officer-induced distress during an interrogation

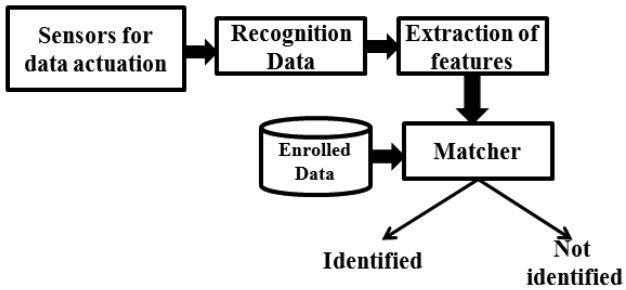

Figure 1: Biometric identification system

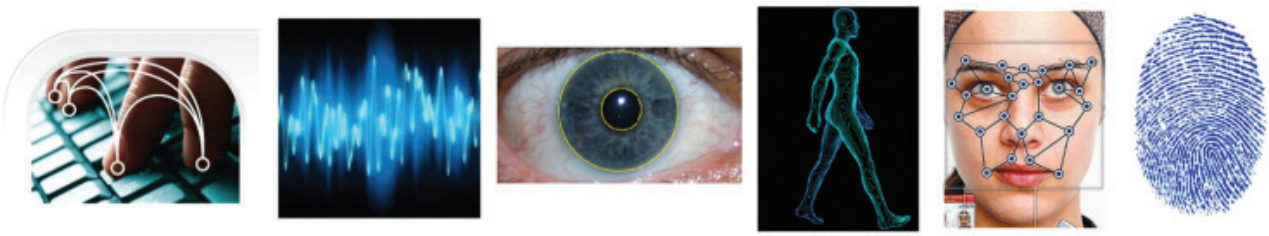

Figure 2: Different types of biometric modalities such as keystroke, voice, iris, gait, face and fingerprint.

Some of these data can be vulnerable to forgery, but our heart is constantly beating and can be used for obtaining different information based on the electrical heart characteristics[1,2,3]. There is an expanding enthusiasm for utilizing the ECG in biometric recognizable proof. Every individual has an distinctive ECG characteristics which gives robustness for falsification using fraudulent techniques[4]. Generally there are two types of ECG biometric recognition methods: fiducial and non-fiducial. Fiducial method is a preprocessing step for the detection of heartbeat. Specific points are identified in this step which is vulnerable to processing errors, due to, e.g., noise. There is no need of ECG wave detection or configuration in non-fiducial methods. These methods are generally used for reducing the preprocessing error rate. Also there are some semi-non-fiducial methods in which at least the R-peaks are detected for window alignment[5,6]. In ECG based biometric identification method the ECG data is collected every time the person arrives at the access point. There are some external factors like circadian cycle which affects the signal characteristics. For this reason the identification system should be vigorous and protected to variations in ECG. For obtaining a reasonable and perfect identification system, it is important to employ a method which can accurately deal with the usual biometric identification systems.

Keeping the level of user interaction for authentication as low as possible, adds to usability and ultimately increases user acceptance. They are available, because most biometrics don't change significantly within weeks or months and they are on hand wherever we go. From some biometrics like voice, gait or ECG, even liveliness can be derived. They are secure, because many offer high classification rates, they are not prone to shoulder surfing and counterfeit attacks at least require a certain degree of equipment and preparation. And last but not least they are portable, because most biometrics can be measured with sensors that have small form factor and would easily fit into most mobile devices[7]. A structure of different types of bioinformatics is presented in **Figure 3**.

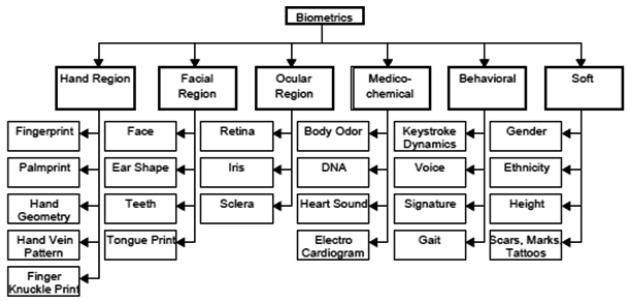

Figure 3: Structure of the different types of Bioinformatics[24]

Sate of the Art of the Work: It is one of the complicated tasks to develop an ECG based biometric identification system which can identify a person accurately. Different techniques have been applied by the researcher for getting a better identification system and some of them are cited here.

A recent study was driven by the fact that blood circulation causes periodic subtle changes to facial skin color[8]. This fact was utilized in[9,10,11,12,13] for HR estimation and [14,15,16] for applications of heartbeat signal from facial video. These facial color-based methods, however, are not effective when taking into ac-count the sensitivity to color noise and changes in illumination during tracking. Thus, Balakrishnan *et al.* proposed a system for measuring HR based on the fact that the flow of blood through the aorta causes invisible motion in the head (which can be observed by Ballistocardiography) due to pulsation of the heart muscles[17]. An improvement of this method was proposed in[12]. These motion-based methods of [17,18] extract facial feature points from forehead and cheek.

