ORIGINAL RESEARCH ARTICLE

Virtual reality versus low level simulation in newborn care teaching in Turkey

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Abstract

The aim of this study is a virtual reality versus low level simulation in newborn care teaching in Turkey. Data were collected in 2019-2020 academic year in midwifery students in Turkey. In the first stage, virtual reality simulation software was developed. In the second stage, newborn care was provided with a virtual reality simulator to the experimental group and a low-fidelity simulator to the control group. Students' practice, self-confidence and satisfaction levels were compared using two different simulators. There was a difference between the two groups in terms of their skills, satisfaction and self-confidence. The simulator, which was developed and evaluated in the research, increased the students' satisfaction, self-confidence and skills. It was also found to be more effective than the classical method. *(Afr J Reprod Health 2024; 28 [7]: 54-60).*

Keywords: Medical education; midwifery education; newborn; pediatrics; virtual reality simulation

Résumé

Le but de cette étude est une réalité virtuelle versus simulation de bas niveau dans l'enseignement des soins aux nouveau-nés en Turquie. Les données ont été collectées au cours de l'année universitaire 2019-2020 auprès d'étudiantes sages-femmes en Turquie. Dans un premier temps, un logiciel de simulation de réalité virtuelle a été développé. Dans la deuxième étape, les soins aux nouveau-nés ont été fournis avec un simulateur de réalité virtuelle pour le groupe expérimental et un simulateur basse fidélité pour le groupe témoin. Les niveaux de pratique, de confiance en soi et de satisfaction des étudiants ont été comparés à l'aide de deux simulateurs différents. Il existe une différence entre les deux groupes en termes de compétences, de satisfaction et de confiance en soi. Le simulateur développé et évalué dans le cadre de la recherche a accru la satisfaction, la confiance en soi et les compétences des étudiants. Elle s'est également révélée plus efficace que la méthode classique. *(Afr J Reprod Health 2024; 28 [7]: 54-60).*

Mots-clés: Éducation médicale; formation de sage-femme; nouveau née; pédiatrie; simulation de réalité virtuelle

Introduction

It is quite difficult to gain practical skills during the training of individuals in the field of health. Factors including patient safety, clinical environment-related problems and the pandemic make it difficult to gain practical skills[1,2]. Students trained in health fields such as midwifery, nursing and medicine, which require skills, may manage the situation better with a real patient through simulation training before they start clinical practice. One of these simulations is virtual reality (VR) technology. This technology is becoming increasingly popular as an educational tool[3,4].

In the international literature, in professions with applied education such as midwifery, nursing and medicine, the high number of students in formal education institutions and the insufficient number of implementation areas to perform clinical practice prevent students from gaining skills and experience at the desired level[5,6]. Students usually face many conditions, such as stress in the practice area. This condition is reported to negatively affect academic success and professional adaptation of students[7]. Studies have reported that the anxiety experienced by the students during practice renders them unable to transfer their previous knowledge to practice, they experience communication problems with healthcare workers, they develop the fear of making errors, have worries about transferring incorrect knowledge to their patients and feel professional insufficiency[8,9]. Trainers have a great responsibility to eliminate these problems. Students' self-confidence should be promoted and they should be enabled to gain healthy communication skills and develop problem-solving skills. For this purpose, it would be appropriate to use educational techniques that teach through repetition and skill acquisition through innovative training techniques. Using technology enables permanent learning in practical education. These developments have much more importance in health-related training programs[10].

Midwifery training requires an education system that covers cognitive, psychomotor and affective learning areas. One of the greatest innovations for this training is the use of simulators in skill-based training[11]. It is very difficult for students to touch the newborn, which is one of the most sensitive areas in midwifery. Newborns efforts to adapt to extrauterine life in the postpartum period make this even more difficult. During the initial care of the newborn in the delivery room, students may be hesitant to touch and provide care due to the baby's activities and small size. In this case, simulation training was considered appropriate for students to enhance their skills.

The World Health Organization (WHO) has published the gold standards for healthcare workers and recommends the use of electronic learning and simulation training in training programs for learning and teaching in accordance with these standards[12]. The use of simulation in midwifery training is one of the most important innovations for midwifery training[11].

Simulators used to improve clinical skills have been reported to increase the self-awareness of students and help them improve their self-assessment skills[13]. In addition, simulators with high levels of reality are reported to be useful in preparing students for situations they may encounter in practical settings and in increasing the students' self-confidence[14].

