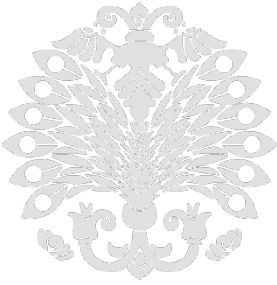# Using a Board Game to Learn a Physical Assessment Course in Nursing Education: A Randomized Controlled Study

Hemşirelik Eğitiminde Fiziksel Değerlendirme Dersinde Masa Oyununun Kullanılması: Randomize Kontrollü Bir Çalışma

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ABSTRACT

Objective: Nursing students are expected to acquire the skills necessary to provide competent patient care in complex healthcare settings. This study aimed to explore the effect of a physical assessment board game on nursing students' knowledge level and determine their opinions about the game.

Methods: A randomized controlled study design was used. The study was conducted from December 2019 to January 2020 among 56 nursing students (game group= 28, control group= 28) enrolled in an undergraduate nursing program in Türkiye. The data were collected using the Kolb's Learning Styles Inventory to determine students' learning styles, the Knowledge Evaluation Form for physical assessment, and the Student Opinion Form for students' opinions about the game. Mean scores for the pre-test and post-tests were compared using independent and paired sample t-tests.

Results: A significant difference was found between the pre-test and post-test knowledge scores of the game group (*P*<.05). The mean post-test knowledge score of the students in the game group was higher than that of the students in the control group, and the difference between the groups was statistically significant (*P*<.05).

Conclusion: The game was beneficial for teaching physical assessment course. Future studies should incorporate different game samples, such as the development of a web-based game, as this study focused on a board game that supported physical assessment skills.

Keywords: Board game, learning, nursing, nursing education, nursing student

ÖZ

Amaç: Hemşirelik öğrencilerinin karmaşık sağlık bakım ortamlarında yetkin hasta bakımı sağlamak için gerekli becerileri kazanmaları beklenmektedir. Bu çalışmanın amacı fiziksel değerlendirme dersi için geliştirilen masa oyununun hemşirelik öğrencilerinin bilgi düzeylerine etkisini ve oyun hakkındaki görüşlerini belirlemektir.

Yöntemler: Araştırmada randomize kontrollü araştırma deseni kullanılmıştır. Aralık 2019-Ocak 2020 tarihleri arasında Türkiye'de bir hemşirelik lisans programına kayıtlı 56 hemşirelik öğrencisi (oyun grubu= 28, kontrol grubu= 28) ile araştırma gerçekleştirilmiştir. Veriler, öğrencilerin öğrenme stillerini belirlemek için Kolb Öğrenme Stilleri Envanteri, fiziksel değerlendirme için Bilgi Değerlendirme Formu ve öğrencilerin oyun hakkındaki görüşleri için Öğrenci Görüş Formu kullanılarak toplanmıştır. Ön test ve son test ortalama puanları bağımlı ve bağımsız gruplarda t testleri kullanılarak karşılaştırılmıştır.

Bulgular: Oyun grubunun ön test ve son test bilgi puanları arasında anlamlı farklılık bulunmuştur (*P*<.05). Oyun grubundaki öğrencilerin son test bilgi puanı ortalaması kontrol grubundaki öğrencilere göre daha yüksek olup, gruplar arasındaki fark istatistiksel olarak anlamlıdır (*P*<.05).

Sonuç: Araştırmada geliştirilen oyun, fiziksel değerlendirme derslerini öğretmek için faydalı bulunmuştur. Bu çalışma, fiziksel değerlendirme becerilerini destekleyen bir masa oyununa odaklandığından, gelecekteki çalışmaların web tabanlı bir oyun geliştirilmesi gibi farklı oyun örneklerini içermesi önerilmektedir.

