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ARAŞTIRMA / RESEARCH

Effect of simulation on the development of cognitive skills of the first aid and emergency aid students in neonatal resuscitation

İlk ve acil yardım öğrencilerinin neonatal resusitasyona yönelik bilişsel becerilerinin geliştirilmesinde simülasyonun etkisi

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Abstract

Purpose: This study was conducted to search the effect of simulation on the development of cognitive skills of the first aid and emergency students in neonatal resuscitation.
Materials and Methods: The study, which was planned as a randomized controlled, experimental study, was performed between with 60 students studying in the second year of First Aid and Emergency Programme. The students were divided into two groups as experimental and control groups. Prior to the study, the students were provided with an information form and the Scale of Problem Solving Inventory (PSI) and the Neonatal Resuscitation Knowledge Exam were conducted on both of the groups to determine the individual characteristics of the students. The students in the experimental group were trained with the "Scenario-Based Simulation Application" while the control group was given a theoretical lecture on "Neonatal Resuscitation" by the researcher. After two weeks, the final tests were applied to both groups.
Result: The averages of the student grades from the Neonatal Resuscitation examination after the training revealed a difference between the groups and that simulation group got higher grades, and the averages of the student groups from the PSI determined that the total grade averages of trust, personal control and total score were significantly different.
Conclusion: The use of simulation in the neonatal resuscitation training of the First Aid and Emergency students is effective and it increases the knowledge score averages and problem-solving skills of the student.
Keywords: Student, neonatal resuscitation, simulation

Öz

Amaç: Bu araştırma ilk ve acil yardım öğrencilerinin neonatal resüsitasyon konusundaki bilişsel becerilerinin arttırılmasında simülasyonun etkisinin incelenmesi amacı ile yapıldı.
Gereç ve Yöntem: Randomize kontrollü deneysel olarak planlanan araştırma İlk ve Acil Yardım bölümünün ikinci sınıfında öğrenim gören 60 öğrenci ile yapıldı. Öğrenciler deney ve kontrol grubu olarak ikiye ayrıldı. Çalışmanın öncesinde her iki gruba öğrencilerin bireysel özelliklerini belirlemeye yönelik bilgi formu, Problem Çözme becerileri ölçeği (PÇÖ) ve Neonatal Ressüsitasyona İlişkin Bilgi Sınavı yapıldı. Deney grubundaki öğrencilere "Senaryo Temelli Simülasyon Uygulaması" ile eğitim verildi, kontrol grubuna ise araştırmacı tarafından "Neonatal Ressüsitasyon" konulu teorik ders verildi. İki hafta sonra her iki gruba son testler uygulandı.
Bulgular: Öğrencilerin eğitim sonrası Neonatal Resuscitation sınavından aldıkları puan ortalamaları incelendiğinde gruplar arasında fark olduğu ve simülasyon grubunda fazla olduğu, PÇÖ'den aldıkları puan ortalamaları incelendiğinde ise, yaklaşma, kişisel kontrol ve PÇÖ toplam puan ortalamalarının istatistiksel olarak anlamlı düzeyde farklılık gösterdiği saptandı.
Sonuç: Simülasyon kullanımının İlk ve Acil Yardım öğrencilerinin neonatal resüsitasyon eğitiminde etkin olduğu, öğrencilerin bilgi puan ortalamasını ve problem çözme becerilerini arttırdığı belirlendi.

Anahtar kelimeler: Öğrenci, neonatal resusitasyon, simülasyon

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INTRODUCTION

Globally, about a quarter of all neonatal deaths are due to asphyxia at birth[1,2]. Neonatal ischemic encephalopathy is found in 2-9% of live births worldwide[3]. Sequelae such as cerebral palsy, mental retardation, epilepsy, loss of vision and hearing may emerge in newborns who are exposed to this condition with high mortality but survive. The initiation of respiration is critical in the transition from intrauterine to extrauterine life. Approximately 85% of the infants spontaneously start breathing after birth, while 15% can start breathing with stimulation, positive pressure support, or intubation[5]. Therefore, national and international organizations suggest increasing the competencies of healthcare professionals to reduce sequelae and deaths associated with neonatal asphyxia by performing effective resuscitation at birth[6,7,8].

The resuscitation of the newborn is also included in the education programs of the graduates in the field of health sciences within the scope of the basic life support trainings[9,10]. After graduation, the Neonatal Resuscitation Program (NRP) is carried out in the world and in our country in order to equip all healthcare professionals with the knowledge and skills to prevent deaths and sequelae associated with asphyxia and to perform a standard resuscitation[8,11,12]. In our country, this training program is provided to the auxiliary health care professionals and physicians by the Ministry of Health after graduation[13].

