VENTROGLUTEAL ENJEKSIYON BECERISININ GELIŞTIRILMESINDE KULLANILAN AKRAN EĞITIMININ HEMŞIRELIK ÖĞRENCILERININ ANKSIYETE VE BECERI YETERLILIK DÜZEYLERINE ETKISININ BELIRLENMESI

Gazi Baran CAMCİ

Doktora Öğrencisi, Kahramanmaraş İstiklal Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, gbaran.camci@istiklal.edu.tr, Kahramanmaraş/Türkiye, 0000-0002-2057-1287

Sümeyra TOPAL

Dr. Öğretim Üyesi, Kahramanmaraş İstiklal Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, sumeyra.topal@istiklal.edu.tr, Kahramanmaraş/Türkiye, 0000-0001-6316-4043

Nuriye Efe ERTÜRK

Dr. Öğretim Üyesi, Gaziantep İslam Bilim ve Teknoloji Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, nuriye.efeerturk@gibtu.edu.tr, Gaziantep/Türkiye, 0000-0002-1574-6097

Yelda KOÇAK

Doktora Öğrencisi, Kahramanmaraş İstiklal Üniversitesi, Sağlık Bilimleri Fakültesi, Hemşirelik Bölümü, yelda.kocak@istiklal.edu.tr, Kahramanmaraş/Türkiye, 0000-0001-8485-8554

Öz

Bu çalışma, akran eğitiminin hemşirelik öğrencilerinin ventrogluteal enjeksiyon uygulama becerilerini öğrenmedeki kaygı düzeyleri ve teknik yeterlilikleri üzerindeki etkisini değerlendirmeyi amaçlamıştır. Ön test-son test kontrol gruplu desen kullanılarak, 44 ilk kez öğrenen öğrenci, 22'şer kişilik müdahale (akran eğitimi) ve kontrol (geleneksel öğretim) gruplarına ayrıldı. Veriler, Eylül 2022-Haziran 2023 arasında kurumsal ve etik kurul onayları alınarak anket formu aracılığıyla toplandı. Sonuçlar, katılımcıların %72.7'sinin daha önce akran eğitimi almadığını gösterdi. Akran eğitimi alan grupta kaygı düzeylerinde anlamlı bir azalma (*p*=0.016) ve beceri (Beceri Değerlendirme Formu) ile bilgi (Bilgi Geliştirme Formu) puanlarında önemli bir artış (*p*<0.05) gözlendi. Çalışma, akran eğitiminin, hemşirelik öğrencilerinin ventrogluteal enjeksiyon becerilerini geliştirmede ve kaygı düzeylerini azaltmada geleneksel öğretim yöntemlerinden daha etkili olduğunu ortaya koydu.

Anahtar Kelimeler: Akran eğitimi, Hemşirelik, Ventrogluteal.

DETERMINATION OF THE EFFECT OF PEER EDUCATION USED IN THE DEVELOPMENT OF VENTROGLUTEAL INJECTION SKILL ON ANXIETY AND SKILL COMPETENCE LEVELS OF NURSING STUDENTS

Abstract

This study aimed to evaluate the impact of peer education on nursing students' anxiety and technical competency in learning ventrogluteal injection administration. Using a pre-test-post-test control group design, 44 first-time learners were divided into intervention (peer education) and control (traditional teaching) groups, each with 22 students. Data were collected between September 2022 and June 2023 using a questionnaire, with institutional and ethical approvals secured. Results showed that 72.7% of participants had no prior peer education experience. The peer education group demonstrated a significant reduction in anxiety (*p*=0.016) and notable improvements in skill (Skill Assessment Form) and knowledge (Knowledge Development Form) scores (*p*<0.05) compared to the control group. The study concluded that peer education was more effective than traditional methods in enhancing nursing students' ventrogluteal injection skills and reducing anxiety levels.

Keywords: Peer Education, Nursing, Ventrogluteal.