Anahtar Kelimeler: Masa oyunu, öğrenme. hemşirelik, hemşirelik eğitimi, hemşirelik öğrencileri

INTRODUCTION

As nursing students are expected to have gained skills after attending theoretical courses on anatomy, pharmacology, physiology, they must also be prepared to put into practice psychomotor and procedural skills in patient care.[1,2] This expectation requires nurse educators to create educational environments to make sure graduate nurses gain cognitive, affective, and psychomotor skills. To ensure this, students must be motivated.[3,4]

In addition, these students have different learning styles which affect their learning methods. For effective learning to occur, education methods that appeal to these students' learning styles and preferences are needed.[5,6,7] Accordingly, it is recommended that educators use active teaching methods to make courses more interesting for students.[8-11] Since interest and motivation have been considered as an important step in learning, using games as an educational strategy may improve learning outcomes.[12,13] Games are one of the active teaching methods used in nursing education to meet students' diverse learning needs and styles.[8,14,15] Nurse educators are challenged to implement innovative strategies that provide opportunities for students to practice their skills. In nursing education, games offer learning through trial and error. For instance, when students are at risk of harming a patient, within the context of the game, communication and decision-making skills are sharpened, teamwork increases, and learning occurs in a fun and motivating environment where stress and anxiety decrease.[14,15] Furthermore, the games used in nursing education have diversified from computer-based games such as virtual reality (VR) to card and board games.[10] Although computer-based games are a highly promising approach to motivating students[16], card and board games are more practical and cost-effective than computer and VR games while still having a positive impact on knowledge levels, motivation, teamwork, and communication skills.[17,18]

The literature also presents evidence that board games are effective learning tools in education related to nursing, medicine, and patient care.[14,17,19,20] However, a physical assessment game did not exist amongst the current literature, and so one was developed for this study.

AIM

This study aimed to investigate the effect of the developed game on nursing students' knowledge level of a physical assessment course. Furthermore, the study also aimed to determine students' opinions about the game.

METHODS

Study design
A randomized controlled study design was used. Moreover, to prevent the pre-test effect, a post-test control group design was used.

Sample and setting
The study was conducted at the Nursing Skill Laboratory at a university between December 2019 and January 2020. The study comprised of 202 second-year nursing students who were enrolled in a physical assessment course. Students enrolled in the nursing department are divided into two groups, A and B, according to their registration numbers, regardless of their success level. In the fall semester of the 2nd year, the physical evaluation course taken by these students consists of 8 weeks of theory and 4 weeks of simulation laboratory practice. The theoretical part of the course was completed in the traditional way, subsequently, after the completion of the program by using courses and PowerPoint presentations, simulation laboratory practices took place. The control group received the teaching through the standard process provided. The game was played with 28 students, who were included randomly according to the learning styles of the group. The game group divided into groups of four and formed into seven groups. The game group played the game organized in four-hour sessions for four weeks.

The G* Power software program was used to calculate the sample size and achieved a power of 80% and 95% confidence, with a 0.80 effect size of 42 students. Considering the students who wanted to participate and those who wanted to leave, a sample of 56 students (28 experimental and 28 control) was formed within the scope of the study.

After taking the course, including courses and high-fidelity simulations in the laboratory, the Kolb Learning Styles Inventory was administered to 202 students who were actively attending the physical assessment course in the 2nd grade fall semester. After determining the learning styles of the students, a software table was created for all students according to four learning styles and participants were divided into four groups according to their learning styles: assimilating, converging, accommodating, and diverging. The students were randomly distributed into game (28 students) and control (28 students) groups using a software program, with 7 students belonging to each learning style category (Figure 1).

