Nursing Students' Practicum Readiness Using Virtual Learning Reality: A Pre-Experimental One Group Study

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Abstract

Technology can be utilized in various fields, with no exception of nursing education in which virtual reality is used as an educational tool. However, the use of virtual reality as a learning media for nursing is still limited, especially as an introductory tool to practicum sessions. This study aimed to give a description on the use of virtual reality as a learning media towards the readiness of students in Faculty of Nursing, Universitas Padjadjaran. A pre-experimental one-group post-test only design was used. A total of 68 nursing students participated and completed a virtual reality suctioning simulation for 20 minutes. The data were analysed using a descriptive analysis consisting scores of minimums, maximums, mean, and standard deviation. The means and standard deviation for practicum readiness were 16.84 and 6.899 respectively. The minimum score acquired in total was 6 out of a possible correct answer of 45, with the maximum score acquired being 34. Based on the result, virtual reality as a learning media has effects on practicum readiness. Further studies should take the implementation of a comparison group and the number of opportunities for participants to do the simulation procedure into consideration so that practicum readiness is more comprehensively described.

Keywords: Laboratory practice readiness, nursing student, virtual reality (VR)

Introduction

The rapid development that continues to occur in the field of technology and information pushes other fields to follow, including the field of education. Nursing science is not an exception, with an example being the use of technology to conduct distance learning in higher education institutions (Gasim, Mohmmed, Mohammed, El-Said, & El-Sol, 2017). However, nursing science as knowledge is more often delivered conventionally, such as through face-to-face classes with lecturers in a traditional classroom (Salari, Roozbehi, Zarifi, & Tarmizi, 2018). By utilizing technology, unconventional learning processes such as e-learning, which uses web- computer-based programs, help create an environment where students are more active in their own learning process (Yangoz, Okten, & Ozer, 2017). As such, modifications are needed in the nursing curriculum.

Learning with unconventional methods has increased recently. As a result of the COVID-19 pandemic, an increasing number of universities are relying on digital technology to hold study sessions (Raison et al., 2021). In health courses, e-learning methods are becoming more frequently applied, such as the implementation of online tutorials, quizzes, and simulations; discussions in forums through Zoom, Google Classroom, or Google Meet; or the use of other virtual media (Kumar et al., 2021; Riyanti & Nurlaila, 2022; Priyastuti & Suhadi, 2020). The amount of learning media that can be used emphasises the importance of choosing the right means to achieve the expected competencies in nursing. As nursing is a profession with a high degree of responsibility, carrying out nursing actions requires high competence in the cognitive, psychomotor, and affective aspects (Ariga et al., 2021). For nursing students, these three competencies can be improved through audiovisual-based learning media, such as virtual reality.

Virtual reality (VR) is becoming even more popular as a learning medium that is used to improve nursing knowledge and skills. The use of VR provides interactive learning opportunities in a safe environment, increases the access and flexibility given to students, and provides a platform and opportunity for discussions (Benham-Hutchins & Lall, 2015; Zackoff et al., 2020; Saab, Hegarty, Murphy, & Landers, 2021). Generally, the nursing procedures simulated by VR are ones that require certain skills. In previous studies, the use of VR was assessed for its effectiveness in improving skills in nasogastric tube insertion, intravenous catheter insertion, chemotherapy administration, and other nursing competencies (Chao et al., 2021; Chan, Chang, & Huang, 2021; İsmailoğlu, Orkun, Eşer, & Zaybak, 2020). The skill improvement observed includes dimensions of readiness to perform nursing actions, such as increased knowledge retention, clinical reasoning, learning satisfaction, and self-confidence. Thus, the use of VR simulations can help improve students' readiness to execute clinical skills.

Although there have been many studies proving the benefits of using VR, the use of VR itself to assist nursing students' practicum skills is still uncommon in Indonesia. Until now, there have been only a handful of VR laboratories designed for nursing skill learning, and VNursLab (www.vnurslab.com), created by the Faculty of Nursing, Universitas Padjadjaran, is one of them. Unlike other VR laboratories, the implementation of VR in VNursLab is intended as a tool to introduce students to the skills they will perform in face-to-face practicum sessions with instructors. Based on this aim, students are expected to feel more prepared when they perform real clinical skills. Numerous studies have explored the advantages of using VR in nursing education. Even so, there are still a limited number of studies that discuss the benefits of using VR as a learning medium, especially as an introductory tool for clinical learning to improve students' readiness to do practicums in the laboratory. Therefore, this study aimed to describe the effects of using VR as a learning medium on the practicum readiness of nursing students in the laboratory.

