



The Effect of Mobile Learning In The Acquisition of Nursing Skills

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Abstract

Introduction: The use of mobile technologies is very widespread among the younger population. This study was conducted to determine the effect of education with mobile support on the skill levels of a sample of nursing students in Tekirdağ/Turkey.

Methods: This quasi-experimental study was conducted with 62 undergraduate students (31 experiments and 31 controls). The research was conducted with students attending the Spring semester of the first year and taking the nursing course fundamentals. First of all, subcutaneous injection skills were explained to the students, and training was given to them (the first part of education). A week later, the students' skills were tested (pre-test), and then the students were divided into the two groups, balanced in terms of their gender and skill scores. A video about subcutaneous injection skills was prepared by the authors for the students in the intervention group, and students were allowed to access this video on their smartphones (Mobile). Three weeks after the first part of education, the students' skill development was re-evaluated with the Subcutaneous (SC) Injection Skill Evaluation Checklist.

Results: The mean age of the students who participated in the study was 19.04±1.16 years. The intervention group students watched the educational video with their smartphones 3.87 times on average. The difference between the post-test and pre-test scores of the subcutaneous injection skill was significant in the intervention group (7.71±4.55), compared with the controls (3.51±3.52). Thus, Nursing students in the intervention group, got a higher clinical skill for subcutaneous injection (P<0.001).

Conclusions: Our results showed that a planned educational video through mobile learning could contribute to the clinical skill development of nursing students in the first year of education. It can inspire the university teachers to apply this method for clinical education of nursing students in other education areas.

INTRODUCTION

Nursing education aims to make students internalize knowledge, skills, attitudes, and ethical principles and make them part of their behavior [1-3]. Skill training in nursing is important concerning ensuring occupational proficiency and high quality, safe care. Students' interest in skill training is ensured by forming an efficient learning environment [4]. However, today, the facts that the number of students is high and the number of educators is less in the education system, insufficient learning locations, and the complex structure of services provided in the health care field cause students not to learn nursing skills on the desired level [3, 5-7]. In actualizing desired behavior change and making it easier for students to learn, learning styles and efforts to make training programs concurrent with those are important

[8]. Students who participate in the learning process willingly and actively are known to have increased self-efficacy with positive clinical proficiency reflections [9, 10].

In nursing education, it is necessary to use new practices to increase education's permanence and ensure that students take on their roles [11, 12]. Information technologies in nursing training have become a need, especially to provide students with proficiency before they go out for clinical intervention [13]. In the 1980s, certain novel methods, including video support, have been started to be used to teach clinical skills in health sciences [14]. Educational videos provide the students with the opportunity to repeatedly watch clinical skills they have not experienced yet. Additionally, it

contributes to the students' proper clinical skills intervention and decreases their anxiety [15]. Video supported training has been started to be used in nursing education in the 1990s. In the year 2000, computerized training has been integrated into public health nursing education at the LaTrobe University Bendigo [16]. In the year 2005, Dublin City University prepared training videos to improve clinical skills in the nursing major module. Video supported education used alongside classic education has been reported to be effective in improving students' clinical skills [17]. With the development of 3G mobile technology, which supported high data transfer speeds, efforts to use mobile interventions in education methods started in those years [18]. Through interventions such as podcasts, which enables the downloading of digital video files on portable devices, students were provided with the possibility of reaching training materials multiple times and learn better [19, 20]. For this reason, and since it is efficient, accessible, and cost-effective, the use of mobile technologies to improve health care has become more widespread in nursing education [21]. Particularly nursing students who do not have enough educational resources are seen to use mobile technology as educational tools [22].

Mobile technologies increase permanency in education by providing the student with access whenever and wherever he/she wants and repeated watching opportunities [23-25]. Mobile learning helps students learn the subject's context and makes the development of certain skills, such as making clinical decisions, supporting patient care plans in an evidence-based manner, improving clinical learning, communication, problem-solving, and creativity easier [25-27].

Studies in literature indicate that nursing educators in other countries have started using various mobile devices in their training sessions [13, 26, 27]. Although there are studies regarding mobile learning across other disciplines in Turkey [28-30], there are a limited number of studies on the subject performed with nursing students [31, 32].

Realized learning with mobile learning can be seen to have an important place in the future [33]. In this context, the study was conducted to determine the effect of education with mobile support on the Turkish nursing students' skill levels for subcutaneous injection.