Game Design. The game was inspired by a board game designed by Gibson and Douglas[14] similar to Monopoly and Trivial Pursuit, used in learning to care for critically ill patients. It was also inspired by the Nursopardy game created by Boctor.[8] The board game consists of 96 questions including right or wrong, multiple choice and open-ended questions. The questions were categorized into easy (yellow question cards), medium (green question cards) and difficult (red question cards). Question topics related to the data collection methods of physical assessments. For instance, preparing the patient both mentally and physically; skin, hair, and nail assessment; head, eye, ear assessment; nose, mouth, throat assessment; and respiratory, cardiovascular, gastrointestinal, and neurological assessment.
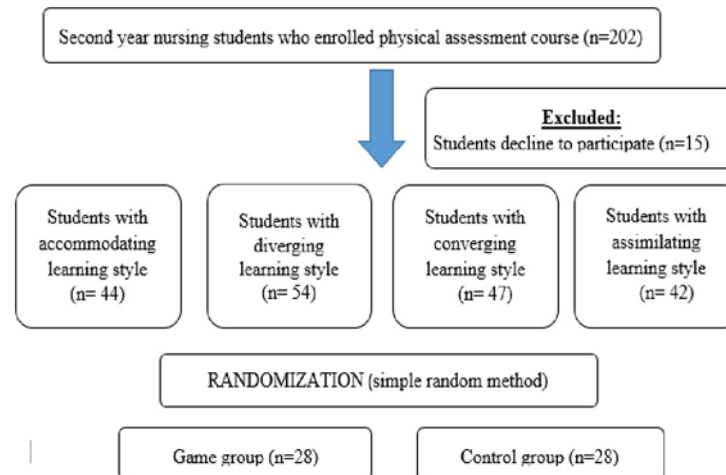
Figure 1. Flow Chart for The Recruitment of The Sample

The game was played with four students and each student was given an icon to follow their progress within the game. Players moved from start to finish by throwing dice and answering questions correctly. The game ended when someone reached finish first. Next, scores were calculated by totalling the points of correctly answered questions and the winner was determined by having the most points. Questions were scored according to the difficulty level (yellow cards: 2 points, green cards: 4 points, red cards: 6 points). To make the game more challenging, Duel, Joker, and Chance categories were placed on the template randomly (Figure 2).

Figure 2. Game template

Data collection tools
The data were collected using the Kolb Learning Styles Inventory to determine students' learning styles, while the Knowledge Evaluation Form was used for physical assessment and the Student Opinion Form was used for students' opinions about the game.

Kolb's Learning Styles Inventory: The inventory was published by Kolb in 1999. The Cronbach's alpha reliability coefficients of the learning style dimensions of the inventory, whose validity and reliability study was performed by Evin Gencel, were adapted to Turkish and varied between 0.71 and 0.80. The inventory comprised 12 items with four options each which students can were asked to select as 4 for the most appropriate, 3 for the second appropriate, 2 for the third appropriate, and 1 for the least appropriate. As each option represented one of the four main learning methods: concrete experience (CE), reflective observation (RO), abstract conceptualization (AC), and active experimentation (AE), scores for the four learning styles were obtained from the total items. By subtracting scores, two dimensions (AC - CE) and (AE - RO) were derived and the learning styles of the students (accommodating, assimilating, converging, diverging) were obtained by placing the scores obtained from the learning styles cycle on the Kolb's Learning diagram.[21] In this study, Cronbach's alpha of the inventory was determined as 0.90.

The Knowledge Evaluation Form for Physical Assessment: This form was prepared by authors to determine the students' knowledge level of the physical assessment. A total of twenty multiple-choice questions were developed from course notes and recommended reference textbooks utilised in our undergraduate program.[22,23] The correct

answers given to the questions were evaluated as four points and the wrong answers as zero points. There are 25 questions in knowledge evaluation form for physical assessment and the lowest and highest scores on the form are 0 and 100. The higher score indicates a higher level of knowledge. The reliability coefficient of Kuder-Richardson-20 (KR-20) was calculated and was found to be 0.81.

The Student Opinion Form: In this form students were asked for statements about the positive and negative aspects of the game as well as its limitations in nursing education.[8,15,24] This form included socio demographic questions such as students' age, gender, marital status and questions about their opinions about the game. It contains three open-ended questions including the positive, negative aspects of the game and suggestions for the development of the game.