ECG based human verification system was proposed in [19] for both healthy and cardiac irregular condition. They have used heart beat level and segment level information fusion methods. principal component analysis (PCA), linear discriminant analysis (LDA) and within-class covariance normalization (WCCN) for beat variability compensation followed by cosine similarity and S-norm as scoring were used in their work. Their proposed PCA algorithms perform 25% realisable on PTB data base. Same PCA was applied in[20] for identification purpose and 92.9% classification accuracy was obtained in their work. Authors in[21] extracted 19 features from each heart beat for the identification purpose. Template matching and adaptive thresholding was applied in their work for matching purpose. The matching was calculated by using correlation between features and 99% accuracy was obtained from their proposed system. ECG can be employed as a continuous authentication system. When the human heart pumps blood, subtle chromatic changes in the facial skin and slight head motion occur periodically. These changes and motion are associated with the periodic heartbeat signal and can be detected in a facial video[22]. Takano et al. first utilized the subtle color changes as heartbeat signals from facial video acquired by a camera to estimate HR[23].

Biometrics Method for Human Identification Using Electrocardiogram: This work exploits the feasibility of physiological signal electrocardiogram (ECG) to aid in human identification. Signal processing methods for analysis of ECG are discussed. Using ECG signal as biometrics, a total of 19 features based on time interval, amplitudes and angles between clinically dominant fiducials are extracted from each heartbeat. A test set of 250 ECG recordings prepared from 50 subjects ECG from Physionet are evaluated on proposed identification system, designed on template matching and adaptive thresholding. The matching decisions are evaluated on the basis of correlation between features.

The advantages of using the ECG for biometric recognition can be summarized as universality, permanence, uniqueness, robustness to attacks, liveness detection, continuous authentication and data minimization.

With time-varying biosignals there is high risk of instantaneous changes which may endanger biometric security. Recordings of the cardiac potential at the surface of the body are very prone to noise due to movements. However, even in the absence of noise, the ECG signal may destabilize with respect to a biometric template that was constructed some time earlier. The reason for this is the direct effect that the body's physiology and psychology have on the cardiac function. Therefore, a central aspect of the ECG biometrics research is the investigation of the sources of intra-subject variability. ECG of two different persons is presented in **Figure 4**.

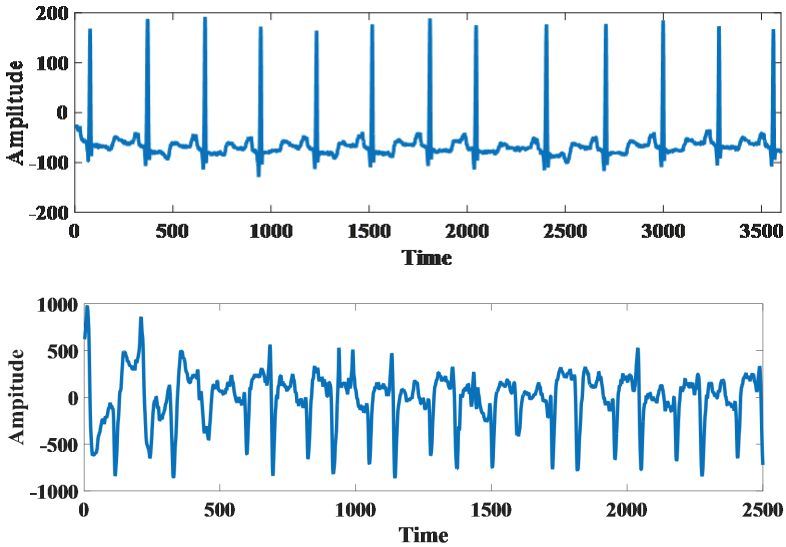

Figure 4: Different ECG patterns for different persons

Wavelet Transform: Basically wavelet transform decomposes the signal in different scales. This will represent to the resolution of the signal. The corresponding frequency can be found according to time localization. Because of its scaling property, it holds a unique position for time-frequency analysis of the non-stationary signals. Since ECG is a category of non-stationary as well as noisy signal, wavelet transform is chosen for such analysis[25]. In this case, noise is removed and simultaneously the specific peaks are located clearly.

DWT provides a cosy relationship of a signal in time and frequency domain and can be defined as:

$$D(c_1, c_2) = \sum_{c_1}\sum_{c_2} S[c_2]2^{-\frac{1}{2}}\left(\dot{E}2^{-\frac{1}{2}} j - c_2\right) \quad \ldots(1)$$

Here $D(C_1,C_2)$ is the DWT coefficients $S[C_2]$ is the discrete signal.

In wavelet analysis any signal space of a multi-resolution approximation can be decomposed into lower frequency (lower-resolution) approximation and high frequency (higher-resolution) approximation. The noise is eliminated by discarding the detail coefficients D1, D2. Secondly, in our method, using filtering approach before wavelet and FT analysis we have removed most of the unwanted noise of the signal. The probability of error in R peak detection is minimized in spite of the presence of drastic irregularity in the baseline[26,27].