Neonatal basic life support differs significantly from adult basic life support. Therefore, to gain sufficient knowledge and skills on the subject, it is recommended to ensure the students gain experience through innovative learning methods[14]. One of the most innovative methods used for neonatal resuscitation is simulation-based learning[15,16]. In realistic environments created with simulation, it is aimed to help the student learn from his/her own experience without any fear of making any mistakes[17]. Although simulation-based education has become increasingly widespread, there are few studies conducted on its effectiveness compared to traditional learning styles[18]. The results of this study reveal the positive effects of simulation on learning[15]. From this point of view, it is aimed to contribute to the literature by examining the effects of simulation on increasing the cognitive skills of the First and Emergency Aid students in neonatal resuscitation.

MATERIALS AND METHODS

The study was conducted as a randomized controlled experimental study. The population of the study consisted of students studying at the Vocational School of Health Services in the First and Emergency Aid Assistance Program of a foundation university. Without sample estimation, 60 second-year students who accepted to participate were included in the study. Prior to the study, ethical approval was obtained from the Istanbul Bilim University Ethics Committee (Decree No: 19.09.2017/62-10) and written consent from the institution. Students were informed about the research and their verbal and written consent were obtained.

Procedure

60 students studying in the First Aid and Emergency program were randomly divided into two groups as experimental and control groups. Pre-tests, including information form to determine the individual characteristics of the students, Neonatal Resuscitation Questionnaire, and Problem-Solving Inventory (PSI)[19] were applied to both groups.

A document on the Neonatal Resuscitation was provided to the students in the experimental group to prepare before coming to practice. On the day of the practice, 1 hour before the start of the simulation, the students were taken to the practice room in groups of 5, provided with information forms about the scenario and thus, they were allowed to prepare. Later, within the scope of the scenario, the students were allowed to practice with the help of a simulator with a medium level of proximity to reality. The students in the control group were theoretically taught neonatal resuscitation for two course hours by the researchers. Final tests were applied to both groups after 2 weeks.

Measures

The information form to determine the individual characteristics, Neonatal Resuscitation Knowledge Exam and Problem Solving Skills Perception Scale were used as data collection tools and thus the data was collected.

Information form

It was composed of questions to determine students' age, sex, graduated secondary school program, employment status, preferred type of learning, and the general weighted average of the first year.

Neonatal Resuscitation Knowledge Exam

The knowledge exam consisting of 20 multiple choice questions to determine the level of knowledge of the students on neonatal resuscitation was created by researchers through searching the relevant literature[8]. Questions include the first assessment of the infant, ensuring airway patency, oxygen requirement, cardiac massage method, adrenaline requirement, and usage. Students were able to score "1" for each question they answered correctly. Therefore, the total score they could get from the knowledge test was minimum "0" and maximum "20".

Problem-Solving Inventory (PSI)

The validity and reliability study of the Problem-Solving Inventory developed by Heppner and Petersen (1982) was conducted by Nail Şahin, Nesrin Hisli Şahin and Paul Heppner (1993). Inventory is a self-evaluation scale, a tool for adolescents and adults that assesses what they think about problem-solving behavior and approaches.

The inventory consisting of 35 items is a Likert type scale scored between 1-6. "1" means "I always behave like this"; "2", "I mostly behave like this"; "3", "I often behave like this"; "4", "I sometimes behave like this"; "5", "I rarely behave like this", and "6" means "I never behave like this". The items are composed of positive and negative judgments about problem-solving and their order is random. Negative items are reversed while calculating the score. Some items, however, are excluded from the score. With 32 items taken into consideration, the lowest score that can be obtained from the scale is 32 and the highest score is 192. A high total score obtained from the inventory indicates that the individual perceives himself/herself as inadequate in problem-solving skills, while a low score indicates that the individual perceives himself/herself as adequate.

The scale consists of three sub-dimensions. These are; "Problem-Solving Confidence" (PSC), which expresses the belief in one's ability to solve new problems, "Approach-Avoidance Style" (AAS), which represents revising the first problem-solving efforts for future reference and actively conducting research for various alternative solutions, and "Personal Control" (PC), which indicates the ability to maintain control in problematic situations. The Cronbach's Alpha values of the scale of research were found to be 0.79 before the simulation, however, 0.77 after the simulation[19].