Data collection

After the students had completed both the physical assessment course and laboratory practices, The Student Opinion Form and Knowledge Evaluation Form for Physical assessment were completed by the game group. Next, the game was played by the students while the researcher took on the roles of observer and facilitator. For the control group, learning continued traditionally with the use of course notes. Finally, the Knowledge Evaluation Form for Physical Assessment was given to both groups (Figure 3).
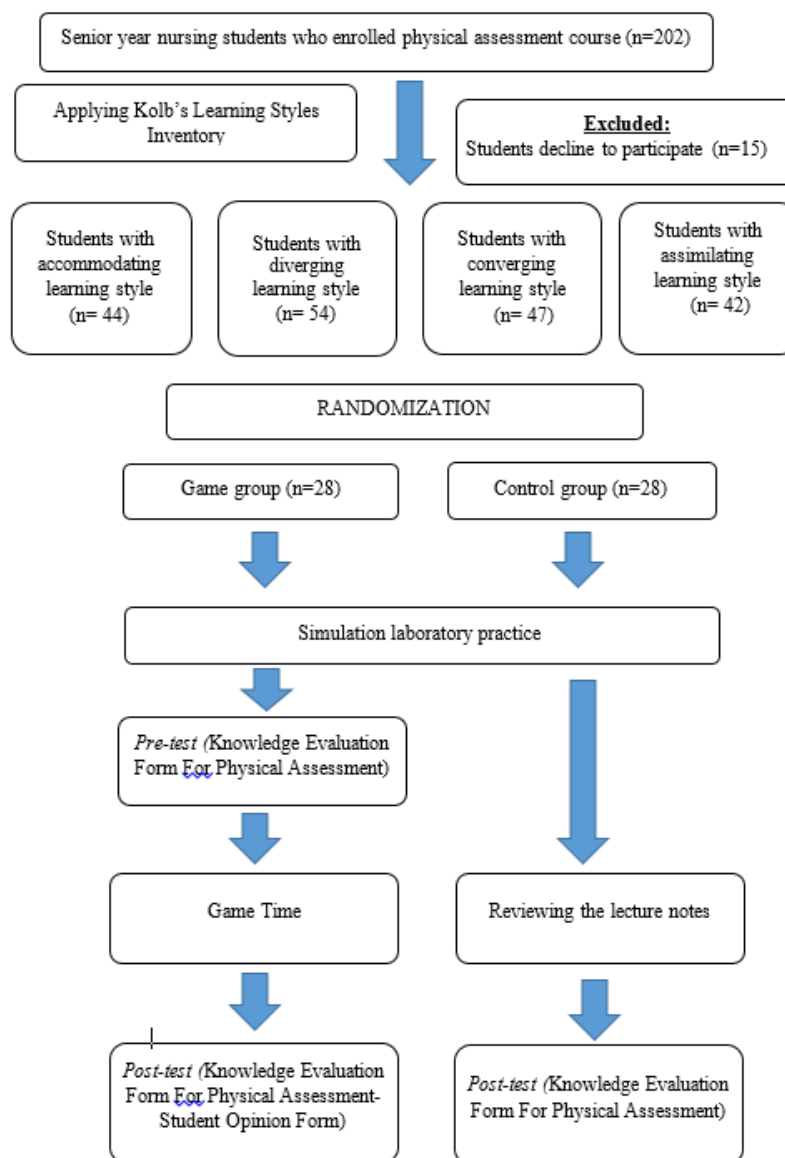
Figure 3. Study Flow Diagram

Data analysis

The data were evaluated using the SPSS 24.0 descriptive statistics software package. The chi-squared test was used to compare the equivalence of demographic characteristics between the game and control groups. Frequency (f), number (n), percentage (%), mean ($\overline{X}$), and standard deviation (SD) were used to describe the data. Homogeneity and normal distribution assumptions were also analysed. Normality testing showed that the data were normally distributed based on the nonsignificant Kolmogorov–Smirnov test. The mean scores for the pre-test and post-test were calculated. The scores were compared using independent and paired sample t-tests. The level of significance was set at $P<.05$.

After the answers to the open-ended questions were written in word format, they were read by both authors. Statements of students were grouped under two headings, positive and negative contributions, and the relative frequency and percentages were calculated.

Ethical consideration

Ethical approval was obtained from the Non-Interventional Health Research Ethics Committee of Duzce University (Date: 16.12.2019 / No: 2019/274). Furthermore, after a thorough explanation of the content and purpose of the study by the researcher, informed consent was obtained by all participating students.