1. LITERATURE

Through theoretical and practical learning, nursing education enhances students' professional knowledge, skills, and competencies. Theoretical education encompasses topics such as nursing principles, patient care, preventive health, and ethical values, while clinical education provides students with hands-on experience to apply this knowledge in practice (1, 2). In clinical settings, students develop their cognitive, affective, and psychomotor abilities, with psychomotor skills being a key component of this process (3). Professional skills laboratories are fundamental to nursing education as they provide the environment for acquiring psychomotor skills. These labs enable students to practice and refine their skills in settings that simulate clinical practice, ultimately boosting their professional competence and reducing clinical anxiety (4, 5, 6). Intramuscular (IM) injection is a critical skill in nursing practice, but improper administration can lead to serious complications. Although the ventrogluteal region is considered the safest site for IM injections, studies show that many nurses lack the knowledge and skills to use this site effectively (7, 8). Alternative teaching methods like peer education have recently gained popularity in health sciences education. Peer education involves individuals with similar learning experiences supporting one another in their educational journey (9, 10, 6). This approach fosters an interactive and collaborative learning environment by removing the traditional power dynamic between instructor and student. Research suggests peer education enhances learning, alleviates anxiety, and helps develop professional skills. Peer guidance reduces students' anxiety when acquiring new skills and fosters problem-solving abilities through teamwork (5, 11). Peer education has proven especially effective in teaching psychomotor skills in nursing education (12, 11), with studies indicating that students engaged in peer education perform better and experience less anxiety during practice (13, 14, 5, 11). For instance, Gharib Sabaq et al. found that peer education significantly improved nursing students' performance (15). McKenna and French reported that senior nursing students teaching first-year students about vital signs positively affected instructors and learners (16). However, it is essential to note that the success of peer education depends on clearly defining student-peer-educator roles (16, 15). While studies on peer education in psychomotor skill acquisition are still limited compared to other teaching methods, recent research indicates its potential in nursing education (5, 11, 17). Specifically, there are no studies in Turkey examining the development of nursing students' IM injection skills in the ventrogluteal region using peer education methods. Therefore, investigating the impact of peer education on students' newly learned skills and comparing it with traditional teaching approaches would significantly contribute to the literature. Additionally, gathering students' feedback on their skill development will provide valuable insights for refining nursing curriculum programs. This study aims to evaluate the effect of peer education on nursing students' ventrogluteal injection skills, focusing on its influence on their anxiety levels and skill competence.

2. METHOD

Research Design:

A pretest-posttest control group design was used in this study to examine whether peer education affected nursing students.

Population and Sample:

The research was conducted with first- and fourth-year nursing students from two state universities in the Southern Anatolia Region of Turkey. The study population consisted of a newly established nursing department that included only first-year students, with a total enrollment of 110 students. The sample size was determined using a 95% confidence interval, an effect size of 0.8, and a theoretical power of 80%. Ultimately, 44 students participated in the study, with at least 21 students assigned to the intervention and control groups. Additionally, 11 fourth-year nursing students from

the second university in the region were selected as peer educators, with one peer educator assigned to every two students during the peer education process.

Ethical Considerations:

Ethical approval for the study was obtained from the Ethics Committee of Kahramanmaraş İstiklal University (Approval Date: 27/06/2022, Approval Number: 2022/02). Additionally, permission to collect research data was granted by the Faculty of Health Sciences at Kahramanmaraş Sütçü İmam University. The students were informed about the purpose of the study and voluntary participation and informed consent was obtained from all participants.

Research Implementation:

During the preliminary phase, a lottery approach was used to randomly assign first-year nursing students who were part of the research sample to either the intervention or control group. The students in both groups completed the Descriptive Characteristics Form, Ventrogluteal IM Injection Application Knowledge Assessment Form, and Trait-State Anxiety Scale as pretest measures.

Next, peer educators were selected through a lottery, ensuring each pair of students in the intervention group was assigned a peer educator. The designated peer educators received training from the lead researcher on peer coaching techniques and ventrogluteal injection skills. Their competencies were assessed after the training, and sessions were repeated until each peer educator demonstrated proficiency in the skill.

For the intervention, students in the control group received instruction on ventrogluteal injection application using standard curriculum-based teaching methods. In contrast, their assigned peer educators trained students in the intervention group. After the instructional sessions, students were asked to perform the injection procedure. Throughout this process, assistant lecturers observed both groups and completed the Skill Observation Form for IM Injection into the Ventrogluteal Region to assess performance. Upon completion of the injection practice, both intervention and control group students retook the Trait-State Anxiety Scale. All collected forms and data were submitted to the lead researcher for comparative analysis.

Data Collection Tools:

Descriptive Characteristics Form

The literature was reviewed to formulate the questions, which sought information about the students' descriptive characteristics (age, gender, socioeconomic status, etc.).

Descriptive Characteristics Form (for peer educators)

This form includes questions about the students selected as peer educators and included in the scope of the application, such as age, school of graduation, and their previous experiences in peer education.

