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Review Article

Virtual simulation vs traditional training instruction: A narrative review article

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Abstract

Simulation-based education is increasingly favored in nursing schools as it enables students to hone their clinical skills in a secure setting. This research examines studies that contrast traditional learning methods with virtual reality (VR) simulations in nursing and medical education. Evidence indicates that VR simulations significantly enhance knowledge retention and conceptual understanding, with research like Pallavi Bobade's demonstrating better results in training for intravenous cannulation. Although virtual reality provides flexibility, engagement, and satisfaction, it faces challenges in replicating essential physical and procedural elements necessary for skill acquisition. Research by Elizabeth A. and Abeer William Victoria L. indicates that both traditional educational approaches and VR methods show comparable effectiveness in practical execution, with no notable discrepancies in outcomes such as phlebotomy training. Additionally, the influence of VR on clinical judgment and confidence remains unclear, according to findings from Chen FQ and Banjo-Ogunnowo SM. Employing a hybrid approach that integrates both VR and traditional training methods can improve knowledge retention while ensuring hands-on skill competence. Future investigations should prioritize the refinement of blended training models to enhance clinical proficiency and patient care results.

Keywords: Simulation-based education, Virtual Reality Simulation, Traditional Instruction, Nursing Education, Knowledge Retention, Clinical Reasoning.

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1. Introduction

Simulation-based education is being increasingly recognized as an effective educational approach.[1] It enables healthcare professionals and students to hone their clinical skills in a secure learning environment. Research has demonstrated that teaching nursing through simulation can be just as effective as conventional teaching methods.[2] The primary goal of simulation in nursing education is to enhance clinical practices and ensure patient safety through its use. Simulation consists of developing a model that replicates the desired behavior, testing the model to produce observations of these behaviors, and striving to comprehend, summarize, and generalize the findings.[3]

Traditional education is typically conducted entirely in-person, following a fixed schedule and pace. Learners are brought together to share knowledge with one another. Virtual modeling represents a modular form of learning. When comparing virtual learning to traditional education systems, the former offers total flexibility. Here, the pace of learning is adaptable, as this platform provides all necessary tools and study materials.

The Study was performed under the title "A Comparative Study of Traditional Instruction & Virtual Reality Simulation on Intravenous Cannulation Training among Nursing Students in Nagpur" authored by Pallavi Bobade. The purpose of the study was to assess the knowledge and practice of undergraduate nursing students regarding intravenous cannulation through traditional instructional methods and virtual reality simulations.[4] The first objective was to evaluate the effectiveness of traditional training instructions for intravenous cannulation. The second objective was to assess the effectiveness of virtual reality simulation for intravenous cannulation. Additionally, the study aimed to explore the relationship between traditional training methods and virtual reality simulation among nursing students. A non-experimental comparative research design was utilized, involving 60 nursing students. Group I (30 students) received traditional instruction, while Group II (30 students) was taught through virtual reality simulation,

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using a non-probability convenience sampling method. The assessment was carried out using a structured knowledge questionnaire that focused on demographic variables and knowledge about intravenous cannulation, as well as a checklist for evaluating practical skills related to intravenous cannulation. According to the findings, 70% of nursing students in traditional technique had inadequate knowledge and practice, 30% in traditional technique and 10% in IV cannula technique had an average level of knowledge score, and 90% of nursing students in cannula technique had a high level of knowledge score. There is no significance association between demographic variables.[5]

Elizabeth A et al. conducted a study comparing a Virtual Reality Simulator with Simulated Limbs for training in phlebotomy. In the first experiment, medical students underwent two 1-hour training sessions utilizing either of the two methods. Following this, their performance was assessed using both simulated limbs and actual patients. Those who trained with simulated limbs demonstrated better performance than those who trained with the CathSim system in both the posttest and the real patient field test. The second study involved graduate students practicing with the CathSim system for a total of 5 hours. The findings indicated that these students showed significant improvement in their scores from the pretest to the posttest. Nevertheless, even after extensive practice, their final scores remained comparable to those of the medical students from the first experiment. The differences in design features between the two systems may account for these outcomes. While the researchers identified a clear advantage for simulated limbs over the CathSim system, neither training method accurately mimics all the processes necessary for performing the procedure. Consequently, training decisions may need to take into account the unique benefits that each system offers.[6]

Abeer William Victoria L, and colleagues carried out a study on Traditional Instruction Compared to Virtual Reality Simulation: A Comparative Analysis of Phlebotomy Training Among Nursing Students in Kuwait. This quasi-experimental research assessed the differences in phlebotomy performance on a live patient between a control group that received traditional training and an experimental group that was instructed using virtual reality simulation. The findings revealed that both groups performed effectively on various metrics, including the number of reinsertions, pain levels, hematoma condition, duration of tourniquet application, time taken to complete the procedure, and successful completion of the treatment. A t-test was applied to assess the performance metrics between the control and experimental groups, but no significant differences were noted. Although the total duration to complete the procedure in both groups recorded the lowest p value, it was still not significant. Both methods of phlebotomy training were found to be equally effective. Nurse educators are encouraged to recognize the strengths and limitations of each approach in order to enhance the quality of phlebotomy programs.[7]

