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Blood Pressure Measurement Skills with Self-instruction Video in Nursing Students' Distance Education and Influencing Factors

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Abstract

Background: Nursing educators are warned to determine the effects on student outcomes of changes in nursing education during the pandemic process and to be prepared for possible pandemics.

Aim: This study aimed to evaluate the factors that affect the blood pressure skill scores, E-learning styles, and blood pressure measurement skill levels of nursing students in distance education.

Methods: This was a descriptive study. This study was conducted between January and April 2021 with 2nd-year nursing students at a public university. The data were collected using a descriptive information form, the e-learning styles scale, a video recording of students' blood pressure measurement skills, and a blood pressure skill checklist. Mann–Whitney *U*-test and Kruskal–Wallis test were used to evaluate the difference in blood pressure measurement skill scores.

Results: The mean age of the students was 20.04 ± 1.53 years. Of them, 82.6% were female and 65.2% preferred YouTube for skill training. The mean scores of blood pressure measurement skill of students were 14.61 ± 5.04. Students mostly had independent (66.3%), logical (63%), and audiovisual (44.6%) dominant e-learning styles. The blood pressure measurement skill scores of the students, who are female, have 75–100% synchronous course attendance, and have an independent e-learning style were significantly higher. There was difference between students' blood pressure skill scores and independent e-learning styles.

Conclusion: In distance education, nursing students' blood pressure measurement skills are insufficient and should be compensated by face-to-face education. Blood pressure skill self-instruction videos can support laboratory practices in a distance/hybrid nursing education platform.

Keywords: Blood pressure, distance education, nursing students, psychomotor skills, video recording

Introduction

Blood pressure is a basic physiological parameter and blood pressure measurements guide nursing practices and medical decisions.[1] Serious errors in the measurements of systolic and diastolic blood pressure can increase the morbidity and risk of heart and kidney diseases, particularly in patients with undiagnosed hypertension. Therefore, health-care personnel should receive a standard education for blood pressure measurement, and this education should be repeated every year after graduation.[1,2]

Education for basic skills was given remotely to the nursing students, and the education had limitations because of the COVID-19 pandemic.[3,4] Blood pressure measurement is a non-invasive skill that can be practiced at home. Self-instruction videos recorded with smartphones can be used to evaluate and give feedback to the nursing students about their blood pressure measurement skill learning in the distance education setting.[4]

Smartphones and the Internet are indispensable tools in the modern world, and thus, video-based applications can be used to strengthen skills.[5-7] In addition, interactive videos, one-to-one feedback to student self-instruction videos, and mobile applications are used in skills education in the recent years.[8-10] Self-instruction videos are an effective tool in teaching nursing skills, which allows nursing students to evaluate their strengths and their weaknesses and determine their implementation in clinical practice.

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Further, self-instruction videos or laboratory video recordings can be useful for clinical education and objective structured clinical examination (OSCE),[11] for increasing learning motivation and satisfaction,[12] and providing competence, confidence, and self-awareness.[8] Studies in nursing students have shown that self-instruction videos increase OSCE success and student satisfaction[10,13] but do not improve clinical skills and knowledge.[12] Online nursing education cannot replace traditional or hybrid education.[14] However, video demonstrations and self-instruction videos can be an alternative to in-person education in situations where distance education or hybrid education is the only option for nursing students.

Learning styles, expectations, and needs of the students should be considered while developing distance education programs.[15,16] Therefore, determining the e-learning styles of nursing students can contribute to the development of teaching methods and assessments used in distance education,[17] Learning style is defined as an individual's learning preference and learning differences.[15] While there are studies showing that there is a correlation between the learning styles and academic achievement of nursing students,[18,19] there is also study stating that it is not.[20] However, a study examining the relationship between the learning styles of nursing students and their psychomotor skill acquisition was found in the literature.[17] In this study, it was stated that there was a relationship between intramuscular injection (IM) knowledge and learning style, but no relationship was found among IM skill acquisition. Nursing educators are warned to determine the effects on student outcomes of changes in nursing education during the pandemic process and to be prepared for possible pandemics.[21] In this context, it is a necessity to examine skills training and related factors carried out under limited conditions. We thought that there may be a difference between learning the skill of measuring blood pressure, which is one of the basic nursing skills, according to the e-learning styles of generation "Z" in distance education. This study aimed to evaluate the factors that affect the blood pressure skill scores, e-learning styles, and blood pressure measurement skill levels of nursing students in distance education.

Research Questions

This study seeks answers to the following questions:

1. What are levels of blood pressure measurement skill in nursing students' distance education?
2. What are e-learning styles of nursing students receiving distance education?
3. What are the factors affecting the levels of blood pressure measurement skill in nursing students' distance education?