Designing, implementing and evaluating simulation education under the guidance of learning theories contributes to the learning acquisition of students. Therefore, this study was conducted and evaluated within the framework of Jeffries' Simulation Theory[15]. In this simulation experience, there is a dynamic interaction between the participant and the facilitator. The Jeffries' Simulation Theory is characterized by the simulation experience being collaborative, experimental and trainee centered. This simulation experience is also collaborative, experiential, and student-centered for both groups. In addition, it includes a learning application based on INACSL standards[16]. The present study was conducted in accordance with the INACSL guidelines, including the measurability of the learning objectives, providing preliminary information, maintaining the facilitating approach, and conducting the analysis session. It aimed to explore the role of VR in educating midwifery students.

Methods

Design of the study

This is a quantitative cross-sectional study conducted in two parts.

Population and sample of the study

The sample of the study comprised grade 3 students of the four-year midwifery undergraduate program in the 2019-2020 academic year in Turkey. During this period, the total number of students was 98. All students agreed to participate in the study and the students who fulfilled the inclusion criteria constituted the study sample (n=92). In midwifery education in Turkey, neonatal health undergraduate course is given in the 3rd grade. For this reason, 3rd grade students were included in the research. The students who fulfilled the inclusion criteria were randomized and were divided into experimental and control groups. Randomization was performed through MedCalc version 18.111.13 using the class list; 46 students were included in the experimental group and 46 students were included in the control group.

Data collection procedures

Virtual reality simulation (VR) development

A VR was developed on the subject of newborn initial care. The steps of the initial care of the newborn simulation were outlined, the opinions of the experts were sought, and the scenario was created. Blender, an open-source computer graphics software for the creation of virtual environments and scenarios for computer-aided applications[17], was used in tandem with the Unity 3D program to create 3D images compatible with an Oculus VR Quest head mounted display and controllers.

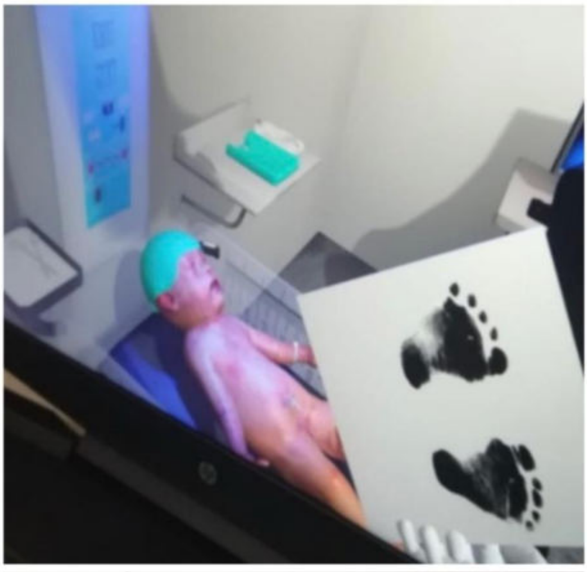

Figure 1: The virtual reality simulator image

Figure 2: The low-fidelity simulator image

Figure 1 shows the head-mounted display placement and the images seen by the students.

A Low-fidelity simulation

In the low-fidelity simulation group (control group), the students performed the initial care of the newborn on the model doll. This simulation was the model used constantly in the training of midwifery students (Figure 2).

Simulation experience

All students were informed, a personal appointment was made for the simulation practice during the study period, and the subjects were asked to read the readings on the initial care of the newborn and to wear their white coats for that day. While the students were performing newborn care implementations one by one, the researcher supported them as a facilitator and helped them wherever they had difficulties. After the completion of the simulation, the debriefing session began in accordance with the Jeffries' Simulation Theory. The students watched the video and the practice skills that they could or could not perform were marked, and the practice skill score each student was obtained. The time of the simulation carried out through virtual reality was a maximum of 10 minutes for each student. The simulator was completed within an average of nine minutes. However, a participant stated that he experienced dizziness during the virtual reality practice (at the 3rd minute) and wanted to drop out of the study. Therefore, one subject from the experimental group was not included in the analysis (experimental group n=45, control group n=46).

Procedures in the initial care of the newborn

The baby is taken from the mother and placed under a radiant heater.

Baby is dried with a towel.

APGAR score is evaluated.

Baby's umbilical care is done (clamped).

Eye drops are administered to the baby's eyes.