The research was carried out on the Effectiveness of Virtual Reality in Nursing Education: A Meta-Analysis by Chen FQ et al. This study aimed to evaluate the effectiveness of virtual reality (VR) in nursing education regarding knowledge, skills, satisfaction, confidence, and performance time.[8] The researcher conducted a meta-analysis using the Cochrane method to assess VR's impact on nursing education. In December 2019, a search was performed to identify research that analyzed VR's effectiveness on knowledge, skills, satisfaction, confidence, and performance times. Two independent reviewers selected the relevant studies and extracted data. The methodological quality of the chosen papers was evaluated using the Cochrane risk-of-bias criteria. The findings indicated that a total of 12 trials involving 821 participants were included in the final analysis. The researcher discovered that VR was significantly more effective than control conditions in enhancing knowledge (standard mean difference [SMD]=0.58, 95% CI 0.41-0.75, P<.001, I2=47%). However, there was no significant difference between VR and control conditions concerning skills (SMD=0.01, 95% CI –0.24 to 0.26, P=.93, I2=37%), satisfaction (SMD=0.01, 95% CI –0.79 to 0.80, P=.99, I2=86%), confidence (SMD=0.00, 95% CI –0.28 to 0.27, P=.99, I2=0%), and performance time (SMD=–0.55, 95% CI –2.04 to 0.94, P=.47, I2=97%). The researchers suggest that while virtual reality (VR) can significantly enhance knowledge in nursing education, it does not outperform other educational methods in terms of skills, satisfaction, confidence, and performance time. Further rigorous studies with larger sample sizes are necessary to confirm these results.[9]

Padilha JM conducted a research study on Clinical Virtual Simulation in Nursing Education: Randomized Controlled Trial in July 2018. The objective of this research was to evaluate how clinical virtual simulation affects nursing students' retention of information, clinical reasoning skills, self-efficacy, and overall learning satisfaction.[10] A randomized controlled trial was performed involving Portuguese nursing students (N=42) with a pretest and two posttests. The participants were divided into two groups, both receiving lessons with identical objectives and timing. The experimental group (n=21) engaged in a case-based learning method utilizing a clinical virtual simulator, while the control group (n=21) employed the same approach with a low-fidelity simulator in a realistic setting. The classes were taught by the standard course instructors. The researcher assessed knowledge and clinical reasoning prior to the intervention, immediately following it, and two months later using true or false and multiple-choice tests. The students' learning satisfaction and self-efficacy were measured after the intervention using a Likert scale. Results indicate that the experimental group achieved significantly greater improvements in knowledge after the intervention (P=.001; d=1.13) and again two months later (P=.02; d=0.75), as well as demonstrated higher levels of learning satisfaction (P<.001; d=1.33). No significant statistical differences were

observed in self-efficacy perceptions (P=.9; d=0.054). The researcher concludes that incorporating clinical virtual simulation into nursing education can enhance information retention and clinical reasoning in the short term and over time, while also increasing nursing students' satisfaction with their learning experience.[11]

The research conducted by Abarghouie examined the impacts of virtual versus lecture-based instruction on learning outcomes, content retention, and student satisfaction among surgical technology students. The study assesses the effects of these two instructional methods on student learning, satisfaction, and retention of information at Isfahan University of Medical Sciences. This quasi-experimental investigation was carried out in two phases involving 40 surgical technology students from the School of Nursing and Midwifery. After meeting the inclusion criteria, participants were randomly divided into two groups: the virtual instruction group (VG, n = 20) and the traditional lecture-based group (TG, n = 20). Data collection was carried out using a custom student satisfaction questionnaire and two different learning assessments, both of which had established validity and reliability. The analysis of data was performed using SPSS 13, applying both analytical and descriptive tests ($P < 0.05$). The results showed no significant difference in the mean scores of the first examination between the TG and VG groups ($P = 0.89$). However, a significant difference was found in the mean scores of the second examination between the two groups ($P = 0.03$). In terms of content retention and recall ability, the VG group performed better than the TG group. Additionally, the VG group had a higher mean satisfaction score (132.24 ± 17.92) compared to the TG group (115.56 ± 17.57) ($P < 0.05$). The researchers concluded that while virtual training and traditional lecture-based instruction produced similar short-term learning outcomes, virtual training has been shown to lead to improved learning performance, as well as enhanced retention of information and greater satisfaction over time.[12,15]