Methods

Study Design

This study was a descriptive study.

Sample

The study population consisted of 138 students who were enrolled in the Nursing Department of the Faculty of Health Sciences of a university in the western part of Türkiye and completed the course on Basic Principles and Practices in Nursing. In the analysis performed by the G* Power Software (latest vs. 3.1.9.7; Germany, 2020), assuming that small effect size would be obtained in the study, the sample size was determined as 92 with 95% confidence and 90% power. The inclusion criteria were as follows: Completing the basic principles and practices in nursing course, agreeing to participate in the study, and sending his/her blood pressure measurement self-instruction video to the lecturer conducting the course. Students who did not send the self-instruction video to the course instructor, and used electronic manometer in self-instruction video were excluded from the study. A total of 92 nursing students were included in the study.

As part of the lesson, students prepared the blood pressure measurement skill video and sent it through e-mail. Participation in the study was not mandatory. The students were explained verbally and in writing about the study objectives and it was conveyed that the study participation would not affect the course grade.

Procedure

Theoretical Course

The basic principles and practices in the nursing course consist of a 4-h theoretical and 12-h practical course and are offered in the fall semester. The course was conducted by 2 instructors in the fall semester of the academic year 2020-2021, and a total of 69 students took the course from each class. As a part of the distance education process, theoretical courses and applications were administered online through the teaching management system (TMS) of the university, and the courses were automatically recorded on the system. There was no obligation to attend the course. The theoretical blood pressure measurement course was carried out synchronously for 2 h. In the theoretical course, the basic concepts of blood pressure, blood pressure classification, affecting factors, blood pressure measurement, points to be considered during measurement, and the reasons for incorrect measurement were explained. Theoretical lesson was applied with PowerPoint explanation, discussion, and question-answer methods.

Practice Course

During the practice course hours, basic nursing skills were presented Mosby's Nursing Skills (Elsevier) videos through the TMS. Basic nursing skills steps were highlighted and discussed one by one. Mosby's nursing skills blood pressure measurement skill video is a demonstration of two-stage blood pressure skill practice.[22] Video content hand hygiene, patient authentication, appropriate cuff selection, brachial artery palpation, cuff placement, manometer control, determination of maximum inflation pressure, blood pressure measurement with auscultation, systolic and diastolic blood pressure determination, patient comfort, hand hygiene, recording, and blood pressure classification steps. Since the basic skill videos are in English, while demonstrated with the video, the original sound of the video was reduced and narrated in Turkish spontaneously. Nursing students were able to watch live lecture recordings at any time and as many times as they wanted. Apart from this, they were advised to watch Basic Nursing Skills Training Videos[23] individually. The blood pressure measurement laboratory practice course was carried out synchronously for 2 h. The clinical application of the course was not made. Since distance education continued during the clinical practice week, the blood pressure measurement skill was repeated in the form of video watching and discussing each step. No feedback was given to the videos recorded by the students.

Data Collection

During the course, nursing students were advised to get an aneroid sphygmomanometer and a stethoscope and to practice at home by

watching live lecture recordings and relevant videos. Before preparing a blood pressure skill video for students, a standard number of video watching was not specified. Then, they were asked to prepare a self-instruction video for recording their blood pressure measurement skill after they felt sufficiently competent and e-mail it to the instructor. Instructions about shooting the nursing skill video were prepared by the lecturers of the course and the instructions were shared with the students. In these instructions, it was stated that they should make video recordings by paying attention to privacy in the home environment. The video content included the images and voices of the students as well as the images of their relatives.

Nursing students were informed about the study, and those who agreed to participate in the study were asked to complete in the student introductory information form and the e-learning styles scale using Google Forms.

The self-instruction video's blood pressure measurement of students was evaluated independently by two instructors using a blood pressure skill checklist. The instructors-observer fit index was calculated using Cohen's kappa coefficient, and a very good level of agreement was determined (0.91).[24]

Data Collection Tools

The data of the study were collected with student descriptive information form, e-learning styles scale, and blood pressure skill checklist between January and April 2021.

Student Descriptive Information Form

The form was prepared by the researchers and included gender, general academic average, place of residence, full-time work, having a private room, owning a personal computer, participation in synchronous courses, and resources used for skill video of the nursing students.