Statistical analysis

The data acquired from the research was evaluated by using the SPSS Inc. Released 2007. SPSS for Windows, Version 21.0 Chicago, IL, ABD (Statistical Package for the Social Sciences) software. Categorical variables are presented in numbers and percentages; continuous variables are presented as mean and standard deviation. As the distribution of the data was normal during the analysis before and after the simulation, T-test and One Way Anova tests were used to analyze the data. The One-Sample Kolmogorov-Smirnov test determined that the data showed normal distribution. Pearson correlation analysis was used to determine the relationship between GPA and PSI sub-dimensions. Cronbach's alpha was found by using reliability analysis. Significance was accepted to be 0.05.

RESULT

The majority of the students who participated in the study were in the 18-20 age group (55.0%) and 66.7% of them had graduated from a high school of general education while only 10% of them were still actively working. When the learning method preferred by the participants was examined, it was determined that the majority (80.0%) preferred to learn through practice and their general weighted grade point average at the end of the first year was 2.50 ± 0.38 (Table 1). When the averages of the student scores obtained from the Neonatal Resuscitation Knowledge Exam before and after the training are examined; the pre-training knowledge examination average scores of the experimental and control groups showed no statistically significant difference ($p = 0.962$). The average scores of the groups after the training showed higher scores in the experimental group and a statistically significant difference between the two groups ($p=.000$), (Table 2).

When the mean scores of the students obtained from the Problem-Solving Inventory and its sub-dimensions applied before and after the education were examined; there was no statistically significant difference between the groups in terms of the average scores of the students before ($p = 0.366$) and after ($p = 0.672$) the training from the trust in ability sub-dimension. While there was no significant difference between the experimental and control groups in terms of average scores of approach sub-dimension before the training ($p=0.497$), there was a statistically significant difference between the groups after the training ($p = 0.017$). The average scores of the

students in the experimental and control groups in terms of average scores of personal control sub-dimension before the training revealed a significant difference between the groups (p = 0.045). There was a statistically significant difference between the groups in the average scores of the students in the experimental and control groups after the training (p = 0.034).

Table 1. Distribution of individual characteristics of students (N=60)

Individual Characteristics	**n**	**%**
Age Groups (Mean:21.15±2.72; Distribution:19- 25)		
18-20	33	55.0
21-24	21	35.0
24 and above	6	10.0
Sex		
Female	23	38.3
Male	37	61.7
Secondary Education Type		
Common High School	40	66.7
Vocational School of Health Services	20	33.3
Active Working Status		
Yes	6	10.0
No	54	90.0
Learning Style		
By Reading	3	5.0
By Writing	6	10.0
By Seeing	3	5.0
By Practicing	48	80.0
GPA	2.50±0.38	

GPA: Grade Point Average

Table 2. Mean score of knowledge exam and problem solving inventory of the students (N=60)

	Between the Groups Before training		**t[a] p**	**Between the Groups After training**		**t[a] p**	**Before/After-training In-group**	
	Case	Control		Case	Control		Case	Control
	Mean±SS	Mean±S.S.		Mean±S.S.	Mean ± S.S.		t[b]	t[b]
Knowledge Exam Total	10.00±3.31	9.96±2.15	0.048 0.962	14.40±1.86	11.33±2.36	5.568 .000[c]	-5.488 .000[c]	-2.283 0.031
PSI Trust in Ability	27.50±8.04	25.73±6.94	0.911 0.366	24.13±6.64	24.86±6.69	-0.426 0.672	1.573 0.127	0.441 0.663
PSI Approach	36.86±10.78	38.70±9.99	-0.683 0.497	32.93±7.44	38.76±10.60	-2.466 0.017[d]	1.577 0.126	-0.023 0.982
PSI Personal Control	17.60±3.51	19.63±4.14	-2.047 0.045[d]	17.36±2.83	19.50±4.53	2.086 0.034[d]	0.271 0.788	0.110 0.913
PSI Total	78.10±17.89	80.50±16.60	-0.538 0.592	70.70±12.40	79.56±18.19	-2.205 0.031[d]	1.778 0.086	0.192 0.849

[a]t=t test [b]t= paired t test [c]p<0.001 [d]p<0.05; PSI: Problem Solving Inventory

The average of the scores of the students in the experimental and control groups in terms of total PSI scores before the training showed no statistically significant difference between the groups (p = 0.592), however, there was a statistically significant difference between the groups after the training (p=0.031), (Table 2). When the mean scores of knowledge exam and PSI subscale and scale total scores of the students were compared with the individual characteristics of the students, no statistically significant difference in terms of sex, type of graduated secondary education and preferred type of learning was found in the average scores of students before and after the simulation (p>0.05). There was a statistically significant difference between the active employment status of the students at the time of the study and the mean score of the pre-simulation test (p=0.045), however, this difference was not detected after the simulation (p>0.05).