A study by Leili Mosalanejad explored the impact of virtual learning compared to traditional methods on the attainment of competency-based skills. Due to the rapid advancement of network technology, conventional classrooms are increasingly being replaced by internet-based learning environments. The aim of this research was to evaluate how virtual learning systems influenced the competency-based skills of first-year nursing students. The researcher involved 86 first-year nursing students in a quasi-experimental study. The nursing course, focusing on Fundamentals and Skills, encompassed both theoretical and practical components. One group received instruction on theory and practical skills through traditional means (face-to-face teaching and moulage demonstrations), while another group engaged with virtual simulations and interactive multimedia. The final assessment, instructor, and content were identical for both groups. Statistical analysis was performed using paired t-tests and independent sample t-tests. Findings indicate that in the theoretical exam, the average score for the virtual teaching group surpassed that of the traditional group ($P<0.001$), yet there was no notable difference in the outcomes of the objective structured clinical examination between the two groups. The study concludes that virtual systems enhance student learning. Both traditional and virtual methods can be effective in teaching nursing skills; however, it seems that an integrated approach may better facilitate knowledge transfer.[13,14]

Banjo-Ogunnowo SM conducted a research study comparing virtual and traditional learning during the COVID-19 pandemic, focusing on the outcomes for two nursing cohorts in an ADN program. This research analyzes the results of nursing student groups who experienced virtual learning during the pandemic in contrast to those who received traditional instruction before the pandemic. Clinical reasoning plays a vital role in the development of clinical nursing judgment. In response to the COVID-19 pandemic, nursing programs transitioned from traditional classroom and in-person clinical education to virtual settings. The design of the study involved a retrospective cohort analysis comparing the impacts of virtual learning during COVID-19 (n = 18) against traditional learning methods prior to the pandemic (n = 14) at a college located in Texas. The outcomes were evaluated using a standardized Health Education Systems Inc. (HESI®) specialty exam, HESI® exit exam, and the HESI® clinical judgment subscales. Independent-samples t-tests and Chi-square analyses were performed to assess the differences in outcomes between the two modes of learning. The results indicated no statistically significant difference between the traditional group ($M = 752.93$, $SD = 148.88$) and the virtual learning group ($M = 761.72$, $SD = 152.11$); $t(30) = -0.16$, $p = 0.87$ was recorded on the HESI® Maternal pediatric Specialty exam. The evaluations from the HESI® Exit test and clinical judgment subscales also revealed no significant differences, and no relationship was found between the type of learning and NCLEX-RN® pass rates. The conclusions drawn from this study are intriguing yet limited, suggesting that further research into virtual learning is needed.[14,17]

2. Discussion

The research papers analyzed together illustrate the capabilities of simulation-based education in nursing and medical training. Both conventional and virtual methods have their own advantages and disadvantages, with VR simulation offering unique benefits in knowledge acquisition and retention, though it struggles to replicate the tactile and hands-on aspects of clinical procedures.

2.1. Knowledge and retention

VR simulation has notably enhanced knowledge retention and learning outcomes. Studies conducted by Chen FQ et al. and Padilha JM indicated VR's effectiveness in enhancing theoretical understanding over time with statistically

significant results. Similarly, Pallavi Bobade's research indicated that nursing students who were trained in intravenous cannulation through VR simulation achieved considerably higher knowledge scores (90% of students demonstrated good knowledge) compared to those who received traditional instruction, where only 70% of the students had poor knowledge levels. This underscores VR's ability to close gaps in theoretical knowledge.[18-19]

2.2. Skill development

Traditional methods and virtual reality techniques yield different outcomes in skill performance. A study by Pallavi Bobade demonstrated that VR simulations notably enhanced practical skills in intravenous cannulation when compared to conventional training. This aligns with the results of Elizabeth A. et al., who highlighted the advantages of using simulated limbs for phlebotomy education. Nonetheless, the realism associated with traditional hands-on training remains essential, as indicated by a study conducted by Abeer William Victoria L et al., which showed no significant difference in phlebotomy performance metrics between VR and traditional methods.[20-21]

2.3. Satisfaction and engagement

Investigations by Padilha JM and Abarghouie revealed that learning through VR resulted in higher satisfaction levels. Students perceived virtual reality platforms as engaging, adaptable, and conducive to personalized learning.[12,21]

2.4. Limitations of VR simulation

Although VR simulation is beneficial for enhancing knowledge, it has limitations in replicating every facet of clinical skills. Research by Chen FQ et al. and Banjo-Ogunnowo SM indicated that VR did not exceed traditional methods in clinical judgment or confidence levels.[14,22]