RESULTS

The descriptive characteristics of the nursing students participating in the study showed that of a total of 56 nursing students, 38 (67.9%) were female and 54 (96.4%) were single. The average age of the students was 20.67±1.60 years. There were no statistical differences between the gender (x^2 = 0.000, P=1.000), marital status (x^2 = 0.000, P=1.000), age (t = -2.238, P= .29), and learning styles of the groups (x^2 = 0.000, P= 1.000) (Table 1).

Table 1. Descriptive Characteristics of Students

Variable	Total (n=56)		Game group		Control group		Test value
	n	%	n	%	n	%	
Gender							
Female	38	67.9	19	67.9	19	67.9	χ2 = 0.000
Male	18	32.1	9	32.1	9	32.1	P= 1.000
Marital status							
Single	54	96.4	1	3.6	1	3.6	χ2 = 0.000
Married	2	3.6	27	96.4	27	96.4	P= 1.000
Learning style							
Accommodating	14	25	7	23.3	7	23.3	
Diverging	14	25	7	23.3	7	23.3	χ2 = 0.000
Converging	14	25	7	23.3	7	23.3	P= 1.000
Assimilating	14	25	7	23.3	7	23.3	
Age ($\overline{X}$±SD)	20.67±1.60		20.21±1.57		21.14±1.53		t = -2.238 P= 0.29

n, number; %, percentage; χ2, Pearson's chi-squared test; t, independent sample t-test; $\overline{X}$, Mean; SD, Standard deviation

When the physical assessment knowledge scores of the game group were compared, it was found that there was a significant difference between the pre-test and post-test scores of the game group (t = –7.21, P= .00). The post-test scores of the students were higher than the pre-test scores. The mean post-test score of the students in the game group was higher than that of the students in the control group, and the difference between the groups was statistically significant (t = 3.614, P= .01) (Table 2).

There was no significant difference between the knowledge scores and learning styles of the students in the game (F= 1.052, P=.388) and control groups (F=1.034, P=.43). However, the knowledge scores of nursing students with all four learning styles (accommodating, diverging, converging, and assimilating) were found to be above average (Table 3).

Table 2. Comparison of Physical Assessment Knowledge Scores of Groups

	Game group X̄±SD	Control group X̄±SD	Test value
Knowledge			
Pre-test	69.28 ± 14.57	--	t = 3.614
Post-test	82.32 ± 8.97	71.42±13.18	P= .01
Test Value	t= -7.21 P= .00		

X̄, Mean; SD, Standard deviation; t, t-test

Table 3. Physical Assessment Knowledge Scores According to Students' Learning Styles

	Physical assessment knowledge scores	
	Game group	Control group
Learning style	X̄±SD	X̄±SD
Accommodating	85.71±7.86	81.12±3.23
Diverging	77.85±5.66	66.04±2.33
Converging	84.28±7.86	75.05±6.24
Assimilating	81.42±12.81	80.22±9.87
Test value	F= 1.052 P=.388	F=1.034 P=.43

X̄, Mean; SD, Standard deviation; F,ANOVA test

Concerning the positive contributions of the game, the students stated that they learned new information about physical assessments (f=23) and that they had fun while learning (f=18) (Table 4). Most of the students stated that the game had no negative aspects (f=24). However some of the students reported the game being based on luck (f=3), having not enough time for some questions (f=2) and causing competition among friends (f=1) as a negative aspects of the game. When their recommendations about the game was asked, the students suggested that the game should be longer and would be played with more students (Table 4).