METHODS

A quasi-experimental study with a pre-and post-test design in two intervention and control groups was done. The study, which was conducted between June 7th and 28th 2016, consisted of 106 undergraduate nursing students studying at the nursing department of a state university in Tekirdağ (Turkey). Sixty-two undergraduate nursing students (31 experiments and 31 controls) meeting the study's criteria made up the study

sample. This study's inclusion criteria are being a first-year student, not being a graduate of a health vocational high school, having no training on subcutaneous injection, and having a smartphone with internet access. The study's data were collected using a Student Information Form, the BIG 16 Learning Modality Inventory, The Subcutaneous Injection (SC) Skill Evaluation Form, and The Self- Efficacy Scale.

The Student Information Form: The form was prepared according to the literature by the researchers. Nursing students' socio-demographic characteristics were questioned regarding age, gender, willingly choosing to nurse, and having fear/hesitation in providing care to the patients. Also, there were questions about what device they were connected to the internet and how long they spent on the internet daily through their computer and mobile phone.

The BIG 16 Learning Modality Inventory: Learning style shows the individual's preference for perceiving information. The provision of teaching appropriate to the individual's learning style makes learning easy and permanent. In educators' efficient performance of their function, it is important to know learning styles. The inventory was developed by Simsek et al. (2002) [34] to determine the three types of learning styles of students (motor, audial and visual learning) at the age 16 to 25 in the secondary and higher education institutions. In the five Likert-type inventory, there are a total of 48 questions, 16 questions for each of the three learning styles. The lowest score that can be obtained from each learning style is -16, and the highest score is 16. The method to calculate learning styles using the inventory separately calculates scores for each style, compares them, and determines the student's learning style according to the highest score. The Cronbach's alpha reliability coefficients were found to be 0.68 for motor style, 0.77 for auditory style, 0.79 for visual style, and 0.84 for the whole inventory [34]. In this study, the Cronbach's alpha reliability coefficients were found to be 0.72 for motor style, 0.80 for auditory style, 0.78 for visual style, and 0.83 for the whole inventory.

The Subcutaneous Injection (SC) Injection Skill Evaluation Checklist: A 25-step checklist was prepared by the authors through reviewing the literature on the SC injections, where the process steps of the SC injection skill were present respectively [35, 36]. The prepared checklist was sent to 10 experts in the field of Fundamentals nursing by e-mail. The necessary corrections were made in line with their suggestions, and the final shape was given in the checklist. In the scoring by the checklist, each step the student applies correctly was calculated as 1 point, while each erroneous step was calculated as 0. The lowest score that can be attained from the checklist is 0, while the highest is 25. Higher scores indicate higher levels of skill development in the student.

The Self-Efficacy Scale: Self-efficacy is one of the cognitive perception factors that affect the individual's behavior. In other words, it is the perception of the individual on whether a certain action or performance can be done independently or whether events can be controlled. The scale was developed in 1982 by Sherer et al. in order to evaluate behavior and behavioral changes. The scale was not specific to any behavior but generally, it evaluates beginning and finishing the behavior as well as the willingness to continue the behavior in the face of an obstacle. In the 23-item scale, some items are reversely scored. The highest score that can be taken from the 5 Likert-type scales is 115, while the lowest is 23. A higher total score from the scale shows better self-efficacy perception. The scale has four sub-scales dimensions: behavior starting, behavior continuance, behavior completion, and fighting obstacles. Sherer et al. have suggested that instead of accepting each factor as a subscale, the scale should be evaluated as a whole and that studies should be made over a single total score attained from the whole scale [37]. The validity and reliability study of the Turkish version of the scale was performed by Gozum and Aksayan (1999), and its Cronbach alpha coefficient was found to be 0.81 while the test-retest reliability value was 0.92 [38]. In this study, the Cronbach alpha coefficient of the scale was found to be 0.86.

Intervention Description and Data collection

In the study, SC injection application, a treatment method that students should learn and apply within the scope of nursing fundamentals course in the first year of nursing education, was chosen to evaluate students' skill development. One of the prerequisites for participation of students in our study was, not having a basic knowledge and skill for SC injection. For this reason, all students were first given training for SC injection with the traditional method (theoretical and practical education at the skill lab). Students were allowed to make practice on the simulation model. In addition, a three-page educational material containing information about the purpose and application steps of the SC injection was given to the students.