E-Learning Styles Scale

This scale was developed by Gülbahar and Alper[25] and consists of 38 items and 7 subfactors, including audiovisual learning, verbal learning, active learning, social learning, independent learning, logical learning, and intuitive learning. The scale is five-point Likert type and each item "almost always (5)," "often (4)," "occasionally (3)," "rarely (2)," and "almost never (1)" is scored. A value between 1 and 5 is obtained by dividing the total score for each subscale by the number of subscale items. The e-learning style, which has the highest average score among the 7 different e-learning styles of the student, is accepted as the dominant e-learning style. This scale had very good reliability (Cronbach $\alpha = 0.94$). In addition, our results showed that the scale had good reliability (Cronbach $\alpha = 0.62$).

Blood Pressure Skills Checklist

This checklist was created by the researchers in line with the data reported previously[26-29] and consists of 22 items. The content validity of the checklist was determined by presenting the checklist to 5 instructors in the Department of Nursing Fundamentals. Experts suggested adding some items to the checklist and observing some items in two separate steps. The final version of the checklist, which was organized according to expert recommendations, consisted of 26 items. The content validity was calculated using Lawshe's content validity formula, and the results showed that the checklist had a very good fit (0.92).[30] The blood pressure measurement skill checklist evaluates each skill step as fully done or not. It was scored with one (1) point for each skill level performed exactly correctly. The checklist takes a value between 0 and 26, depending on the number of skill levels done correctly.

Data Analysis

Data were analyzed using the SPSS 21.0 package program (IBM, New York, USA). Continuous variables were presented as mean ± standard deviation and categorical variables were represented as numbers and percentages. The Shapiro–Wilk test was used for determining whether the data were normally distributed. Since the variables were not normally distributed, the Mann–Whitney *U*-test and Kruskal–Wallis test were used. A value of $P \leq 0.05$ was considered as statistically significant.

Ethical Considerations

Permission for conducting the study (Approval Number: 2021/01-14, Date: 20.01.2021) was obtained from the Faculty of Health Sciences and an approval from the Non-Interventional Clinical Research Ethics Committee of the Kütahya Health Sciences University. Institutional permission was obtained from the dean of the faculty where the research was conducted. Written permission was obtained from the authors who developed the scale by e-mail. A written permission was obtained from nursing students who agreed to participate in the study. Student videos were sent to educators as part of the lesson. The students were informed with written instructions that they should comply with the home and personal privacy rules in the self-instruction videos. Student videos were stored in the unit (Department of Nursing Fundamentals) for institutional security, provided that they are kept for 5 years. After 5 years, the video recordings will be deleted. This study was conducted in accordance with Helsinki Declaration.

Results

The descriptive characteristics of the nursing students are shown in Table 1. The mean age of the students was 20.04 ± 1.53 years. A majority of the students were female (82.6%). Almost all of the students (96.7%) re-watched the live lecture recordings and more than half of the students (65.2%) watched YouTube for prepare self-instruction skill videos (Table 1).

The levels of nursing students to perform blood pressure measurement skill steps accurately are given in Table 2. It was observed that the students correctly followed at a rate of 70 and above the steps related to positioning the individual, removing the clothes on the arm, closing the air valve, palpating the radial pulse, determining the maximum inflation pressure, placing the stethoscope on the brachial artery, closing the air valve, and reading the systolic pressure.

The mean scores of blood pressure measurement skill of students were 14.61 ± 5.04. The dominant learning styles of nursing students were independent (66.3%), logical (63%) and audiovisual (44.6%), social (31.5), and intuitive (14.1%) e-learning styles, respectively, It was determined that they used active and verbal learning less (Table 3).

The female students correctly applied more skill steps in blood pressure measurement skill than male students ($P = 0.027$). The scores of blood pressure measurement skill of the students whose synchronous class participation rate ranged from 75 to 100% were significantly

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Table 1. Descriptive characteristics of the nursing students (n=92)

Descriptive characteristics		N	%
Age, mean ± SD (min–max)		20.04 ± 1.53 (18–32)	
Gender	Female	76	82.6
	Male	16	17.4
General academic average		3.36 ± .21 (2.74–3.79)	
Place of residence	Town/Village	11	12
	District	25	27.2
	City	56	60.9
Full-time work	Yes	9	9.8
	No	83	90.2
Having a private room	Yes	69	75
	No	23	25
Owning a personal computer	Yes	57	62
	No	35	38
Participation in synchronous courses	≤50%	13	14.1
	51–75%	39	42.4
	76–100%	40	43.5
Resources used for skill videos			
Live lecture recordings	Yes	89	96.7
	No	3	3.3
hemsirelikbeceri.net	Yes	34	37
	No	58	63
Mosby nursing skills	Yes	36	39.1
	No	56	60.9
YouTube	Yes	60	65.2
	No	32	34.8

different compared to participation rate ranging 50–75% ($P=0.000$). There is no difference between other descriptive characteristics of nursing students and the accuracy scores of blood pressure measurement skill ($P > 0.05$). There was difference between students' scores of blood pressure measurement skill and independent e-learning styles ($P=0.034$, Table 4).