Vitamin K and hepatitis B vaccines are administered to the baby (routine newborn vaccines in Turkey).

Baby temperature, height and weight are measured.

Baby's footprint is taken on a piece of paper.

Baby's diaper and all clothes are dressed.

Wristbands are attached to both the baby and the mother for identification of the baby.

All transactions are recorded in the ledger.

The baby is given to the mother.

Data collection tools

The Practice Skills List (PSL), which includes the practice steps of the initial care of the newborn, was developed by the researcher based on the literature and expert opinions. It was structured as a 25-item scale in line with the expert opinions of professionals in the field of midwifery and obstetrics and gynecology. The maximum score was 100, with 4 points for each correctly implemented skill.

The student satisfaction and self-confidence in learning scale (SCLS) was used to evaluate student satisfaction and self-confidence in accordance with the Jeffries' Simulation Theory. Higher scores indicate higher satisfaction and self-confidence. In this study, the Cronbach's alpha value of the scale was 0.95 for satisfaction and 0.94 for self-confidence. The total reliability coefficient of the scale was calculated as α=0.970.

The Simulation Design Scale (SDS) and The Educational Practice Questionnaire (EPQ) were used to analyze the effect of the simulation education given in the context of Jeffries's Simulation Theory[18]. The Cronbach's alpha reliability coefficient of the educational practice questionnaire was calculated as α=0.948.

Presence Scale: This experience, described as a feeling of being in the scenario, is called the "presence feeling". The scale consists of 29 items and is scored between "1" (negative) and "5" (positive). Its Cronbach's alpha reliability coefficient was calculated and the reliability coefficient of the group (experimental group) evaluating the virtual reality environment was found α=0.931[19].

The primary outcome was knowledge (measured by PSL score) post experimental. Prespecified secondary outcomes included attitudes on the learning experience assessed using the SCLS, the SDS and EPQ. Another measurement tool is the presence scale, which measures how much the virtual environment reflects reality.

Data analysis

The data were analyzed using IBM SPSS 25.0 and G*Power 3.1.9.2 software. In scales with a normal distribution, the independent groups t test was used to test the difference between the two groups when comparing the quantitative data. The Mann–Whitney U test was used as a nonparametric test to assess the difference between the experimental and control groups for nonnormally distributed data. Correlation analysis was conducted to test the relationship between categorical variables, while the chi-square test was conducted to test the relationship between continuous variables. A level of $p<0.05$ was taken as the statistical significance.

Ethical approval

All participants signed an informed consent form, being previously informed of the purpose of the study and the voluntary nature of their participation. The ethical approval for the study was obtained from the Ege University Health Sciences Scientific Research and Publications Ethics Committee Decision Document (Decision no: 2019-03/14). The study adhered to the tenets of the Declaration of Helsinki.

Results

The mean age of the students was found to be 20.40±2.01 years and the vast majority were graduates of "Anatolian high school". There was no significant difference between the descriptive characteristics of the experimental and control groups ($p>0.05$). The groups were found to have a homogenous distribution. When the groups were compared regarding the scores of the Practice Skills List, there was a significant difference between the experimental (83.28±19.67) and the control (74.17±13.55) groups. The mean score of the experimental group was significantly higher than that of the control group ($p<0.05$) (Table 1).

When comparing the groups in terms of their SCLS scores, the mean score of the experimental group was 4.67±0.33, while that of the control group was 2.88±0.84. There was a significant difference between the total SCLS scores and the subdimensions (Satisfaction with Current Learning and Self-confidence in Learning) ($p<0.05$). The mean SCLS score of the students in the experimental group was higher than that of the students in the control group (Table 2).

When comparing the groups in terms of their SDS scores, the experimental group had a mean score of 4.69±0.28 and the control group had a mean score of 3.07±0.75. The mean SDS score in the experimental group and the mean scores of the subdimensions were significantly higher than those in the control group.