One week after the traditional education training, students completed the Student Information Form, BIG 16 Learning Styles Inventory, and Self-Efficacy Scale. A number was given to each student to ensure data consistency. Afterward, each student was given equal time under supervision of two clinical teacher-researcher and asked to inject SC on the model. The skill levels of the students were measured by the "SC Injection Skill Assessment Checklist." After the practice training students were divided into the experimental and control groups, balanced in terms of their gender and skill scores.

Later, a communication network (WhatsApp) only for the experimental students group, was created. An 10-

minute educational video was prepared for application of the SC injection. In this video, SC injection was described by a tutor on a simulation model. The educational video was uploaded to the communication network of the experimental group, and the students were asked to watch it three times via their mobile phone. Three weeks after the first part of education, all students' SC injection skills were re-evaluated in the skills laboratory (Figure 1).

In addition, for the reliability of the study; written and verbal consent was obtained from the students in the experimental group so that they would not share the prepared video with the students in the control group. It was ensured that the researchers who collected the data did not know which group the students belonged to. For this purpose, students were assigned to the groups by one researcher. The other two researchers were held responsible for data collection.

Analysis of Data

The study data were analyzed using the SPSS version 22.0 software program. In the analysis process, firstly, the Kolmogorov-Smirnov test was performed for the normality distribution of variables. As a result of this test, it was determined that the data did not conform to a normal distribution, and non-parametric tests should be used. For data analysis, descriptive (numbers, percentages, mean values, standard deviation, minimum-maximum) and comparative statistics (Chi-square test, Mann-Whitney U test) were used.

RESULTS

The mean and standard deviation age of the students who participated in the study was 19.04 ± 1.16 years (range:18-24). It was determined that 74.2% of the students were female, 77.4% chose to nurse willingly, and that 54.8% thought they would not experience fear/hesitation in caring for ill/healthy individuals. Students' a mean daily internet connection duration of 1.19 ± 1.33 (min: 0, max: 5) hours and a mean daily smartphone usage duration of 5.45 ± 3.80 (min: 0, max: 15) hours. It was found that there was no statistically significant difference between the experimental and control groups regarding socio-demographic and internet usage characteristics, with students in both groups showing similar distributions ($P > 0.05$); (Table 1).

The mean number of watching the prepared video on their smartphones among the intervention group students was 3.87 ± 0.82 .

When the pretest mean scores of the study and control groups regarding SC injection skills were compared, it was found that the students in the intervention group took a mean of 9.26 ± 4.42 points while students in the control group took a mean of 9.26 ± 4.15 points. It was determined that there was no statistically significant difference between the study and control groups

($P>0.05$). When the post-test mean scores of the study and control groups regarding SC injection skills were compared, it was found that the students in the intervention group took a mean of 16.97 ± 3.46 points while students in the control group took a mean of 12.77 ± 2.66 points. The intervention group's mean scores were found to be higher, with a statistically significant difference ($P<0.001$). When the SC injection skill post-test and pretest mean score differences of the intervention group and control group were compared, the score difference of the intervention group (7.71 ± 4.55) was found to be higher than the score difference of the control group (3.51 ± 3.52), with a statistically significant difference ($P<0.001$); (Table 2).

In order to determine that there was no difference between students in both groups, the self-efficacy (The Self-Efficacy Scale) and learning styles (The BIG 16 Learning Modality Inventory) were evaluated before the intervention. 67.8% of the experimental group students and 64.5% of the control group students were found to use the visual style among different learning styles. Total mean scores of the students for self-efficacy were respectively 89.58 ± 9.85 and 89.06 ± 10.44 in the experimental and control groups. Before the intervention, it was determined that there were no statistically significant differences between the experimental and control groups, concerning demographic characteristics ($P>0.05$); (Table 3).

Table 1. Socio-Demographic Characteristics and Internet Usage in Nursing Students (n=62)

Characteristics	Control Group (n=31)	Intervention Group (n=31)	Total (n=62)	Analysis
	N(%)	N(%)	N(%)	
Age, (year) Mean $\pm$ SD, (min-max)	18.94 $\pm$ 0.96, (18-21)	19.16 $\pm$ 1.34, (18-24)	19.04 $\pm$ 1.16, (18-24)	Z=-0.430, P=0.667**
Gender				
Female	23(74.2)	23(74.2)	46(74.2)	$\chi^2=0.000$
Male	8(25.8)	8(25.8)	16(25.8)	P=1.000*
Selection of nursing Profession with eager				
Yes	26(83.9)	22(71.0)	48(77.4)	$\chi^2=1.476$
No	5(16.1)	9(29.0)	14(22.6)	P=0.224*
Fear/hesitation in experience of patient care				
Yes, 15, 48.4, 13, 41.9			28(45.2)	$\chi^2=0.261$
No, 16, 51.6, 18, 58.1			34(54.8)	P=0.610*
Time to connect daily internet with computer (hour)				
Mean $\pm$ SD(min-max), 1.16 $\pm$ 1.34, 1.22 $\pm$ 1.35, (0-5), (0-4)			1.19 $\pm$ 1.33, (0-5)	Z=0.081, P=0.936**
Time to connect daily internet with smartphone (hour)				
Mean $\pm$ SD(min-max), 5.03 $\pm$ 3.36, 5.87 $\pm$ 4.20, (0-12), (0-15)			5.45 $\pm$ 3.80, (0-15)	Z=0.718, P=0.473**