Research Methods

A one-group post-test only pre-experimental design was used. This design was chosen because of ethical considerations when

choosing respondents who fit the criteria and the nature of the questionnaire used in the study. The research was carried out at Universitas Padjadjaran's Faculty of Nursing from December 21 to 29, 2022. Purposive sampling was used to recruit potential participants. First-year undergraduate nursing students who had never performed suctioning as a practicum topic were included in the study. Students with myopia with a >-2.00 prescription were excluded, along with students who had a history of vertigo and motion sickness tendencies characterized by nausea, vomiting, and dizziness when staring at a screen monitor for too long. Those who were not present for the intervention and/or failed to fill out the questionnaire were considered sample dropouts. To deal with possible bias in sample selection based on the exclusion, the amount of sample required by the study was determined through a calculation using the Slovin equation with an error rate of 5%. A total of 68 nursing students who met the criteria consented to participate in the study.

The independent variable in this study was the virtual reality (VR) learning medium, with suctioning a patient with a tracheostomy as the nursing skill chosen for the simulation. Suctioning was chosen because it is a basic nursing procedure with many potentially dangerous risks, necessitating expertise. The dependent variable was students' readiness to do practicum in the laboratory, which consists of knowledge retention of the procedure involved. The questionnaire about suction procedures was used to measure readiness. The questionnaire was developed by the researcher and supervisors based on the Standard Operating Procedure (SOP) assembled by the VNursLab Team. The questionnaire consisted of two sections with a total of 52 items. The first section was the sequencing of the tools used in suctioning, and the second section was the ranking of procedural items based on their implementation order. Each correct answer or sequence was given a score of 1, and any wrong sequence was given a score of 0.

Potential respondents were first collected by the researcher through a representative, which was the first-year students' batch leader at the Faculty of Nursing at Universitas Padjadjaran. The representative was given a link to a Google Form that consisted of questions that would determine the inclusion of respondents. After potential respondents agreed to participate in the study, they were each contacted personally by the researcher to attend the intervention session at the predetermined location and time, which was at the VNursLab laboratory of Universitas Padjadjaran, dated December 21-29, 2022.
All of the students who consented to the study were given 20 minutes to do the VR simulation. The students were first given a brief explanation by the researcher about suctioning and how to maneuver the VR. After the simulation, students were given a moment of rest before they continued to fill out the questionnaire for 7 minutes. The questionnaire was given to the students on printed paper and was collected by the researcher straight after each respondent finished. To ensure that no data was lost, the researcher double-checked the data before allowing the students to leave. No respondents dropped out of the study (n = 68), and all of the required items in the questionnaire were filled out, therefore no missing data were identified.

The data were analyzed through the processes of data editing, coding, processing, tabulating, and cleaning. IBM SPSS for Windows version 25 was used to analyze the data. To describe the characteristics and the results acquired from the participants, descriptive analysis was used, such as minimum, maximum, mean, and standard deviation. To ensure respondents' ethics were sustained, research ethics principles by Polit & Beck (2017) from the Helsinki Ethical Principles were used. The principles included beneficence (the right to be free from danger, discomfort, or suffering and the right to protection from exploitation); respect for human dignity (the right to self-determination and the right to full disclosure); and justice (the right to fair treatment and the right to privacy). This study received approval and ethical consideration from Universitas Padjadjaran with the number 1005/UN6.KEP/EC/2022. Each participant was personally handed an informed consent form, which they signed manually.

Results

Characteristics of participants

The following results were obtained regarding the characteristics of 68 respondents. Table 1 revealed that most of the students were 18 years old (48.5%), and most of them were female (86.6%). The majority of the students also had no experience operating a virtual reality device, with 57 (83.8%) claiming "no" when answering the demographic questionnaire.

Table 1. Frequency Distribution of Respondents Based on Age, Gender, and Experience Using Virtual Reality (n = 68)

Demographic Data	Frequency (n)	Percentage (%)
Age		
17	**4**	**5.9**
18	**33**	**48.5**
19	**25**	**36.8**
20	**6**	**8.8**
Gender		
Female	**9**	**13.2**
Male	**59**	**86.6**
Experience using virtual reality		
Yes	**11**	**16.2**
No	**57**	**83.8**

Students' practicum readiness

The results presented in Table 2 below showed that, from the maximum amount of possible correct answers acquired, which was 45, a score of 34 was the highest that the students achieved and a score of 6 was the lowest. In general, the students achieved a score of 16.84 correct answers.

Table 2. Students' practicum readiness after the use of Virtual Reality (n = 68)

Variable	Min	Max	Mean	SD
Practicum Readiness Score	**6**	**34**	**16.84**	**6.899**

From Table 3 below, it could be understood that the majority of the deducted scores derived from the second part of the questionnaire. The minimum score acquired from the first section of the questionnaire was 6 out of 10, with the maximum score acquired being 10 out of 10. In the second section, the minimum score the respondents acquired was 0 out of 35, with the maximum score being 24 out of 35. In general, respondents achieved a mean of 9.25 for section 1 of the questionnaire and 7.57 for section 2.

