

## **Effect Of Virtual Reality Simulation: “Urinary Catheterization Skills” On Nursing Students’ Self-Confidence**

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### **Abstract**

Confidence is essential for nursing students in producing better practice of nursing action skills, so this needs to be supported by good learning media. One of the learning media currently developing is virtual reality simulation, an interactive learning media based on immersive technology that combines real space (reality) with virtual space (virtual). This study aimed to analyze the effect of virtual reality simulation in urinary catheterization on the self-confidence of nursing students. This study used a pre-experiment design with a one-group pretest-posttest design approach. Self-confidence was measured using The Confidence Scale questionnaire, consisting of five items. The sampling technique uses a purposive sampling technique with a minimum total sample is 49 students. The data collected were analyzed using the non-parametric Wilcoxon signed-rank test. The result showed an increase in the mean value in the post-test results (21.65) compared to the pretest results (16.98), with an average increase of 4.67 points. The statistical test results showed a significant difference after using virtual reality simulation on nursing students’ confidence ( $p < 0.05$ ). So, virtual reality simulation is a learning media that influences nursing students’ confidence in performing urinary catheterization skills.

**Keywords:** nursing students; self-confidence; urinary catheterization; virtual reality simulation.

## **Introduction**

Urinary catheterization is a nursing action that has a complex procedure, requires high skill, and strict adherence to aseptic technique. Installation Urinary catheterization is the most common risk in UTI-complicated and accounts for 40% of all nosocomial infections worldwide (Mireles et al., 2019). Frequent action errors performed is trauma to the urethra and bladder, causing pain and entry microorganisms into the urinary tract which can cause infection (Rupp & Karnatak, 2018). Although much has been discussed in the literature regarding the urinary catheterization procedure, but still presenting improper urinary catheterization. Based on research Mazzo et al. (2015) and Meska et al. (2016) the error in the urinary catheterization procedure can be caused by a lack of confidence in nurses and lack of application of evidence-based practice into the practice of urinary catheterization. For that, in order to reduce the risk of the procedure appropriate learning is needed in the installation of urinary catheterization so that it can improve patient safety and nursing professionals.

Learning approach with conventional media on urinary catheterization still widely used to teach nursing theory and action skills to nursing students in Indonesia. Based on research conducted by Chang et al. (2022) was found that nursing students felt less confident about learning with media conventional because the situation they imagine during learning is considered not aligned with the practical application of clinical skills. The model with conventional learning refers to the teacher who is the center of this learning process and learning is packaged in the form of several writings (Neolaka & Neolaka, 2017). Conventional learning is learning with the classical method whose application uses the lecture method, question and answer, and giving assignments (Voutilainen et al., 2017). In addition, the situation in learning action skills Conventional nursing that is often felt by students is a foreign situation, fear of making mistakes, and fear of a negative attitude from the teacher causing self-doubt (Rushton et al., 2020; Sadeghi et al., 2019; Wang et al., 2019). Thus understanding nursing students

related to urinary catheterization need to be improved with learning media more interesting and applicable so students can feel confident when doing nursing action skills.

The use of simulation training is still considered as the right alternative in learning, the existence of technological developments in the era of society 5.0 raises its presence technology-based simulation learning. The emergence of the COVID-19 pandemic also initiated the process digital transformation is becoming more widespread in the field of education (Bygstad et al., 2022). Based on research by Hanshaw and Dickerson (2020) innovative simulation learning with assistance effective technology to teach and enhance the clinical skills of nursing students, such media also provide a safe environment for developing and implementing knowledge without risking harm to the patient. Technology-based simulation learning can apply to nursing students, bearing in mind that current nursing students are a generation Z which is close to the use of technology. Generation Z has a high level of knowledge use of platforms and mobile devices, their dependence on the internet even touching 93.9 percent or commonly referred to as the mobile generation (Kementerian Komunikasi dan Informatika RI, 2021). Thus, the skills teaching approach is innovative and more closely resembles the clinical setting in nursing education can be done by harnessing the power of technological orientation in nursing students.