Discussion

This study evaluated blood pressure measurement skill levels, e-learning styles, and the factors that affect the blood pressure skill scores of nursing students in distance education. Almost all of the students re-watched the live lecture recordings and more than half used YouTube to shoot their skill videos. Nursing students preferred web resources containing professional nursing skill demonstrations to a lesser extent than YouTube. The higher preference for YouTube may be because YouTube can be accessed free of charge, is faster, and includes shorter video content. McDonald et al. suggested using social media resources in the online/hybrid education model for nursing students.[14] Social media resources provide easy, friendly,

Table 2. The blood pressure measurement skill steps of the nursing students (n=92)

		Able to Perform	
Item	Blood pressure measurement skill steps	n	%
1	Perform hand hygiene	44	47.8
2	Identify patient	30	32.6
3	Evaluation of factors affecting blood pressure measurement from the brachial artery (activity, age, exercise, etc.)	30	32.6
4	Assist to position lying/sitting	84	91.3
5	Support the arm to be measured at heart level	38	41.3
6	Removing clothing on the upper arm	89	96.7
7	Locate the brachial pulse by palpation	60	65.2
8	Wrap the midpoint of the cuff over the antecubital fossa, 2.5-5 cm above the brachial artery, leaving one finger of space	30	32.6
9	Close air valve	82	89.1
10	Check if the manometer pointer is above "0"	35	38.0
11	Palpate the radial pulse	72	78.3
12	Inflate the cuff to the point where no radial pulse is felt	75	81.5
13	Determine the manometer pressure at which no pulse is felt	73	79.3
14	Add 30 mmHg above the manometer pressure at which the pulse is not felt	65	70.7
15	Deflate the cuff and wait 30-60 seconds	19	20.7
16	Place the stethoscope receiver on the brachial artery and the earpiece on the ears	90	97.8
17	Close air valve	84	91.3
18	Inflate the cuff to the value determined by palpation	57	62.0
19	Open the valve and slowly release the air by 2-3 mmHg per second	17	18.5
20	Obtain a blood pressure reading, systolic pressure at which you first hear sounds	67	72.8
21	Obtain a blood pressure reading, diastolic pressure when sounds become inaudible	64	69.6
22	Deflate the cuff rapidly	25	27.2
23	Remove the cuff from the patient's arm	43	46.7
24	Ensure patient comfort	16	17.4
25	Record blood pressure	31	33.7
26	Perform hand hygiene	13	14.1

Table 3. The blood pressure measurement skill scores and dominant e-learning styles of the nursing students (n=92)

		Mean±SD	Min-Max	n	%
Blood pressure measurement skill scores		14.61±5.04	5–26		
E-learning styles	Audiovisual	36.09±4.23	20–40	41	44.6
	Verbal	19±4.96	11–31	2	2.2
	Active	20.04±4.46	1–6	2	2.2
	Social	22.3±6.53	10–30	29	31.5
	Independent	17.44±3.96	10–30	61	66.3
	Logical	12.48±3.49	4–20	58	63.0
	Intuitive	13.83±3.95	3–15	13	14.1
	Total	141.17±15.61	98–174		

innovative, and fun learning opportunities for students. However, students who do not know English have a limited use of these resources because of the language barrier.[31] In the analysis of blood pressure videos on YouTube, it is reported that as the scientific quality of the video increases, its duration also increases, but there is a negative relationship between scientific quality and viewing rates.[32]

In this study, it was determined that at least 70% of the students correctly applied the 10 steps in blood pressure measurement skill. Cho Aung et al. (2017) conducted a study that measured the knowledge of nursing and medical students about the blood pressure measurement procedure in face-to-face education. In the study, it was determined that 9 of the 16 steps were applied correctly with 70% or more. In addition, it was determined that the students knew the steps of positioning the patient, calculating the maximum inflation pressure, and deflation rate <70% correctly. In our study, it was observed that students only did not apply the deflation rate fully. Block et al. evaluated blood pressure knowledge, attitudes, and behaviors in medical assistants and nurses with a pre-posttest design. The intervention consisted of two training videos of 30 min in total. In the study, we observed that the staff followed half of the recommended steps in blood pressure measurement in the first and last observation.[33] At the end of the program, patient information, the average blood pressure reading, and recording rates were higher, and the rate of using the right arm and supporting the arm at the heart level were lower.[34] As seen in the study[34] conducted to improve blood pressure knowledge, skills, and attitudes among staff, skill steps other than the technical procedure of blood pressure measurement are applied at a lower level, as in this study. This situation may be related to the fact that blood pressure measurement is only seen as a technical skill or due to insufficient level of knowledge. The findings of this study conducted with distance education are similar to the findings of blood pressure measurement skills of nursing students who receive face-to-face education and graduate nurses.