Table 3. Distribution of questionnaire score per sections (n = 68)

Variable	Min	Max	Mean	SD
Procedure tools (section 1)	**0-10**	**6**	**10**	**9.25**
Procedure sequence (section 2)	**0-35**	**0**	**24**	**7.57**

Discussion

The analysis showed the results of nursing students' readiness to do practicum in laboratories after finishing a nursing procedure simulation through VR. While the level of readiness is not classified into a criterion of high, average, or low, it could be inferred that the majority of the students did not reach even the median score of the questionnaire. It could also be assumed from the results that most students struggled to put the SOP sequence in the correct order. This could be due to the fact that the sequences are not as apparent during the simulation as they are in the SOP or other factors, like the possibility that VR is a complicated medium to navigate through for the first time. It should also be noted that, during the filling of the questionnaire, critical sequences that are put in the incorrect order might mislead the rest of the orders.

The questionnaire used in this study aimed to recognise how VR might affect nursing students' readiness to perform a procedure. From the results shown, the students' readiness to perform a procedure in the laboratory based on their ability to sort the SOP is considered low to moderate. Readiness as a concept is complex, with plenty of other terms to make up a concrete definition. In previous research, readiness was defined as the presence of learner autonomy, self-efficacy, self-regulation, responsibility in learning, and the learners' attitudes and beliefs towards knowledge acquisition, intellectual characteristics, and learning strategies (Chorrojprasert, 2020). As stated in Agustiani, Gumartifa, & Yaman (2021), readiness to learn stems from multiple factors, such as the learner's physical and mental development, along with the suitability of the learning experiences, be they already given or those that will be given. This statement is supported in another study, which explained that leaerners' readiness is unique and varies according to institutional, personal, and technological capacities (Adams, Chuah, Sumintono, & Mohamed, 2022). Therefore, as complex as it is, special consideration must be taken into account when introducing a new media such as VR to support learning readiness.

The VR used in VNursLab had four features that the users could utilise to familiarise themselves with the media. Those four features are the tutorial of the VR controls; an introduction to the tools used in the nursing procedure simulation; the trial for the simulation where the users are directed by a voiceover and text instructions; and the simulation where the users are not assisted by any instructions when doing the nursing procedure. When operating VR, the user interacts with a simulation that mimics the real world so similarly that they feel immersed in the virtual environment (Kardong-Edgren, Farra, Alinier, & Young, 2019). To achieve that sense of realism, VR requires a set of specialised devices, such as a headset and a pair of joysticks (Saurik, Purwanto, & Hadikusuma, 2019). In previous research, it was stated that while VR simulations are beneficial when used more than once, it could be a challenge for some users, hence requiring an active use of the media (Kim & Ahn, 2021). The results of this study strengthen the previous research, because they further the argument that nursing procedure simulations through VR must be done multiple times to give a sense of familiarity, especially for new users.

VR is also a learning medium not made to replace the existence of conventional learning in laboratories. In their study, Kim & Ahn (2021) stated that although VR-based learning has high effects suggested by the improvement of learning experiences, it can still be improved when mixed with traditional learning methods. This is in accordance with research done by Padilha, Machado, Ribeiro, Ramos, & Costa (2019), which explained that learning with VR cannot replace practicum sessions led by an instructor but must be accompanied by further supervisions and a consistent schedule to practise nursing procedures. In their research, Padilha et al. (2019) found that after using VR to perform a respiratory system-based practicum, students experienced improvements in knowledge retention, clinical reasoning, and learning satisfaction. Based on this, VR should be used as a supplement to improve students' clinical skill readiness rather than as a replacement for face-to-face practicum activities.

As the use of VR is still rare in the nursing

education field, this study described how VR affected first-year nursing students' readiness to do a clinical skill. Thus, the findings of this study contributed to the suggestion that, when not done repeatedly, VR alone may not be sufficient to aid additional knowledge before performing a clinical skill in a practicum session. Learning readiness is also a complex concept consisting of multiple principles; hence, a single assessment may not be sufficient for it to be thoroughly described in this study. As a result, one of the limitations of this study is the limited number of times the students were able to do a simulation, which was only allowed once in this study. In addition, this study was unable to determine an intergroup variance test of the students' characteristics based on the results found. Another limitation acknowledged is the lack of a comparison group to see whether there is a difference in the readiness of students who completed a VR simulation with another learning medium.

Conclusion

The application of VR as a learning medium to carry out nursing procedure simulations for nursing students can affect their readiness to do practicum in laboratories. The VNursLab VR simulations can be recommended as an innovative learning medium, especially to bridge students' readiness before performing in the laboratories. However, certain points should be noted, such as the students' familiarity with VR and how consistent they are in using VR to improve their skills. To further develop this research, following studies should consider implementing a comparison group and determining how many opportunities are given for participants to do a simulation procedure so that practicum readiness is comprehensively described. Another way future studies may approach the development of this research is by taking account of the effects and variations of research design and the statistics needed to reduce the bias of the results.

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