Haar wavelet is the simplest and first of wavelet family that resembles to a step function. Daubechies is the mostly discussed wavelet family in signal processing approach. It is generally represented as dbN where, N signifies order of the wavelet. An order of 2, 4 and 6 has been used for comparison of the unhealthy person from a normal person. In this case the 'R' peaks are detected successfully by selecting the optimum coefficients. Different mother wavelets like Coiflet, Symlet and Daubechies have been tested for this problem. The best result with Daubechies has been reported. In case of high pass filtering Db 6 and for low pass filtering Db 2 have shown the best result and is shown in result section.

For 'R' peak detection the following processor has been proposed.

- Consider the filter ECG signal as the input and calculate the wavelet co-efficient.
- Initialize the window time the total time can be evaluated as total number of samples/sampling frequency.
- Find the maximum and minimum for each window from all possible QRS segment.
- Now locate the R peaks of QRS complexes from different segment.

Neural Network: An artificial neural network (ANN) is a generalized mathematical model which is based on biological nervous systems. The fundamental elements of neural networks are artificial neurons. Input, output, and hidden are three basic layers of a simple neural network as presented in **Figure 5**. In feed-forward networks, the signal flow is from input to output units, strictly in a feed-forward direction. Both linear and non-linear classification problems can be solved by applying ANN with various type of network structure and learning algorithm.

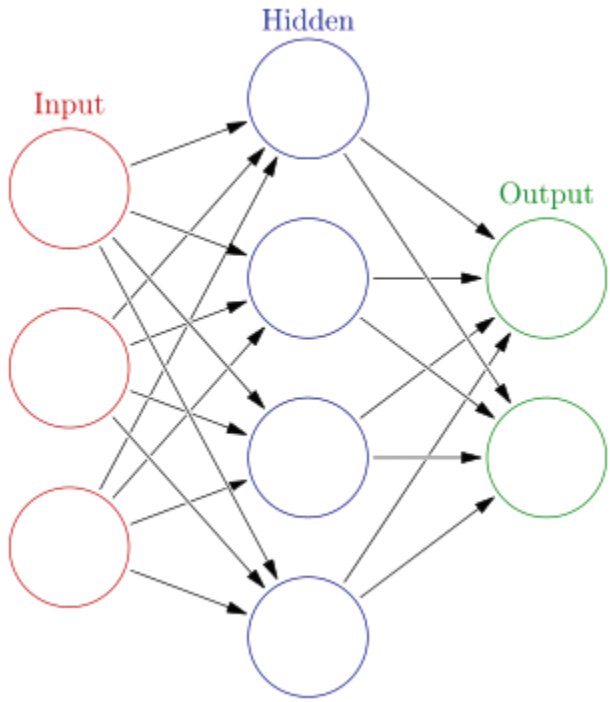

Figure 5: Standard neural network structure

In neural network the output of the hidden layer h and output layer y can be calculated as:

$$h = \sigma(W_1 x + b_1) \quad \ldots(1)$$

$$y = \sigma(W_2 h + b_2) \quad \ldots(2)$$

where W_1 and W_2 are the weights of neuron and x is the input. b_1 and b_2 are the bias. σ is the activation function. The weights are considered with the wavelet coefficients.

Results

In different mental condition ECG is collected experimentally in our laboratory using cardio track device. The experiment is carried with eighty subjects. The age range is between nineteen to twenty one years. The data is verified for frighten boy committed some mistakes related to academic environment. ECG signal with high pulse rate (above 100) is considered for the proposed work. A sample signal is presented in Figure 2. For extracting the QRS complex from the signal, it is decomposed by applying wavelet decomposition method. A decomposed ECG is shown is **Figure 6**.

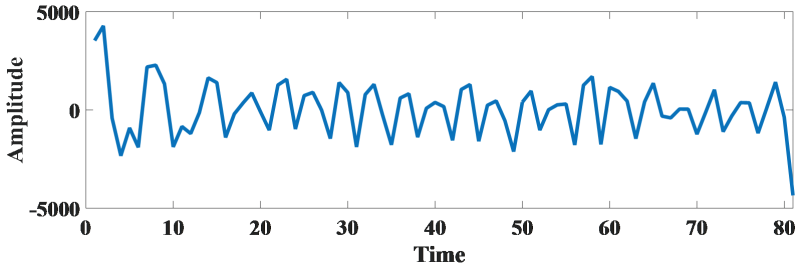

Figure 6: Decomposed ECG

As shown in **Figure 7**, the heartbeat rate is highest. Since, the normal heart beat rate of an average healthy person lies in between 72 to 120. Thus, a value of 132 as heartbeat indicates the degree of illness the person is affected with. Hence it requires immediate attention. The R-peaks are also of highest amplitude. Similar results could be observed from the wavelet features in **Figure 8**.