Table 4. The difference in blood pressure measurement skill scores level according to dominant e-learning styles of nursing students (n=92)

			Blood pressure measurement skill scores		Analysis	
e-learning styles		n	Mean	SD	Test Statistics[a]	*P*-value
Audiovisual	Yes	41	15.61	5.28	1.565	.118
	No	51	13.82	4.76		
Verbal	Yes	2	15.5	12.02	0	1.000
	No	90	14.6	4.94		
Active	Yes	2	13.5	2.12	–.336	.737
	No	90	14.64	5.1		
Social	Yes	29	14.52	4.31	–.063	.950
	No	63	14.67	5.38		
Independent	Yes	61	15.4098	5.16	2.118	.034*
	No	31	13.0645	4.51		
Logical	Yes	58	14.8448	5.11	.560	.575
	No	34	14.2353	4.99		
Intuitive	Yes	13	16.08	5.58	.911	.362
	No	79	14.38	4.95		

[a]Mann–Whitney *U*-test. *$P \leq 0.05$.

Some studies show that the self-instruction video method in blood pressure training will support traditional training.[7,27,28] Yang et al. evaluated the effect of feedback on student self-instruction videos in skills training, including vital signs in face-to-face training. The control group received only traditional skills training, while the intervention group received additional video feedback. No significant difference was found between the general self-efficacy scores of the groups.[7] In another study, nursing students were given web-based education for determining vital signs and infection control skills, and the results of the intervention group were better than those of the group with traditional education.[13] A study among pharmacy students showed that teaching the blood pressure measurement skill using self-instruction videos was as successful as teaching using a face-to-face method, and the results showed that self-video shooting could replace educator-centered teaching in educating for

blood pressure measurement.[35] In another study, the flipped classroom model was used to teach the technique of measuring blood pressure, and the results showed that pharmacy students who shot self-instruction videos achieved higher OSCE and self-assessment scores.[36]

Students mostly had independent, logical, and audiovisual dominant e-learning styles. In İbili's study, nursing students' e-learning style scores were similar to the findings of this study, while the audiovisual e-learning style was high and the verbal e-learning style was low.[37] Kolb's learning style inventory is frequently used in studies on the learning styles of nursing students.[38,39] Studies performed with nursing and midwifery students in Türkiye showed that the students had transformative, assimilative, and converging learning styles.[38,39] Despite the differences in the learning styles, the point of similarity among all the students was that they learned by doing/watching/feeling.[38,39]

In this study, factors affecting students' ability to measure blood pressure were also evaluated. As a result of this study, it was seen that there was a difference in blood pressure skill measurement scores according to gender, participation rate and e-learning style. Active and independent learning styles, attending online classes, and watching video recordings were found to be predictors of academic success in a study conducted with online pedagogical formation participants.[40] Health professionals should be lifelong learners. Self-directed learning and independent learning can develop lifelong learning skills by improving access to information resources.[41]

Limitations

The accuracy of measurements performed by the nursing students could not be examined, and only their compliance with the skill levels was observed. The results from this study cannot be generalized to the general population as it was conducted with a small sample group.

Conclusion

This study showed that teaching blood pressure measurement skill through distance education should be compensated by face-to-face education. In a situation such as the pandemic that necessitates a distance learning format for nursing education and with limited resources, teaching the basic nursing skills through self-instruction videos can replace laboratory learning. Therefore, self-instruction video technique of blood pressure measurement is useful in distance education as they enable nursing students to self-learn and achieve competency in their skill and can also be used to give feedback to the students.

Students should be encouraged for synchronous course participation in online nursing education and attendance requirements should be applied. Social media interest of nursing students can be turned into an opportunity by producing safe social media content. To demonstrate the effectiveness of self-instruction blood pressure videos, we recommend follow-up studies in clinical settings. In addition, it is expected that methods related to blood pressure measurement teaching in distance education are developed.

Ethics Committee Approval: Permission for conducting the study (Approval Number: 2021/01-14, Date: 20.01.2021) was obtained from the Faculty of Health Sciences and an approval from the Non-Interventional Clinical Research Ethics Committee of the Kütahya Health Sciences University.

Informed Consent: A written permission was obtained from nursing students who agreed to participate in the study.

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