When comparing the groups in terms of their EPQ scores, the mean score was 4.44±0.31 in the experimental group and 2.84±0.75 in the control group. The mean score of EPQ in the experimental group and the mean scores of the subdimensions (Active Learning, Different Ways of Learning, High Expectations) were significantly higher than those

Table 1: Comparison of the students in the experimental and control groups regarding their practice skills scores

	Experimental group (N=45)			Control group (N=46)			t	p
Practice skills	**Mean±SD**	**Min**	**Max**	**Mean±SD**	**Min**	**Max**		
list	83.28±19.67	36.00	100.00	74.17±13.55	40.00	96.00	2.576	**0.012**

Note: $p<0.05$ G.= Group, SD = Standard deviation

Table 2: Comparison of the students in the experimental and control groups regarding student satisfaction and self-confidence in learning scale (SCLS) and its subdimensions

	Experimental group (N=45)		Control group (N=46)		t	p
Satisfaction with current learning	**Mean**	**SD**	**Mean**	**SD**		
	4.80	0.29	2.96	0.86	13.636	**<0.001**
Self-confidence in learning	4.59	0.41	2.81	0.90	12.025	**<0.001**
SCLS total	4.67	0.33	2.88	0.84	13.438	**<0.001**

Note. $p<0.05$ G.= Group SD= Standard deviation

Table 3: Comparison of the students in the experimental and control groups regarding their mean scores of educational practices survey (EPQ) and its subdimensions

Participation status	Experimental group (N=45)		Control group (N=46)		t	p
	Mean	**SD**	**Mean**	**SD**	13.808	**<0.001**
Active learning	4.75	0.33	2.93	0.82		
Collaboration	2.21	1.76	1.71	1.09	1.595	0.115
Different ways of learning	4.76	0.43	2.61	1.04	12.797	**<0.001**
High expectations	4.78	0.37	3.76	1.06	6.147	**<0.001**
EPQ total	4.44	0.31	2.84	0.75	13.281	**<0.001**

Note. $p<0.05$ SD= Standard deviation

in the control group ($p<0.05$). However, for the "collaboration" subdimension, the mean score was 2.21±1.76 in the experimental group, whereas it was 1.7±1.09 in the control group. There was no significant difference between the groups in terms of the "collaboration" subdimension ($p>0.05$) (Table 3). The total mean score of the Presence Scale was 4.40±0.33 (min: 3.45, max: 4.69) in the experimental group.

Discussion

We have developed and implemented a new and innovative educational tool and a virtual reality simulation on the subject of newborn care.

In a study conducted with nursing students, it was stated that simulation had positive impacts on learning. With the practice skill list prepared in our study, the students had the opportunity to be evaluated using both a low-fidelity simulator and a high-technology virtual reality simulator. The process steps in the practice skill list enabled us to identify the steps the students implemented and the ones they skipped. Thus, the students were aware of their mistakes and had the opportunity to correct them while repeating the application. On this basis, we proposed that the use of a virtual reality simulator had a positive impact on learning by improving practice skills[20].

The students preferred the advanced technology simulator to the low-fidelity simulator from the satisfaction section of SCLS. The self-confidence of the students who used the advanced technology simulator was higher than the self-confidence indicated on the scale. In another study, the authors, who investigated the training of nurses and midwives, reported that virtual reality technology increased the students' competence and confidence[21]. Similar to the studies in the literature, the virtual reality simulator had a positive impact on the satisfaction and self-confidence of the students. Based on the statements of the students in the experimental group, the use of an advanced-level technology simulator increased both their satisfaction and the self-confidence.

Based on the test results, the virtual reality simulation of the students had a high sense of presence. This is a significant outcome for virtual simulations. If individuals cannot feel themselves in the environment and experience the feeling of reality, the desired result may not be achieved. This can affect both their knowledge and skills. Therefore, virtual reality environments should be designed to be realistic and immersive, and thus, increase the satisfaction of the students who engage in the application.

In the literature, there are many studies investigating virtual reality glasses. One of them found a positive impact of using virtual reality glasses on labor pain[22]. Another study is the study on pain in children[23]. Another study emphasized the importance and effectiveness of virtual reality for midwifery students[4]. Virtual reality can be used safely in health care and education fields. In our study, together with virtual reality glasses, we developed a new simulator with control arms and motion sensors and software, determining that it contributed to the skill acquisition of the students who had this experience.

Conclusion

The simulator, which was developed and evaluated in the research, increased the students' satisfaction, self-confidence, and skills. It was more effective than the classical method (low-fidelity simulator). Virtual reality has been around for a long time; however, its use in midwifery and nursing education is still in its infancy today. Based on these positive findings, the active use of advanced technology virtual reality simulators is recommended for health students.

Conflicts of interest

The authors report no actual or potential conflicts of interest.

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Contribution of authors

SÖ designed the study and SÖ collected data. SÖ and ECT were involved in data analysis and drafted the manuscript. All authors read, edited and approved the final manuscript.

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