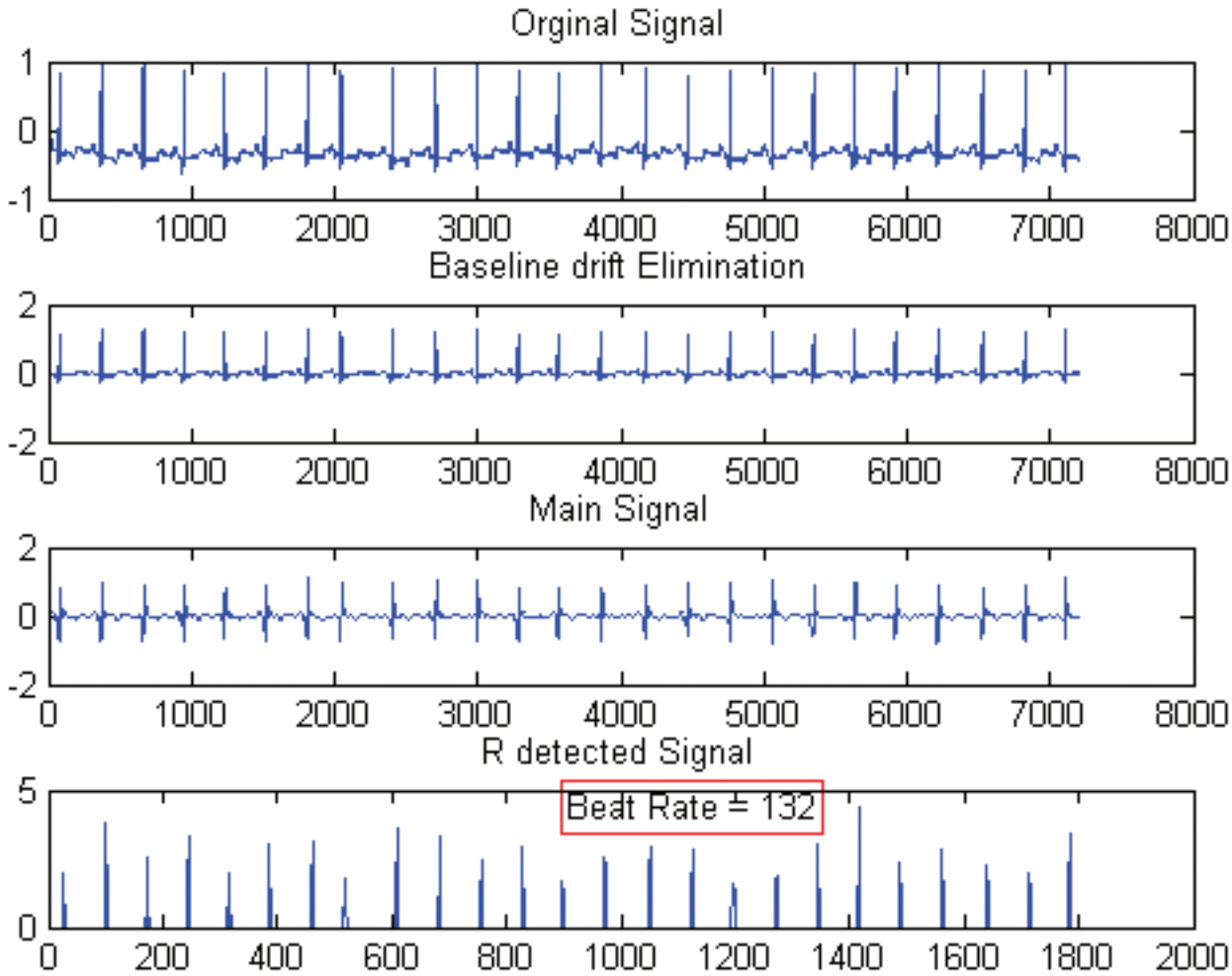

Figure 7: Identification of a terminal ill person from R-peak using db2 wavelet features