Table 4. The Opinions of Students About the Game

Students' statements		f	%
Positive contributions	I learnt new information related to physical assessment.	23	34.8
	I had fun while learning.	18	27.3
	I think the information was more permanent in this way.	14	21.2
	I found it more exciting because there was competition in the game.	9	13.6
	It made me realize both what I knew and what I didn't know about physical assessment.	2	3.1
	Total	66	100

f, Frequency; %, percentage

DISCUSSION

In the present study, it was found that the knowledge level of the game group increased after playing the game (Table 2), and the knowledge level of the game group was significantly higher than that of the control group (Table 2). Boctor found that the students who played the Nursopardy game stated that the game was beneficial for reviewing the fundamentals of nursing information and reinforcing the information learned.[8] Similarly, studies have shown that the game environment allows students to assess their knowledge and progress and facilitates information retention.[25,26] These results support that the game can be used in conjunction with courses to acquire knowledge and retain information.

The use of games in nursing education is a successful teaching strategy to help engage students and motivate learning.[27] However, students' learning needs and styles still vary. Thus, it is important to use teaching strategies and learning tools that correlate to the students' various learning styles.[6,7] In this study, the knowledge scores of nursing students with all four learning styles (accommodating, diverging, converging, and assimilating) were found to be above average (Table 3). Moreover, students with 'accommodating' and 'converging' learning styles have higher knowledge level scores than students with other learning styles. This could be because these learning style facilitates making inferences and observations based on trial and error, consulting others, and a preference for group work, learning mainly through experience and active participation, all of which are found in a game setting. Studies show that today's students prefer learning environments where they actively participate and learn by doing and experimenting but there is none dominant learning styles among nursing students.[28-30] In this study, the high knowledge scores of students with 'accommodating' and 'converging' learning styles based on learning by doing and experimenting support the literature. That being said, 'converging' students, who need guidance and feedback from their educator and 'diverging' students, who tend to introspect while configuring learning topics,

also increased their knowledge scores by using the game.[31] Hence the game is a tool that creates active learning environments for different learning styles.

Most of the students listed learning new information about physical assessments while having fun as positive contributions of the game (Table 4). This sentiment is paralleled in a study that found that the Jeopardy board game increased enjoyment and motivation among nursing students.[8] All this can be deemed as evidence of the advantages of using games in nursing education.[15] Furthermore, nursing students have stated that their education is their biggest stressor[32,33], thus, a fun and motivating learning environment using games is not only beneficial but also necessary. The vast majority of students did not identify any negative aspects of the game, however, a small minority stated that the cards get picked up by chance, time consumption, and competition were negative aspects of using the game to learn. Overall students' attitudes about using games for learning are mostly positive, however, limitations were listed as subject, having more time for the game, size of the class, and the learning environment.[15] Sealover and Henderson[26] found that students listed competitiveness, confusion, losing the game, time, and difficult questions as what they liked least about learning by using games.[26] That being said, literature states that games should include challenging situations for students.[34] Learning with competition and challenges improves students' academic results and motivates them to participate more actively in their learning process.[24] Still, only some students consider a game-orchestrated learning environment as motivating and a success incentive[15], while others consider using players, rules, luck, winners and losers, and competition, as a negative. It should be noted that students' lack of existing knowledge on the games' content may influence their experience of playing it and thus their overall opinions on using games in education.

Study Limitations

The limitations of this study include drawing a sample from only one nursing department, and using only second-year students because it may hinder generalisability. In addition, the game only covered the content of one course and whether students had studied the material and not knowing study habits can also be considered a limitation. However, regardless of the present limitations this game-based strategy is impactful in the nursing curriculum especially for courses that do not offer practical nursing processes, theories, and models. In future, the board game can be designed to cover different courses with different samples or can be developed as a web-based game.

Although it is recommended to use active learning environments in education, simulation and virtual techniques may not always be cost effective. Being easily implemented, integrated, and developed for various topics and yielding knowledge and motivation, board games offer a cost-effective alternative to computer based and VR learning games.

Overall, the board game that was developed for this study was found beneficial. It allowed nursing students to review the physical assessment course they had just completed and was deemed a positive and useful learning strategy when evaluated by them. The game was easy to implement and can be used to create a fun and active learning environment to improve learning. Thus, it is an effective learning tool for physical assessment courses. Yet, some educators hesitate to use games in education and so this study, and further studies in this area, provide evidence of the benefits of game use in nursing education. This study also provides options for overcoming the current limitations of game use in education.

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