IM Injection Application to Ventrogluteal Region Knowledge Evaluation Form (KEF)

The form consists of 24 propositions prepared by Gülnar and Çalışkan (2014) to be used in their study titled "Determination of Knowledge Levels of Nurses Towards Intramuscular Injection Application to Ventrogluteal Region." The authors' formal consent for using the questionnaire in the study was acquired prior to the research starting. The students were asked to answer the questions containing these propositions with 'true' or 'false' options. Each correct answer to the propositions was evaluated as 1 point and each incorrect answer was evaluated as 0 points. The total knowledge score of the students was calculated over 24 points. The Cronbach's alpha value for the KEF in this study was calculated as 0.84, which indicates high internal consistency. This form was originally developed by Gülnar and Çalışkan (2014), who also reported a Cronbach's alpha value of 0.82 in their validity and reliability study (18).

Spielberger's Trait-State Anxiety Inventory

Initially developed in 1964 by Spielberg (19) and colleagues to assess both trait and state anxiety levels in individuals with or without psychological conditions, the scale was later adapted into Turkish by Öner and Le Compte (1983) (20). Designed as a self-report measure, the scale includes brief statements for evaluation. While the state anxiety section assesses emotions experienced at a given moment, the T-SAI was explicitly created to capture thoughts over the past seven days. The T-SAI is a 20-item for each inventory Likert-type scale, with responses rated on a 1-4 scale. Reliability coefficients for the scale were determined through studies involving both standard and clinical samples. In this research, both the State and Trait Anxiety subscales were utilized (21,22,23) In this study, the Cronbach's alpha coefficient for the Trait Anxiety Inventory was 0.87 and for the State Anxiety Inventory was 0.90, consistent with the values reported by Öner and Le Compte (1983) in the Turkish adaptation study (20).

Intramuscular Injection into the Ventrogluteal Region Skill Observation Form (SOF)

The researcher prepared this form based on the literature. It included the steps of IM injection into the VG region, consisting of 21 steps (1, 4-6, 8, 46, 45, 45, 64, 69). The psychomotor steps of the skills of the nurses trained in the intervention and control groups were evaluated with a checklist. When the participant performed each step, the evaluation was made by marking performed (2 points), incompletely performed (1 point), and not performed (0 points). The highest score from the form is 42, and the lowest is. At the end of the evaluation, the higher the total score obtained from the test, the higher the skill level of the nurses in administering IM injection to the VG region. The internal consistency of the form was assessed using Cronbach's alpha, which was found to be 0.91 in this study, indicating excellent reliability. This form, which the researcher created, was sent to expert faculty members in the field to ensure content validity, and the form was finalized in line with the suggestions.

Data Collection

First-grade students determined to be the study's sample were divided into intervention and control groups by lot method. The Descriptive Characteristics Form, the KAF, and the T-SAI were applied to the intervention and control group students. Afterward, volunteer peer educators were determined by lottery so that one peer educator was assigned to each of the two. Students in the intervention group the responsible researcher trained peer trainers on peer coaching and ventrogluteal injection application skills, and their competencies were evaluated after the training. The training was repeated until the peer trainer reached a sufficient level in the application skill. Ventrogluteal injection application skill was explained to the control group using the teaching methods in the curriculum and to the intervention group using peer trainers. After the explanation, the students were asked to perform the application skill. The assistant lecturers in the intervention and control groups made observations during the application and filled out the SOF. The intervention and control group students who finished the injection process completed the T-SAI. The forms filled out by the students were received by the assistant instructor for comparison.

Analysing the Data

In the data analysis, mean, standard deviation (SD), and percentage (%) calculations were performed for the descriptive characteristics of the student groups. A paired samples t-test was performed to analyze the differences in pre-test and post-test mean scores of students in the peer education and control groups on the T-SAI. An independent samples t-test examined the mean differences between the peer education and control groups.

3. FINDINGS

According to the findings, 77.3% of the students were female, 68.2% had completed high school in Anatolia, 79.5% belonged to a nuclear family, 47.7% of the mothers and 36.4% of the fathers had completed primary school, 81.8% of the mothers were homemakers, 29.5% of the fathers were civil servants, 56.8% had incomes that could cover their expenses, and 72.7% had never attended peer education. The mean age of the students was 20.36±5.67 years (Table 1).