*Chi-Square Test, **Mann Whitney U- Test

Table 2. Comparison of the SC Injection Skill Scores between Students in the Intervention (n=31) and Control Groups (n=31)

	Pre-test Mean $\pm$ SD	Post-test, Mean $\pm$ SD	Differences, Mean $\pm$ SD
Intervention group	9.26 $\pm$ 4.42	16.97 $\pm$ 3.46	7.71 $\pm$ 4.55
Control group	9.26 $\pm$ 4.15	12.77 $\pm$ 2.66	3.51 $\pm$ 3.52
	Z= -0.007, P= 0.994*	Z= -4.416, P< 0.000*	Z= -3.686, P< 0.000*

*Mann Whitney U Test

Table 3. Comparison of Different Types of Learning Styles and Self-Efficacy Scores in Nursing Students (n=62)

	Intervention Group (n=31)	Control Group (n=31)	P
	N(%)	N(%)	
Learning Styles			
Motor Style	5(16.1)	5(16.1)	$\chi^2=0.115$, P= 0.944*
Audial Style	5(16.1)	6(19.4)	
Visual Style	21(67.8)	20(64.5)	
Total score of self-efficacy, Mean$\pm$SD, (min-max)	89.58 $\pm$ 9.85, (65-110)	89.06 $\pm$ 10.44, (62-107)	Z=-0.106, P=0.916**