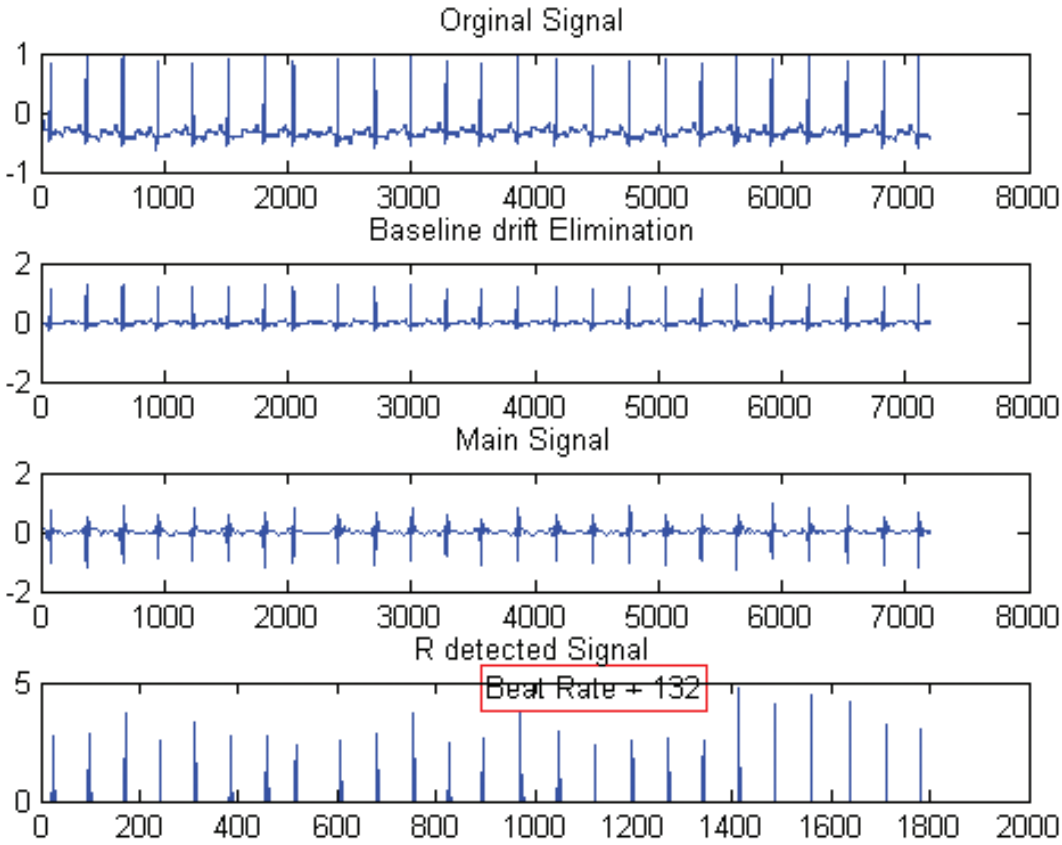

Figure 8: Identification of a terminal ill person from R-peak using Haar wavelet features

The R-peaks are also large although less than that in Figure 7 and Figure 8. Both db and Haar family of wavelet has been used to rate the normal person based on his/her heartbeat. Analysis of these coefficients indicates corresponding R-peaks point towards a normal human being.

After getting the required QRS feature a neural network model is designed for the classification purpose. It classifies the normal ECG and the ECG with high pulse rate. The performance of the neural network classifier is presented in **Figure 9**.

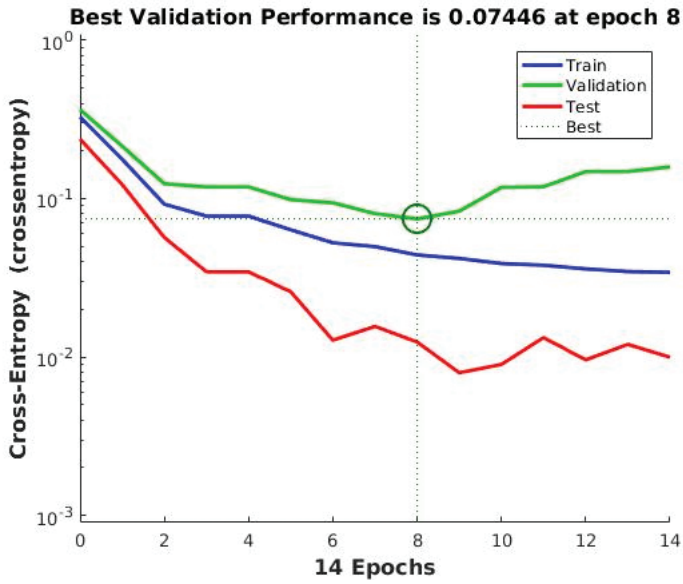

Figure 9: Performance of the Neural Network classifier

Accuracy of a classifier is measured from the confusion matrix. In Figure 10 confusion matrix of the proposed classifier is presented and 96% accuracy is obtained. ROC curve of the neural network in training, testing and validation is presented in **Figure 11**. Result obtained from the proposed system is compared with earlier method and is presented in **Table 1**.

Figure 10: Confusion matrix of the classifier

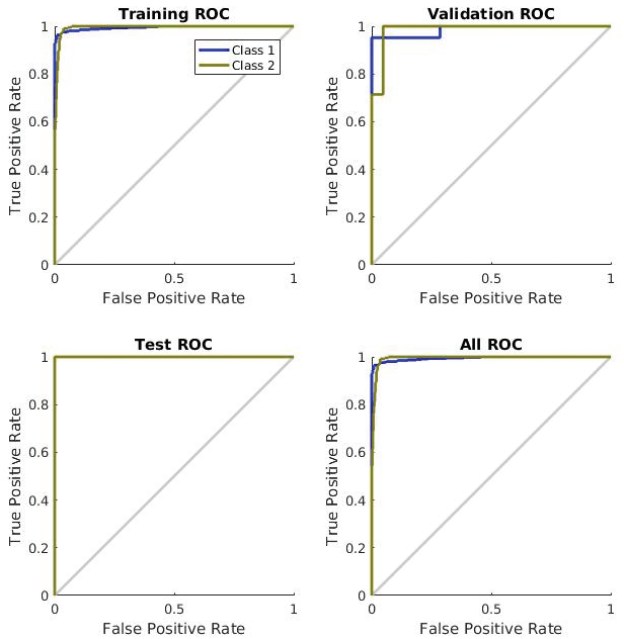

Figure 11: ROC of the neural network classifier

Table 1: Comparison of result with earlier method

Method	Accuracy
EMD [2]	76.19%
SVM [4]	93%
PCA [20]	92.9%
Proposed System	96%

Conclusion

ECG based biometric recognition system is proposed for human authentication purpose. Wavelet features are classified using neural network classifier and the result shows that the neural network classifier for identification is performing well. This system can be implemented in forensic science for biometric identification purpose. Further different feature extraction and classification methods can be taken for better result.