Table 1. Distribution Of Students According To Their Descriptive Characteristics

Descriptive Characteristics	Number (n)	Percentage (%)
Age (mean±SD)	20.36± 5.67	
Gender		
Woman	34	77.3
Male	10	27.7
Graduated school		
Anatolian High School	30	68.2
Science High School	7	15.9
Other	7	15.9
Family type		
Nuclear family	35	79.5
Extended family	8	18.2
Broken family	1	2.3
Mother's education level		
Illiterate	5	11.4
Literate	7	15.9
Primary School	21	47.7
Middle School	3	6.8
High school and above	8	18.2
Father's education level		
Literate	5	11.4
Primary School	16	36.4
Middle School	4	9.1
High School	11	25.0
University	8	18.2
Mother's occupation		
Housewife	36	81.8
Employed in any job	8	18.2
Father's profession		
Self-employment	10	22.7
Labourer	11	25.0
Officer	13	29.6
Other	10	22.7
Economic situation		
Income does not cover expenses	7	15.9
Our income is equal to our expenditure	25	56.8
Our income is more than our expenditure	12	27.3
Prior peer education status		
Yes	12	27.3
No.	32	72.7

Table 2 presents the mean scores of students' TAI and SAI. In the peer education group, a statistically significant difference was observed in one measure between pre-test and post-test scores

(p=0.016). In contrast, no significant change was detected in the overall mean scores (p=0.572). In contrast, the control group showed no significant differences in pre-test and post-test mean scores for total TAI (p=0.186) and I (p=0.754). The results suggest that students in the peer education group had lower post-test SDI mean scores than their pre-test scores, which are statistically significant. These findings indicate that peer education contributed to a reduction in students' trait anxiety levels.

Table 2. Comparison Of The Students' Pre-Test And Post-Test Mean Scores Of TAI And SAI

Groups	The mean score of the TAI pre-test (Mean±SD)	The mean score of the TAI post-test (Mean±SD)	Effectiveness of training means diff. (95% CI)	Test	SAI pre-test mean score (Mean±SD)	SAI post-test mean score (Mean±SD)	The effectiveness of the Training means dif. (95% CI)	Test
Peer Education Group	43.45±7.72	42.72±7.98	0.72±5.93	*p=0.*572	43.90±7.23	41.72±8.48	2.18±3.91	***p=0.016***
Control Group	41.13±9.80	43.04±9.38	-0.90±6.55	*p=0.186*	44.13±8.79	43.77±10.04	0.36±5.36	*p=0.754*
Test**	t= 0.871 *p*= 0.389	t=-0.121 *p=0.904*			t=-0.094 *p*= 0.926	t=-0.730 *p=0.470*		

*A paired test t-test was applied.
** Independent sample t-test was applied.

Table 3 compares students' KEF and SOF mean scores between groups. In the peer education group, post-test scores for both KEF and SOF showed a statistically significant increase compared to pre-test scores. In the control group, while a significant difference was observed between SOF pre-test and post-test scores (p<0.006), no significant change was found in the overall KEF mean scores (p=0.067). Additionally, a significant difference was noted in SOF pre-test scores between the peer education and control groups; However, no significant difference was found between the SOF pre-test and post-test mean scores. Additionally, the post-test mean scores of both groups for SOF did not exhibit a statistically significant difference.

Table 3. Comparison Of The Pre-Test And Post-Test Mean Scores Of The Students In The Knowledge Evaluation Form For IM Injection Into The Ventrogluteal Region (KEF) And Application Skill Observation Form

Groups	KEF pre-test mean score (Mean±SD)	KEF post-test mean score (Mean±SD)	Effectiveness of training means diff. (95% CI)	Test	SOF pre-test mean score (Mean±SD)	SOF post-test mean score (Mean±SD)	Change between SOF pre-test and post-test mean dif. (95% CI)	Test
Peer Education Group	12.54± 2.36	13.63± 2.10	1.09± 1.82	***p=0.011***	16.86± 9.26	33.90± 5.85	17.04± 10.49	***p<0.001***
Control Group	13.18± 2.34	14.22± 2.15	1.04± 2.53	*p*= 0.067	27.40± 5.78	33.04± 7.85	5.63± 8.65	***p<0.006***
Test**	t= -0.897 *p*= 0.375	t= -0.919 *p*= 0.363			t=-4.528 ***p< 0.001***	t=-0.413 *p*= 0.681		

*Paired test t-test was applied ** Independent sample t-test was applied

4. Discussion

Intramuscular (IM) injection is a critical method of drug administration commonly used by nurses (24,25). The ventrogluteal region is widely recommended for IM injections (26-28). Research indicates that nurses often lack adequate knowledge and skills for administering injections in the ventrogluteal region, which can result in hesitation (29,30). The peer education model has recently become increasingly popular in higher education. This approach involves members of the same social group who are not professional educators supporting each other in the learning process. This study aimed to assess the impact of peer education on nursing student's anxiety levels and their competence in performing intramuscular injections in the ventrogluteal region.