* Chi-Square Test, **Mann Whitney U Test

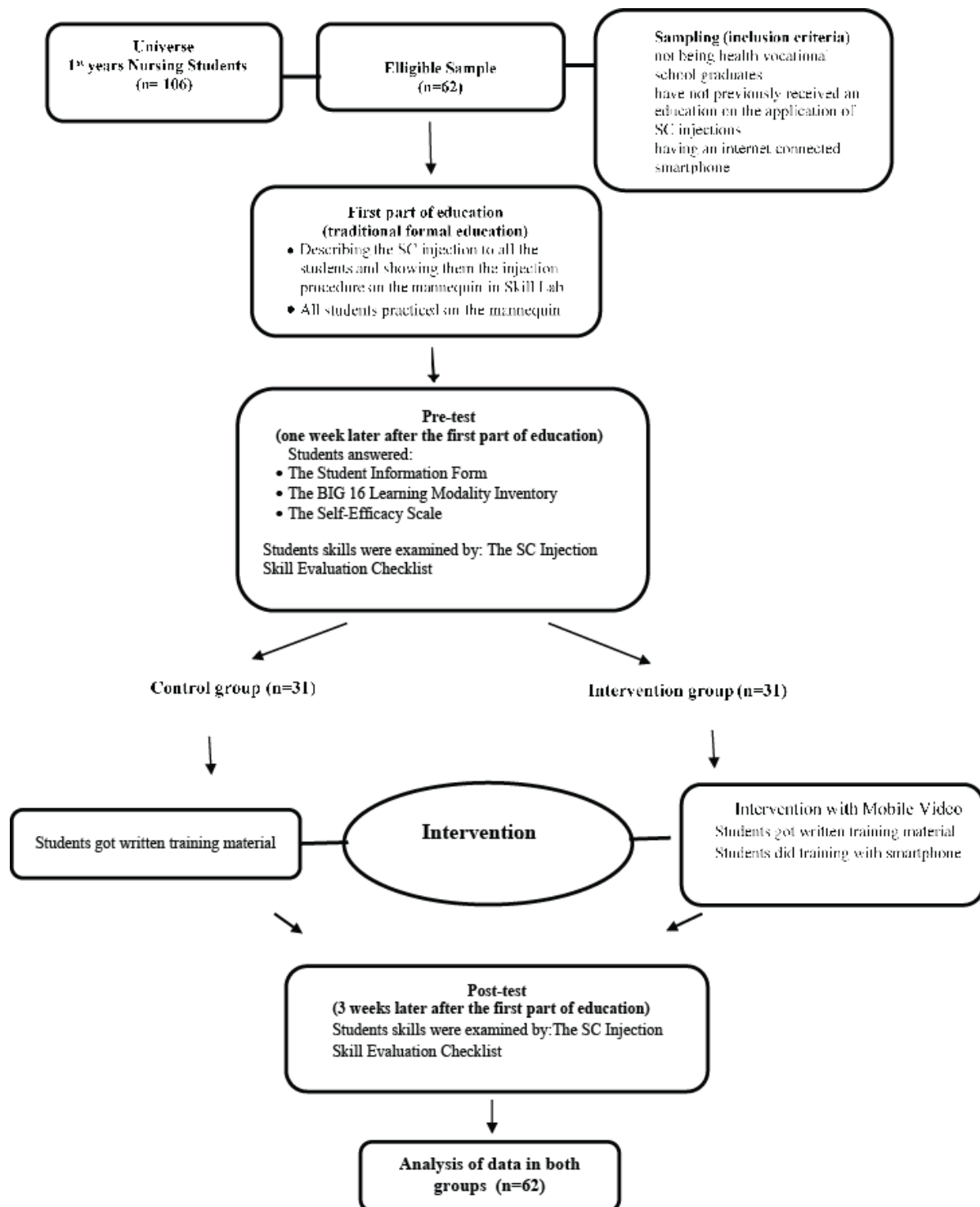


Figure 1. Diagram of Sampling and Research Process

DISCUSSION

The study was conducted to reveal the contribution of an educational video created for mobile learning to nursing students' clinical skills development in the first year of education. As a result of the study, students in the intervention group were found to improve the

intervention of the relevant nursing skill more than students in the control group. These results suggest that using mobile technologies, which provide the opportunity to reach educational materials at any place and time, may be related to the students' skill development.

In health education, students need to be proficient in clinical skills [39]. In professions such as nursing, which require proficiency, the development of complex skills can't be attained only through theoretical training [40]. Benner and colleagues (1992) have stated that gaining proficiency in nursing skills led from novice to expert. They proposed four nursing practice levels (advanced beginner/novice, competent, proficient, and expert [41]. Nursing students are accepted to be on the novice end of the spectrum. In the novice phase of gaining skill, the individual has no experience in the encountered conditions that he/she is expected to perform. They constantly need verbal and physical cues. To provide them with the opportunity to enter these new conditions that they encounter, they need to be taught the condition concerning objective qualities [40].

Videos used for training in clinical skill improvement present the information to the students in an interesting manner [42], explain complex concepts, and focus on and repeating the subject easier, which is very beneficial concerning improving learning [21]. When used appropriately, videos are known to be strong learning tools that draw students' attention and a source of motivation for learning [43]. In a study by Yoo et al. (2009), a video-based self-evaluation was beneficial and efficient in making nursing students discover their strengths and weaknesses and improve their communication skills [44]. Cardoso and colleagues (2012) have reported that the use of training videos improved both the students' cognitive and technical skills, decreasing their anxiety at the same time [15]. According to the systematic review by Stone et al., the use of video technology and traditional teaching methods to improve nursing students' clinical skills creates the most positive learning environment. It is suggested that the videos to be used in education should be conceptualized with an appropriate pedagogical approach to provide a purposeful and meaningful learning experience [45].

Today, the need for instant access to information and the possibility to reach educational videos online freely has increased the use of mobile technologies and made learning easier [13]. Developments in science provide students with new possibilities, such as using smartphones [46]. Smartphones, which provide access to videos through the internet, make students' learning process easier through their usage both inside and outside the classroom, increasing the permanency of information [24,47]. In a systematic review where Mosa et al. (2012) examined the use of smartphone applications in health care, the interventions were beneficial for the students' education, contributing to evidence-based health care [48]. According to another systematic review and meta-analysis study, smartphone-based mobile learning positively affected nursing students' knowledge, skills, confidence in performance, and learning attitudes [49]. In a study conducted by

Kim et al. (2017) with nursing students, it was reported that education through smartphones effectively increased the knowledge, skills, and performances of students [21]. In similar studies, education through smartphones was stated to positively contribute to the skill development [48, 50], communication skills, and emotional intelligence levels of students [46] being beneficial to education overall. Alongside this, Maag (2006) has enabled nursing students to re-listen to recordings of courses, reaching them at any place and time through an iPod. The fact that the satisfaction with students' education rates was high due to the study shows that other mobile technologies beyond smartphones also contribute positively to learning [20]. In the present study, the fact that the intervention group students, who watched an application video for SC injection, which is a basic nursing skill, through their smartphones had better skill development suggests that mobile learning was effective for students' education. These results show that the use of mobile devices in education as an addition to traditional education methods should be made more widespread.