Ethical Clearance: Not required

Source of Funding: Self

Conflict of Interest: Nil

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A Two-Year Prospective Study of Custodial Deaths from Punjab Region of India

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ABSTRACT

On one hand the horizon of human rights is expanding but at the same time the crime rate is also increasing. In this context, custodial deaths are among most contentious deaths for investigation by forensic experts. These deaths sometimes invite mass resentment and condemnation. Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are due to natural causes. To analyse custodial deaths from all aspects present prospective study was undertaken. A total of 135 (119 male and 16 female) cases of custodial deaths were examined in detail over a study period of 2 years. Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. Among 92 cases (out of 135) in which final cause of death was declared, the death was natural in 95.65% while in 4.35% it was unnatural. Pulmonary tuberculosis was the most common natural cause among prison custodial deaths (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the leading cause of natural death. As far as unnatural deaths are concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death was noticed.

Keywords: *custodial deaths, jail, police, mental hospital.*

INTRODUCTION

Unfortunately, the term 'custody' has not been defined in Criminal Procedure Code (CrPC). Its core meaning is that the law has taken control of the person. This control is not the final or absolute control of ownership but controlling of a person's liberty or curtailing in a substantial manner a person's freedom of action. But at the same time there is implied responsibility for the protection and preservation of the person in custody. The person in custody is thus totally dependent on his or her custodian for proper care and attention.

Custodial death is heard in news and media from time to time and most of the highlighted cases invite public resentment and condemnation. Such events invariably have substantial allegations of omission of proper care and attention or commission of atrocities and torture or abuse of power in one or the other way on part of the authorities' concerned.

Not that always such deaths are due to unnatural or violent causes; indeed most of the time they are due to natural causes.[1,2] Inadequate medical facilities, delayed medical attention, inadequately trained staff and insensitive custodial authorities are frequently blamed causes by the researchers, to contribute to untimely natural or unnatural prison deaths. Therefore all cases of custodial deaths need to be investigated thoroughly to bring out the actual facts surrounding the death.

Every case of custodial death is supposed to be reported to the National Human Rights Commission (NHRC) and the police is also required to report the findings of the magistrate's inquiry to the Commission along with the postmortem report.[1] This is an important protection but these steps are frequently ignored. According to Human Rights Watch investigation, a judicial inquiry was conducted only in 31 of the 97 custodial deaths reported in 2015 and 26 cases were not even submitted for an autopsy.[3]

The autopsy surgeon has a unique role in documenting medical evidence in cases of custodial deaths. His/her role assumes significance in events when the custodial authorities try to hide or alter the actual facts behind the death to save themselves from any penal action. He/she can find out the cause of death after meticulous examination and may also come out clear about manner of death on thorough evaluation of available information.

MATERIAL & METHOD

The prospective analytic study was carried out in the Department of Forensic Medicine and Toxicology, Government Medical College Amritsar (GMCA) from 1.10.2014 to 30.9.2016 on cases of custodial deaths brought for postmortem examination. The postmortem was conducted as per the guidelines laid down by NHRC.

Custodial deaths were categorized into three groups namely jail custody, police custody and mental hospital custody (in the custody of Government Mental Hospital Amritsar) deaths.

The inquest papers, hospital record, autopsy findings and the results of laboratory investigations including histopathology and chemical analysis were perused. All the observations are tabulated and the results are compared with the previous studies.

OBSERVATIONS

Out of 695 autopsies conducted during this period, the number of custodial death cases was 135 (19.42%). Based on place of confinement 100 cases (74.07%) died in jail custody, 33 cases (24.45%) died in mental hospital custody and in 2 cases (1.48%) death occurred in police custody. (Table-1) Among those dying in jail custody 50% were convicted prisoners, 47% were undertrial prisoners and 3% were internee. (Fig-1)

Out of 135 deaths 88.1% (n=119) were male and 11.9% (n=16) were female. Among males maximum deaths occurred in jail custody (82.35%; n=98) followed by mental hospital custody (16.81%; n=20) and one (0.84%) died in police custody. Among females 13 (81.25%) died in mental hospital, 2(12.5%) died in judicial custody and 1(6.25%) died in police custody. (Table-2)

The proportion of overall custodial deaths was highest in 26-35 years (26.7%) age group followed by 36-45 years (21.50%) and 46-55 years (16.30%) age groups. In jail, maximum deaths 32% (n=32) occurred in the age group of 26-35 years. While in mental hospital maximum deaths 45.7% (n=16) occurred in the age groups of 46-65 years. Two cases-a 35 year old female and a 16 year old male-died in police custody. (Table-3)

A total of 104 (77.04%) persons received medical care before their death, while 31 (22.96%) died at their place of confinement and had not received medical care before their death.