The study revealed that most participants were female (77.3%) and graduated from Anatolian High Schools (68.2%), which helps generalize the findings. Additionally, since most students had not previously participated in peer education (72.7%), the sample selected was appropriate for assessing the effect of peer education (Table 1).

The results indicated a significant reduction in post-test anxiety levels among participants in the peer education group compared to their pre-test levels (p=0.016). This suggests that peer education is effective in reducing students' trait anxiety. This could be attributed to the students' comfort and safety in the learning environment, which helped build their self-confidence by providing a realistic experience and feedback in a non-punitive, non-rewarding environment. Previous studies, such as one by Thompson (2021), found similar reductions in anxiety when peer education was combined with simulation-based teaching (31). Other studies, including Liu et al. (2012), also concluded that peer education effectively manages anxiety (32). Şancı and Kelleci (2019) found that peer education can reduce anxiety in nursing students related to clinical practices, consistent with our own (Table 2) (33).

Another critical study result was the notable enhancement in skill competencies among students in the peer education group. The post-test mean scores for both KEF and SOF showed a significant increase compared to the pre-test scores. This indicates that peer education allowed students to practice in a supportive, non-judgmental environment to learn from their errors and effectively communicate with their peers using standard terminology. Additionally, peer education helped reduce anxiety and foster motivation, aligning with similar experiences and goals. These findings are supported by research showing that training to improve nurses' knowledge of ventrogluteal injection increases their skills and expertise (33, 34).

Peer education has been shown to transfer knowledge and develop practical skills effectively (35,1,36) (Table 3). Based on our findings, peer education appears to be a highly effective method for reinforcing psychomotor skills. Students engaged in peer learning environments, both in labs and clinical settings, were able to enhance their self-confidence, work independently, think critically, and solve problems. Peer education fosters an interactive and supportive learning environment with lower anxiety levels than traditional methods, which typically involve following instructor-determined procedures (5,11,17).

Peer education thus reinforces the learning process by giving students an active part in their education in addition to standard teaching methods. Students feel more appreciated and are more motivated to learn and gain confidence in developing professional abilities when transformed from passive information consumers to active participants. Additionally, peer education enables students to discover areas for growth, receive active feedback, and collaborate to design learning plans. More professional competency and the creation of safe, efficient healthcare workers result from this approach, which also helps students become more self-reliant and accountable for their education.

Limitations of the Study: This study is limited because it was performed on a single group in a nursing school, and the intramuscular injection skill in the ventrogluteal region was included.

Conclusion and Recommendations

The research results show that learning complex skills with a peer group supports skill development more than students who learn with existing teaching methods and contributes to the reinforcement and retention of learning. In this direction, it is recommended to use interactive learning methods such as peer education. Students can actively participate, realize and complete their own learning needs, and develop their skills in a comfortable learning environment in addition to traditional teaching methods, especially psychomotor skill teaching. In addition, the broader application of peer education in nursing education will facilitate the adaptation of students to the clinical environment and increase their professional competencies. In this process, developing psychosocial support programs, strengthening feedback mechanisms, and systematically integrating peer education models into education programs will contribute to the professional development of nursing students.

''**Ventrogluteal Enjeksiyon Becerisinin Geliştirilmesinde Kullanılan Akran Eğitiminin Hemşirelik Öğrencilerinin Anksiyete Ve Beceri Yeterlilik Düzeylerine Etkisinin Belirlenmesi''Başlıklı Makalenin Araştırma ve Etik Beyanı Bilgileri**

Bu çalışma "Araştırma ve Yayın Etiği" değerlerine uygun olarak hazırlanmış ve intihal kontrol programında kontrol edilmiştir. Çalışmanın tüm sorumluluğu yazar(lar)a aittir.