Immersive technology is one of the technologies that enables students Nursing conducts learning realistically and resembles actual clinical conditions. Immersive technology can combine real space (reality) with virtual space (virtual) (Natale et al., 2020). One of the immersive technologies currently being developed is virtual reality simulation (VRS). Virtual reality simulation is a technology that allows users to interact with a computer-simulated object, an emulated or true environment truth only exists in the imagination (Aulianto, 2020). More virtual reality simulation allows users to perform an activity many times without fear of damage object, requires a lot of preparation of tools and materials because it is only a visual illusion (Musril et al., 2020). The use of virtual

reality simulation technology is expected to be able to be an alternative learning solution in training skills and increasing confidence nursing students themselves.

The use of virtual reality simulation learning media to increase trust student self-help has been carried out in several countries. The study conducted by Chao et al. (2021) in Taiwan and Kane et al. (2022) in Ireland shows the effect of using virtual reality simulation of self-confidence. In Indonesia, the Faculty of Nursing, Universitas Padjadjaran developing learning nursing action skills using virtual media reality simulation VNursLab. Although there has been research related to the influence of media use virtual reality simulation learning in increasing self-confidence, but not yet similar research conducted in developing countries such as Indonesia in particular urinary catheterization skills. Therefore, researchers are interested in evaluating the effect of using virtual reality simulation on urinary catheterization skills on the self-confidence of nursing students.

### **Research Methods**

This study used a pre-experimental method with a one-group pre-test and post-test approach design test used to identify the differences in nursing students' self-confidence. This design was chosen because of difficulties in conducting randomization. The study was conducted at the VNursLab ([www.vnurslab.com](http://www.vnurslab.com)) of the Faculty of Nursing in Universitas Padjadjaran, Bandung, Indonesia, in December 2022.

Purposive sampling was used to recruit potential participants. The inclusion criteria used as samples in this study second- to fourth-year undergraduate nursing students who have attended learning about urinary catheterization through the medical-surgical nursing course and willing to participate, while the exclusion criteria in this study were students who were taking academic leave and do not participate in research until the end. Sample calculation using Windows G\*Power 3.1.9.7 (Heinrich-Heine-Universität Düsseldorf) to get a minimum sample of 0.5 effect size, 5% probability error, and 0.9 for  $1-\beta$  probability error. So that for the results of 45 students, to anticipate the drop out

rate the researchers added 10% of minimum total sample so that the total sample required is 49 people. Each respondent received an intervention of urinary catheterization using Virtual reality (VR).

The independent variable was the simulation of urinary catheterization using Virtual reality (VR). Urinary catheterization was chosen because the procedure is related to the human genitalia area, making it quite difficult to imagine through traditional teaching methods. The dependent variables in this study were self confidence. A five-item confidence scale (C-scale) developed by Grundy (1993) were used to measure a student's confidence level related to a specific skills performance, and permission to use this tool was obtained. This questionnaire has been translated to Indonesia and back translated as well conducted validity and reliability tests on 20 students of the Faculty of Nursing at the Universitas Padjadjaran with the Pearson correlation test values obtained by all items declared valid with the calculation of the value of  $r >$  the value of  $r$  table ( $r$  table = 0.444 with a significance value of 0.05) while the test value cronbach alpha obtained the number 0.845. This questionnaire consists of five statements related to trust nursing students in performing certain nursing action skills. The Confidence Scale questionnaire is measured using a Likert scale. There are five answer choices on each question item consisting of strongly disagreeing with statement (1), disagreeing with statement (2), neutral with statement (3), agree with statement (4), and strongly agree with statement (5). So that the maximum score for this questionnaire is 25 and the minimum score is five. Another tool used in this study is a demographic instrument consisting of generation, type gender, age, GPA, self-desire to study nursing, use glasses, history of using virtual reality simulation, and skills in operating a computer.

Selected participants were given invitations to conduct research distributed through posters and order online complete with research information, objectives, implementation time, namely one time on the range of 18-30 December 2022, and the place of implementation is in the Faculty's VNursLab laboratory Universitas Padjadjaran. Then the researcher asked for

approval for potential participants participate in the study according to the participants' time availability and sign off consent form (informed consent). Participants who are willing to take part in the research proceed to do the pre-test session. Furthermore, participants were asked to attend according to schedule agreement to intervene and they were given a pre-test to assess their self-confidence. The intervention given is learning to use virtual reality simulation in urinary catheterization skills developed by Faculty of Nursing, Universitas Padjadjaran with the name Virtual Reality Simulation VNursLab. The intervention provided lasts for 20 minutes which consists of introducing the tool, nursing action learning accompanied by instruction, evaluation, and simulation without instruction. Following the post-test, participants' self-confidence was re-evaluated. No participants dropped out during the intervention process (n = 49).