In 43 cases of custodial deaths laboratory reports (chemical analysis and/or histopathology) were still pending. So the statistical analysis regarding cause and manner of death could be performed only in 92 cases (out of 135) in which final cause of death were established. Out of these 92 cases 88 (95.65%) died of natural causes while 4 (4.35%) died due to unnatural causes. (Table-4)

Among natural causes 38.64% cases had single organ involved, majority having pulmonary involvement, 28.26% cases had two organ system involved and 20% had multi-organ failure. Pulmonary tuberculosis was the most common natural cause of death in prison custody (22.8%, n=16). In mental hospital custody coronary artery disease (12.8%, n=9) was the main cause of natural death. (Table-5) Out of total 33 cases of mental hospital deaths only 2 cases (6.06%) had pulmonary tuberculosis. (Table-6)

Out of total 102 cases of judicial/police custody deaths 53 cases (51.96%) were suffering either from TB or HIV or HCV or multiple infections. (Table-6)

As far as manner of unnatural deaths is concerned, there were two cases each of suicidal and accidental deaths (2.17% each) and no case of homicidal death has been noticed. Suicide was committed by 2 cases (n=2/92; 2.17%); one each in police and mental hospital custody. Hanging was the method used for suicide in both the cases.

Accidental death also accounted for 2 cases (n=2/92; 2.17%); one each died in jail and police custody. Accidental death in jail occurred due to accidental overdose of intravenous morphine in an undertrial prisoner. In police custody the accidental fall from height and consequent head injury resulted into death of the female inmate. (Table-4)

Table 1: Incidence of custodial death cases as per confinement

Type of custody	No. of cases	Percentage
Jail custody	100	74.07
Police custody	2	1.48
Mental Hospital custody	33	24.45
Total	135	100

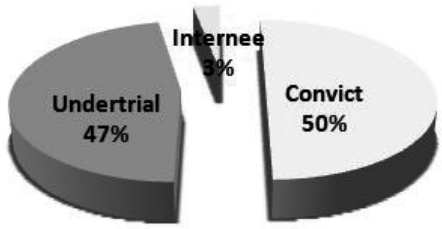

Figure 1: Conviction status of prisoners in jail custody

Table 2: Age wise distribution of custodial death cases

Age group (in years)	No. of cases	Percentage
16-25	20	14.8
26-35	36	26.7
36-45	29	21.5
46-55	22	16.3
56-65	15	11.1
66-75	11	8.1
76-85	2	1.5
Total	**135**	**100**

Table 3: Gender wise distribution of custodial death cases

Gender	Judicial			Police	Mental Hospital	Total
	Convict	Undertrial	Internee			
Male	48 (96%)	47 (100%)	3 (100%)	1 (50%)	20 (61.61%)	119 (88.10%)
Female	2 (4%)	0 (0%)	0 (0%)	1 (50%)	13 (39.39%)	16 (11.90%)
Total cases	50	47	3	2	33	135

Table 4: Manner of death in custodial death cases (n = 92/135)

Manner of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
NATURAL	23	36	26	3	0	88(95.65%)
UNNATURAL						
Accidental	0	0	1	0	1	2(2.17%)
Suicidal	1	0	0	0	1	2(2.17%)
Homicidal	0	0	0	0	0	0(0%)
Total	24	36	27	3	2	92(100%)

Table 5: Cause of death in custodial death cases (n = 92/135)

Cause of death	Mental Hospital	Judicial			Police	Total
		Convict	Undertrial	Internee		
Asphyxia	1*	0	0	0	1*	2
Hemorrhage & Shock	0	1	1	1	0	3
Septicemia	2	1	2	0	0	5
Poisoning	0	0	1*	0	0	1
Shock	0	0	1	0	0	1

Conted…

Organ failure						
One organ failure						
Brain	2	1	1	0	1*	5
Lungs	4	11	10	1	0	26
Liver	0	2	0	0	0	2
Heart	1	0	0	0	0	1
Two organ failure						
Brain &Heart	2	0	0	0	0	2
Brain &Lung	2	3	3	0	0	8
Heart &Lung	7	4	1	0	0	12
Liver &Lung	1	2	0	0	0	3
Kidney &Lung	0	1	0	0	0	1
Multi-organ failure	2	10	7	1	0	20
Total	24	36	27	3	2	92

*Unnatural deaths

Table 6: Prevalence of HIV, TB and HCV infections in custodial death cases

	TB	**HIV**	**HCV**	**HIV+ HCV**	**HIV+ TB**	**TB+ HCV**	**HIV+ HCV+TB**	**Total**
Judicial/police (n = 102)	22 (21.57)	11 (10.78)	12 (11.76)	4 (3.92)	1 (0.98)	1 (0.98)	2 (1.96)	53 (51.96)
Mental hospital (n = 33)	2 (6.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2 (6.06)

(Parenthesis indicates percentage)

DISCUSSION

According to the NHRC, the number of custodial deaths in 2000-2001 was 1,037 while in the year 2012-2013 they have increased to 2,157. A total of 1,702 prisoners have died in Indian jails during 2014; out of which 1,507 were natural deaths and 195 were unnatural deaths.[2]

In present study the incidence of custodial death was 19.42% of the total autopsies. In previous studies from same region conducted by Gargi[4] (1995-97) and Vohra[5] (2009-2010) the incidence of custodial death was 0.77% and 2.93% respectively. This increased proportion of custodial deaths is on account of the fact that since 2013, the GMCA is conducting autopsies in custodial death cases and referred cases requiring forensic pathologist expertise besides in-hospital deaths. Autopsies in all other cases are now being conducted at District hospital.