Bilgilendirme	Bu çalışma "Sağlık Çalışanlarının Dijital Yetkinlik Düzeyleri ve Etkilerinin Belirlenmesine Yönelik Bir Araştırma" başlıklı doktora tezinden üretilmiştir
Yazar Çıkar Çatışması Beyanı	Yazarlar arasında çıkar çatışması yoktur.
Finansal Destek	-
Yazar Katkı Oranı Beyanı	Yazarlar eşit oranda katkıda bulunmuşlardır.
Teşekkür	Çalışmayı destekleyen kurum/projeye dair bilgi.
Etik Kurul Onay Belgesi	Etik Kurul onayı alınmıştır.
Ölçek İzni	Ölçek izni alınmıştır

REFERENCES

1. Ünver, V., & Akbayrak, N. (2013). Peer education model in nursing education. *Dokuz Eylül University Faculty of Nursing Electronic Journal, 6*(4), 214–217.
2. Yava, A., & Çiçek, H. S. (2016). A new approach in nursing education: Peer coaching. *Hacettepe University Journal of Nursing Faculty*, 65–71. http://dergipark.gov.tr/download/article-file/225599
3. Ay, F. (2011). Evaluation of clinical skills training achievements and self-efficacy of nursing education students with peer education. *Dokuz Eylül University School of Nursing Electronic Journal, 4*(2), 63–68.
4. Narayanan, G. (2021). Effect of peer-assisted learning on improving psychomotor skills, self-confidence, and attitude among second-year nursing students. *Sustainable Leadership and Academic Excellence International Conference (SLAE)*, 1–7. https://doi.org/10.1109/slae54202.2021.9788094
5. Bahar, A., Kocaçal, E., & Maras, G. (2022). Impact of the peer education model on nursing students' anxiety and psychomotor skill performance: A quasi-experimental study. *Nigerian Journal of Clinical Practice, 25*, 677–682. https://doi.org/10.4103/njcp.njcp_1905_21

6.   Reaves, C., Martel, M., & Rose, K. (2024). Teaching psychomotor skills in undergraduate nursing education: An integrative review. *The Journal of Nursing Education, 63*(7), 421–426. https://doi.org/10.3928/01484834-20240505-01

7.   Sari, D., Şahin, M., Yaşar, E., Taşkıran, N., & Telli, S. (2017). Investigation of Turkish nurses' frequency and knowledge of administration of intramuscular injections to the ventrogluteal site: Results from questionnaires. *Nurse Education Today, 56*, 47–51. https://doi.org/10.1016/j.nedt.2017.06.005

8.   Arslan, G., & Özden, D. (2018). Creating a change in the use of ventrogluteal site for intramuscular injection. *Patient Preference and Adherence, 12*, 1749–1756. https://doi.org/10.2147/PPA.S168885

9.   [Yazar bilgisi eksik]. (2018). Nurse education: An integrative review. *Nurse Education Today, 70*, 60–68. https://doi.org/10.1016/j.nedt.2018.08.009

   ➤ *Not:* Bu kaynağın yazar adı eksik görünüyor. Düzenlenmesi gerekir.

10.   Choi, J., Kim, O., Park, S., Lim, H., & Kim, J. (2021). The effectiveness of peer learning in undergraduate nursing students: A meta-analysis. *Clinical Simulation in Nursing, 50*, 92–101. https://doi.org/10.1016/j.ecns.2020.09.002

11.   Al, A. (2023). Peer teaching strategy and its effect on nursing students' self-efficacy, collaborative behavior, and performance at Nursing College, King Khalid University. *Russian Law Journal*. https://doi.org/10.52783/rlj.v11i12s.2214

12.   Aldridge, M. D. (2017). Nursing students' perceptions of learning psychomotor skills: A literature review. *Teaching and Learning in Nursing, 12*(1), 21–27. https://www.sciencedirect.com/science/article/pii/S155730871630087

13.   Blazun, H., Saranto, K., & Rissanen, S. (2015). Impact of computer training courses on reduced anxiety and improved skills and satisfaction in hospital staff. *Journal of Nursing Education and Practice, 5*(11), 101–107.