When the relationship between students' GPA and the average scores of Knowledge Exam before and after the Simulation and the average scores of PSI total and sub-dimension were examined, a poor positive correlation between the mean score of knowledge exam and GPA was found only in the pre-simulation case group (r=0.373, p=0.042), and no significant relationship was determined between the total score and sub-dimensions of the PSI (r<0.25, p>0.05), (Table 3).

Table 3. The relationship between gpa and the average scores before and after the simulation (N=60)

	Before Training				After Training			
	Case		Control		Case		Control	
	r	p	r	p	r	p	r	p
Knowledge Exam Total Score GPA	0.373	0.042	0.224	0.438	-0.214	0.257	-0.147	0.438
PSI Total Score GPA	-0.023	0.902	0.082	0.668	-0.104	0.583	-0.105	0.581
Trust in Ability GPA	-0.004	0.981	0.006	0.975	-0.009	0.964	0.070	0.714
Approach GPA	-0.034	0.859	-0.206	0.275	-0.173	0.359	-0.218	0.247
Self-confidence GPA	-0.018	0.826	-0.097	0.611	-0.020	0.917	0.018	0.923

PSI: Problem Solving Inventory; GPA: Grade Point Average

DISCUSSION

Students are expected to gain both theoretical and practical application skills during the First Aid and Emergency Training. In order to improve knowledge and skills in areas requiring critical care, such as neonatal resuscitation, should be actively involved in the educational processes of the students. After examining the learning method preferred by the students in our study, it was determined that the majority of the students (80%) preferred learning through practice. In the study conducted by Terzioğlu et al., the majority of the students expressed that the simulation training provided before they begin in the clinics was beneficial for them [20]. As a result of the study, it was seen that the average score of knowledge exam of the students who took neonatal resuscitation training with simulation application was high, however, the theoretical lectures given only in the classroom environment were not effective enough in the course success of the students. It is clear that students taking an active role in the learning process increases the success of the course. The study conducted by Lendahls et al. shows that simulation and skills training establish a connection between theory and practice [21]. In the study of Smith et al., the students expressed a higher level of satisfaction and an increased level of learning and knowledge in the field of simulated application [22]. This is because of the fact that the students learn to see their mistakes in their decisions about patient care and to act on their decisions. In this respect, with an experience-based learning opportunity, it is known that the self-confidence, knowledge and clinical decision-making skills of the students develop[23,24].

In our study, it was determined that the total score averages of First Aid and Emergency students in the Problem-Solving Skill Scale were higher in the case group than the students in the control group, and the difference was statistically significant. It is clear that the simulation training contributes to the competence of the scores of the students in approach and personal control, clinical skills and clinical readiness. The study performed by Burns et al. found that the use of simulation facilitated the acquisition of problem-solving skills [25]. In addition, it is thought that this newly obtained competence of the students will improve teamwork and communication skills, contributing to the solution of the problem. The evaluation of the groups among themselves before and after them showed no difference in terms of the scores they obtained from the Problem Solving Scale in our study. The findings showed that this difference occurs in the approach/avoidance sub-dimension and the difference in the simulation group is higher. This situation can be explained by saying that the avoidance behavior increases in the students who are faced with the real scenario and their desire to cope with the problem decreases.

In the study of Andrighetti et al., it is seen that the self-confidence of the students trained with a high-quality model is significantly increased [26]. When the studies are examined, it is seen that the training with

the computer-based high-level simulator is supported by other training models and techniques. It is stated that not only advanced technology models but also low-quality models can be used in simulation trainings[27,28]. The superiority of the training given with simple models in a real-like environment over theoretical ones is also supported by the studies conducted [29].

The use of simulation positively contributes to the learning experiences and professional skills of the students. In our study, only neonatal resuscitation skills were studied. The study can be expanded to improve other basic skills and it can be conducted as a multicentered study. While the use of valid and reliable data collection tools and a high rate of participation of students constitute the strengths of the research, the lack of simulation experience and the single-center collection of the data may limit the results of the research.

According to the results obtained from this study, it was determined that there was a significant improvement in the knowledge score averages and problem-solving skills of the students after the simulation. While the level of knowledge and problem-solving skills of the students who obtain the experience of practicing during the simulation increase, it is believed that, this will contribute to the acquisition of permanent cognitive skills through problem-oriented scenarios and serial simulations.

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