The smartphone use rate of individuals between 18 and 34 years of age in Turkey has been reported as 81% [51], and the mean daily smartphone internet connection duration has been reported as 3 hours [52]. The facts that almost all of the students in the study connected to the internet through their smartphones, that the daily internet use was above 5 hours a day, and that students in the intervention group wanted to watch other nursing interventions through their smartphones as well suggest that the students were very willing for mobile learning. Each individual learns differently and develops his/her own learning style [53]. Knowing the learning styles of individuals would help them learn easier and faster, as well as making them more successful in problem-solving. Learning has three generally accepted styles. These are the kinesthetic, auditory, and visual styles [54]. As a result of a study where Clay investigated mobile technologies' use to improve clinical skills, most of the students stated that mobile learning with video support was appropriate for their own learning style [53]. According to another study, it was stated that most of the nursing students were able to store the information they learned in the classroom through their smartphones and then use this information in clinical settings. In the same study, the use of YouTube applications on their smartphones for 88.9% of the students can be shown as an example of the visual learning style [55]. In the provision of effective learning and the realization of positive behavior change, providing education appropriate for students' learning styles is important [8]. The use of different teaching methods also increases the participation of the students in education [56]. In Turkey's studies with nursing/midwifery students [57] and students from other departments [58, 59], the students were found to

learn using the visual style most. Students with a visual learning style can form images in their minds as they read and hear. They can remember what they see visually in a detailed manner [54]. In the present study, the most common learning style among nursing students was found to be the visual style as well. Alongside this, the facts that all of the students were pleased with the intervention, that all of the students stated that the process made their learning easier and that most of the students learned through the visual style suggest that video supported education (which includes visual elements) was effective in making learning easier. Besides their learning styles, individuals' self-efficacy levels also constitute an important element that affects their learning and motivation. Nursing students with high self-efficacy levels help them exhibit effective learning information, skills, and attitudes [4, 60] and provide high-quality care [60]. In a study performed by McDonough et al. (2016) with nurses, the education given was found to increase nurses' self-efficacy besides their information levels, and this situation was found to increase patient-nurse satisfaction and patient care quality [61]. It is thought that knowing the self-efficacy level of students can be beneficial in developing effective strategies for increasing success in the learning process and making learning easier. The fact that self-efficacy perception was high in both groups in the study suggests that there was no difference between the groups regarding the reliability of the study and that good levels of self-efficacy would improve students' learning performances in both groups. Alongside this, in many studies performed with nursing students, it has been stated that the self-efficacy levels of students were high [4, 62], that students with high self-efficacy participated in their own learning process more, and that those students were more successful [9, 10].

The number of students participating in this study is relatively low, the number of watching the training video being self-report, only one nursing skill being evaluated, and learning permanency not being monitored longitudinally are among the study's limitations.

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CONCLUSIONS

Interventions by smartphones are used by students widely and for many purposes. In this study, the researchers prepared a video to make it easier for students to improve their nursing skills, and the video was shared with the students in the intervention group through their smartphones. As a result of the study, mobile supported learning with visual elements was seen to contribute to nursing students' skill development. In today's nursing education system, where the number of students is great, and the number of educators is small, mobile learning methods and traditional learning methods to make learning easier are unavoidable. When the positive effect of mobile technologies, which are interesting and constantly accessible, on learning is considered, this method is suggested for use with other nursing interventions as well.

ETHICAL CONSIDERATION

Before the study, written permission from the institution where the study was conducted and ethical approval from the Namık Kemal University School of Medicine Non-Invasive Clinical Studies Board of Ethics were received (Date: 28.02.2016, number:2016/09). The students were informed about the research's aim and benefits, and written permission was obtained from them before data collection.

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CONFLICT OF INTEREST

The authors have no conflicts of interest.

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AUTHORS CONTRIBUTIONS

All authors contributed equally to the design of the study. ŞB drafted the manuscript and revision of it. All authors read and approved the final manuscript.

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