Data analysis using univariate and bivariate. The univariate analysis used was in the form of frequency distribution and percentage to describe sample characteristics. While analysis bivariate is used to determine

whether or not there is a difference in confidence before and after being given a virtual reality simulation learning intervention in installation skills urinary catheterization. The normality test was carried out as a prerequisite test to determine the distribution of data with Kolmogorov-Smirnov, after testing it was found that the data were not normally distributed so that the data were analyzed using a non-parametric test, namely the Wilcoxon signed rank test. Data analysis used SPSS version 25 for Windows with a significance of  $p < 0.05$ . This research has received ethical approval from the Research Ethics Commission of Universitas Padjadjaran with registration number No. 1005/UN6.KEP/EC/2022.

## Results

This section presents the results of data analysis on the characteristics of the participants who participated in research and analysis results of nursing students' self-confidence in skills urinary catheterization through the use of virtual reality simulation. Detailed analysis can see in table 1 and 2.

**Table 1. Description of Participant Attribute Variables (n=49)**

Characteristics	f	%
<b>Class of</b>		
2019	14	28.6
2020	17	34.7
2021	18	36.7
<b>Gender</b>		
Male	5	4.8
Female	99	95.2
<b>Age</b>		
18	1	2.1
19	11	22.4
20	22	44.9
21	13	26.5
22	2	4.1
<b>GPA</b>		
< 3.0	1	2.0
3.0 – 3.50	14	28.6
> 3.50	34	69.4
<b>Desire to study in nursing</b>		
Yes	46	93.9

No	3	6.1
Using glasses		
Yes	25	51.0
No	24	49.0
History of use of virtual reality simulation		
Once	2	4.1
Never	47	95.9
Computer operating skills		
Neither Agree nor Disagree	20	40.8
Agree	27	55.1
Strongly Agree	2	4.1

Table 1 reflects the lowest number of participants coming from the 2019 class (28.6%) while those who the highest is the class of 2021 (36.7%). The majority of respondents are female (91.8%), 20 years old (44.9%), has a GPA > 3.50 (69.4%), has the desire to learn nursing knowledge (93.9%), uses glasses (51%), never uses virtual reality simulation (95.5%), and have good computer operating skills (55.1%).

**Table 2. Difference in Nursing Students' Confidence through the Use of Virtual Reality Simulation in Urinary Catheterization Skills**

Variable	Min	Max	SD	Mean	Asymp. (2-tailed)	Sig.
Pretest	10	21	2.626	16.98		
Posttest	13	25	2.529	21.65	0.000	

Table 2 shows an increase in the confidence of nursing students in skills Urinary catheterization is proven by an increase in the mean value on the post-test results (21.65) compared to the results of the pre-test (16.98) with an average increase of 4.67 points. The results of the Wilcoxon signed rank test show that the p value indicates a significant difference ( $p < 0.05$ ). So it can be said that the use of virtual reality simulation can increase nursing students' self-confidence in the skill of urinary catheterization significant.

### Discussion

Virtual reality simulation has been studied in various roles of the medical field to evaluate its impact on self-confidence. This study was conducted to determine whether there is an effect of virtual reality simulation in Urinary catheterization skills on nursing student confidence after given learning interventions. In this study, Table 2 shows that the learning media using virtual reality simulation can significantly increase self-confidence nursing students in urinary catheterization skills. The results of this study are in line with the research of Kane et al. (2022) which shows an increase in post-test scores and there is significant difference after using virtual reality simulation media. Virtual reality simulation allows students to be able to do

learning repeatedly and independent so as to increase the ability and confidence in taking action nursing through the learning process safely without any risk of injury to patients resulting from a lack of experience (Chen & Liou, 2022). Another research that conducted by Liaw et al. (2022) also stated that virtual reality simulation is effective in increase the self-confidence of nursing students. In a study by Chang et al. (2021) mentions technology that has components in the form of images, sound, and motion animation the advantage of being easily remembered by someone so that it can increase self-confidence take action. The results of this study reinforce previous research evidence that virtual reality simulation is an effective media to increase self-confidence.