Out of 135 cases of custodial deaths, 11.9% were female and majority of them died in mental hospital with only two deaths occurred in prison. Vohra[5] has also mentioned 18.6% female deaths, majority of them died in mental hospital. Gargi[4] and Bardale[6] reported all males while Mittal[7] reported only one female death in prison. Higher incidence of female deaths in mental hospital was during their old age after they had been left here by the relatives for rest of their life.

Predominantly the custodial deaths (26.7%) were seen in the age group of 26-35 years while Bardale[6] and Vohra[5] reported maximum age incidence (24.3%) in age group of 31-40 years. It shows that crime rate is enhancing amongst the younger age group.

The present study found more incidence of death among convicts (50%) comparative to undertrials (47%); the finding is in line with findings of Bansal et al[8] who has reported, respectively 58.7% and 41.3% deaths among convicts and undertrials. Contrary to this observation Vohra[5] has mentioned 71.4% deaths involving undertrial prisoners.

In present study 77.04% of inmates received medical care before their death. The studies of Vohra[5], Bardale[6] and Mittal[7] put this figure respectively at 55.71%, 64.28% and 69.56%. It points towards a positive trend of timely referral of sick custodial patients.

Natural Deaths: The current study found that natural causes were responsible for majority of custodial deaths (about 95%).[4-12] Among natural deaths most of the deaths were due to pulmonary system involvement; pulmonary tuberculosis being the leading cause. This finding is supported by various other researchers.[4-6,11-14] However, Wobeser et al[9] and Frueshwald et al[10] found that majority of deaths were due to cardio-vascular diseases. This is attributed to overcrowding, closed living conditions, insufficient ventilation and poor nutrition in Indian jails as compared to western countries.

In our study out of 102 cases in judicial/police custody 21.57% were having tuberculosis, 10.78% were HIV infected and 11.76% were HCV infected. Besides, 8.7% cases were infected with multiple infections. (Table-6) Bansal[8] and Bardale[6] found the prevalence of HIV respectively in 13.5% and 14.08% of prison inmates. From above observation it is clear that prisoners constitute high risk group for acquisition of these infections.

Unnatural Deaths: The unnatural deaths comprised only 4.35% of cases which is lowest figure found as compared to figures reported by other authors. General welfare of prisoners and vigilance in Punjab jails might be comparably better than other study regions. The reason for this can be attributed to NHRC activism, media and general public awareness regarding custodial deaths, and constant fights of various NGO's against the custodial torture.

Suicidal and accidental deaths were found to have equal incidence (2.17% each). In this respect, the present study differs from other researchers, who found overall higher incidence of suicides, and also the most common manner of unnatural death. (Table-4)

However present study is in consonance with studies by Vohra[5], Bardale[6], Bansal[8], Agnihotri[11], Sonawane[12] and Sonar V et al[13] as far as most common method used for suicide viz. hanging. Therefore authorities should be careful that the inmates are not in the possession of such materials which may help them in taking the extreme step of ending their lives.

No case of homicide has been noticed in present study and this indicates effective control of authorities over inmates. However one disturbing fact is that all deaths occurring under police custody were unnatural. **(Table-4)** Moreover these deaths had occurred shortly after arrest and one of the arrestee was detained without any entry in daily diary. These shocking practices used by police undermine public faith in law enforcement.

Accidental deaths were due to drug overdose (poisoning) and accidental fall. The access of prisoners to poisons/drugs of abuse indicates lapses in jail security and has been found to be the commonest cause of unnatural deaths by few authors.[7,14]

CONCLUSION

Custodial deaths are predominantly due to natural causes and pulmonary tuberculosis is the leading cause in developing countries, which is further compounded by high prevalence of HIV and HCV infections among prisoners. There should be regular health check-up and an effective programme to screen and treat inmates. Better maintenance of prisons, trained, sensitive and more dedicated staff including medical staff and de-crowding of prisons are few of important suggestions to be followed.

Access to various drugs and poisons inside jail is also a matter of concern and this could not be possible without connivance of jail officials. Those involved in such practices should be warned and strict action need to be taken. De-addiction and rehabilitation services to addict prisoners and timely medical care to sick ones should be provisioned as a matter of right.

An unnatural death in police custody is another grave area of concern. The way forward is to strictly enforce existing laws and guidelines on arrest and detention. The Supreme Court's D.K Basu decision particularly with respect to recording detentions, informing families, producing suspects before magistrates and providing medical examinations should be adhered to by the police.

Only a more humane approach towards prisoners and providing care and timely medical aid as a matter of right will go a long way to bring down the incidence of prison deaths in India.

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