14.   Kachaturoff, M., Caboral-Stevens, M., Gee, M., & Lan, V. (2020). Effects of peer mentoring on stress and anxiety levels of undergraduate nursing students: An integrative review. *Journal of Professional Nursing, 36*(4), 223–228. https://doi.org/10.1016/j.profnurs.2019.12.007

15.   Gharib Sabaq, A., Farouk, M., & Ismail, S. S. (2016). Effect of peer teaching versus traditional teaching method on nursing students' performance regarding pediatric cardiopulmonary resuscitation. *Journal of Nursing and Health Science, 5*(2), 18–25. https://pdfs.semanticscholar.org/d479/e945ee055d6cd842a5425bd942c4a1978061.pdf

16.   McKenna, L., & French, J. (2011). A step ahead: Teaching undergraduate students to be peer teachers. *Nurse Education in Practice, 11*(2), 141–145. https://doi.org/10.1016/j.nepr.2010.10.003

17.   Botelho, M., & Boubaker, B. (2023). Near-peer teaching in a psychomotor skills course: Benefits, challenges, and solutions. *European Journal of Dental Education*. https://doi.org/10.1111/eje.12951

18.   Gülnar, E., & Çalışkan, N. (2014). Hemşirelerin ventrogluteal bölgeye intramüsküler enjeksiyon uygulamasına yönelik bilgi düzeylerinin belirlenmesi. *Dokuz Eylül Üniversitesi Hemşirelik Yüksekokulu Elektronik Dergisi, 7*(4), 275–284.

19.   Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

20.   Öner, N., & Le Compte, A. (1983). *Durumluk-Sürekli Kaygı Envanteri el kitabı*. İstanbul: Boğaziçi Üniversitesi Yayınları.

21.   Özusta, H. Ş. (1995). Çocuklar için Durumluk-Sürekli Kaygı Envanteri uyarlama, geçerlik ve güvenirlik çalışması. *Türk Psikoloji Dergisi, 10*(34), 32–44.

22.   Aydemir, Ö., & Köroğlu, E. (2000). *Psikiyatrik değerlendirme ölçekleri*. Ankara: Hekimler Yayın Birliği.

23.   Şahin, N. H., Batıgün, A. D., & Uğurtaş, S. (2002). Üniversite öğrencilerinde depresyon, anksiyete ve stres düzeylerinin bazı değişkenler açısından incelenmesi. *Türk Psikoloji Dergisi, 17*(49), 1–10.

24.   Dinç, L. (2011). *Drug applications in nursing*. Nobel Medical Bookstores.

25.   Güneş, U. Y., Zaybak, A., & Biçici, B. (2009). Investigation of nursing students' knowledge and skill levels in intramuscular injection applications. *Florence Nightingale Journal of Nursing, 17*(3), 125–131.

26.   Kaya, N., & Palloş, A. (2012). Determination of students' knowledge and skill levels in using ventrogluteal region in IM injection applications. *Journal of Ege University School of Nursing, 28*(2), 41–49.

27.   Mishra, P., & Stringer, M. D. (2010). Sciatic nerve injury from intramuscular injection: A persistent and global problem. *International Journal of Clinical Practice, 64*(11), 1573–1579.

28.   Small, S. P. (2004). Preventing sciatic nerve injury from intramuscular injections: Literature review. *Journal of Advanced Nursing, 47*(3), 287–296.

29.   Greenway, K. (2004). Using reflective practice in a peer-learning group to support nursing students' learning in clinical practice. *Journal of Nursing Education, 43*(2), 48–54.

30.   Nicoll, L. H., & Hesby, A. (2002). Intramuscular injection: An integrative research review and guideline for evidence-based practice. *Applied Nursing Research, 15*(3), 149–162.

31. Thompson, C. E. (2021). The effects of high-fidelity simulation, low-fidelity simulation, and video training on nursing student anxiety in the clinical setting. *Nursing Education Perspectives, 42*(3), 162–164.

32. Liu, Y., & Tang, T. L. (2012). Does classroom incivility matter? *Journal of Health Psychology, 17*(1), 3–13.

33. Şancı, Y., & Kelleci, Ö. (2019). Nursing department students' opinions on peer education: The case of a foundation university. *Health Sciences University Journal of Nursing, 1*(2), 104–111.

34. Eyikara, E., & Baykara, Z. G. (2017). Effect of simulation on the ability of first-year nursing students to learn vital signs. *Nurse Education Today, 60*, 101–106.

35. Topping, K. (2005). Trends in peer learning. *Educational Psychology, 25*(6), 631–645.

36. Kaplan, S. (2019). *The effect of web-supported education and peer education on nursing students' stoma care knowledge and skills* (Master's thesis). Ankara Yıldırım Beyazıt University Institute of Health Sciences.