The use of learning media is a significant



aspect of learning in this era society 5.0 along with the rapid development of science and technology. Media use appropriate learning can maximize the efficiency of the teaching-learning process. in the era digitalization, the development of technology-based learning media requires teachers to providing a learning environment that can improve learning outcomes (Fadieny & Fauzi, 2021). In the research of Chao et al. (2021) found that the use of virtual reality simulation in learning Nasogastric Tube (NGT) can make students have high self-confidence. Many studies have shown that the use of virtual reality simulation can help improve behavior and performance in courses, this is evidenced by increasing scores of knowledges and clinical skills competency of nursing students after given learning using virtual reality simulation (Lee, 2022). Nevertheless, in the research of Chao et al. (2021) found no significant difference in self-confidence to students who are given learning using virtual reality simulation and demonstration video despite the group's self-confidence score using virtual reality simulation is higher than the group using video demonstrations. This research focuses on examining the effect of virtual reality simulation on urinary catheterization the confidence of nursing students in one group, has not been studied specifically related to it with knowledge and student learning outcomes. Further studies on the influence of virtual reality Simulation of the knowledge and learning outcomes of nursing students is important to do expanding evidence related to the benefits of virtual reality simulation learning media. There is control or comparison groups can also be used for further research see how far the effectiveness of virtual reality simulation.

In the world of education, virtual reality simulation can be a deep learning media increased confidence in performing nursing actions. However, a nurse in carrying out nursing actions not only promotes self-confidence, but also knowledge, skills, attitudes and morals in providing services to clients. Study conducted on nursing students found that knowledge and skills Nurses are very important so that they affect client safety (Nuryanti, 2019). Besides that, other studies also state that attitudes and morals are no

less important aspects effect on client safety in health services (Lim et al., 2017). So that it takes a combination of knowledge, skills, attitudes and morals to form nurses quality in the future.

Challenges and obstacles in the education sector, especially in developing countries such as there are problems in financing that affect facilities and infrastructure obtained as a support for education. As for being able to organize education based on e-learning that requires technology such as virtual reality simulation. This can be done if there is availability of technological infrastructure such as computers, electricity, internet, and so on other supporting equipment that may not be fully obtained in developing countries (Naresh & Reddy, 2015). Implementation of technology-based media learning is also not easy applied, because not everyone in developing countries can accept this way of learning the. According to Sfenrianto et al. (2018) an update that is something new in community it will be difficult for them to adapt at the beginning of its implementation. As for on Haerling (2018) which was conducted qualitatively found students who felt frustrated with his new technology associated with the simulation environment. Although Thus in a study conducted by Chen et al. (2021) mentions a change on the participant's heart rate before using a virtual reality simulation where pulse fluctuations the heart increased more during the first simulation experiment compared to second simulation. So it can be concluded that virtual reality simulation can affect physiological response of an individual but when used repeatedly can relieve psychological tension. The utility-cost ratio in virtual reality simulation is found to be lower compared to mannequin-based simulation based on tool and material costs (Haerling, 2018). So that virtual reality simulation is expected to be replicated and made into media recommendations learning in developing countries as a substitute learning media to improve competence of nursing students.

The limitation to the Simulation in this study was the sample size used was relatively small, but this research is the first study to evaluate the effect of virtual reality simulation on nursing student confidence in urinary

catheterization skills in the country develop. This study only used one group so there was no comparison from the control group. In addition, this study involved participants from different year study even though the participants came from the same institution but there were differences in the curriculum may allow bias in research results to emerge.

## Conclusion

Nonetheless, the results of this study can be used as recommendations for institutions nursing education in applying a variety of learning media to improve learning outcomes nursing students related skills either through distance learning, or conventional learning. This can be a recommendation for universities high to use virtual reality simulation in teaching and learning activities as alternative in learning media in order to achieve student competence in the domain confidence. Required combination with other methods to improve understanding and learning effectiveness. In addition, nurses also need knowledge, skills, attitudes and good morals when interacting with clients later so that media modification and innovation learning that includes these points needs to be developed. Advanced research with the method Randomized Controlled Trial related to virtual reality simulation needs to be done to find out the true effectiveness of this virtual reality simulation.

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