2.5. Combination of methods

Numerous studies, such as those by Mosalanejad et al. and Pallavi Bobade, emphasize the importance of a comprehensive approach. Merging traditional and VR methodologies enables the benefits of VR's theoretical features while ensuring robust practical skills development. This blend could provide a complete educational experience that addresses the shortcomings of each method individually.[13,18]

3. Conclusion

In nursing education, traditional teaching methods and virtual simulation each present unique benefit. Although traditional techniques remain valuable for building practical skills and attaining quick results, virtual simulation excels in enhancing knowledge retention, learner satisfaction, and long-term recall of information. The research reviewed suggests that neither method can entirely supplant the other. Instead, the optimal strategy for nursing education involves a hybrid model that leverages the strengths of both approaches. Future research should concentrate on creating integrated frameworks and evaluating their effects on clinical competency and patient care outcomes.

4. Source of Funding

None.

5. Conflict of Interest

None.

References

1. Gu Y, Zou Z, Chen X. The effects of vSIM for nursing™ as a teaching strategy on fundamentals of nursing education in undergraduates. *Clin Simul Nurs.* 2017;13(4):194–7.
2. Smith SJ, FarraS, Ulrich DL, Hodgson E, Nicely S, Matcham W. Learning and retention using virtual reality in a decontamination simulation. *Nurs Educ Perspect*. 2016;37(4):210–4.
3. Lateef, Fatimah. Simulation-based learning: Just like the real thing. *J Emergen Trauma Shock.* 2010;3(4):p348-52.
4. Foronda, Cynthia. Evaluation of Simulation in Undergraduate Nurse Education: An Integrative Review. *Clin Simul Nurs.* 2013;9(10):09–16
5. Bobade, Pallavi, Shambharkar A. "A Comparative Study of Traditional Instruction & Virtual Reality Simulation on Intravenous Cannulation Training Among Nursing Students in Nagpur. *Curr J Appl Sci Technol*. 2024;43(8):14-22.
6. Scerbo, Mark W. PhD; Schmidt, Elizabeth A. MS; Bliss, James P. Comparison of a Virtual Reality Simulator and Simulated Limbs for Phlebotomy Training. *J Inf Nurs.* 2006;29(4):214-24.
7. William, A., Vidal, V.L., & John, P. Traditional Instruction Versus Virtual Reality Simulation: A Comparative Study of Phlebotomy Training among Nursing Students in Kuwait. *J Educ Pract. 2016;*7.18-25.
8. Cook DA, Hatala R, Brydges R, Zendejas B, Szostek JH, Wang AT, Erwin PJ, Hamstra SJ. Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *JAMA*. 2011;306(9):978-88.
9. Chen FQ, Leng YF, Ge JF, Wang DW, Li C, Chen B, Sun ZL Effectiveness of Virtual Reality in Nursing Education: Meta-Analysis. *J Med Internet Res.* 2020;22(9):e18290
10. Alinier G, Hunt B, Gordon R, Harwood C. Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education. *J Adv Nurs.* 2006;54(3):359-69.
11. Padilha JM, Machado PP, Ribeiro A, Ramos J, Costa P. Clinical Virtual Simulation in Nursing Education: Randomized Controlled Trial. *J Med Internet Res.* 2019;21(3):e11529
12. Abarghouie Mohammad Hassan Ghasemi; Omid, Athar1; Ghadami, Ahmad 2. Effects of virtual and lecture-based instruction on learning, content retention, and satisfaction from these instruction methods among surgical technology students: A comparative study. *J Educ Health Prom.* 2020;9(1):296.
13. Leili Mosalanejad, Somayeh Shahsavari, Saeed Sobhanian, Mehdi Dastpak. The effect of virtual versus traditional learning in achieving competency-based skills. *Turkish Online J Dist Educ.*2012;13(2):69-75.
14. Banjo-Ogunnowo SM, Chisholm LJ. Virtual versus traditional learning during COVID-19: quantitative comparison of outcomes for two articulating ADN cohorts. *Teach Learn Nurs.* 2022;17(3):272-6.
15. Abarghouie M. Extended Analysis of Virtual Learning Outcomes in Surgical Technology Education. *Int J Educ Res Open*. 2023;4,100234.
16. Mosalanejad L. Evaluating Virtual Competency-Based Education in Nursing: A Follow-Up Study. *Nurse Educ Today.* 2022;112:105342.

17. Banjo-Ogunnowo, S. M. Retrospective Analysis of Virtual Learning in Nursing During COVID-19. *Clin Simul Nurs*. 2023;74,101594.
18. Chen F.Q. Virtual Reality Simulation in Nursing Education: Enhancing Knowledge Retention. *Simul Healthcare.* 2022;17(1):1-8.
19. Padilha J.M. Enhancing Theoretical Understanding Through Virtual Simulation in Nursing Curricula. *Nurse Educ Today*. 2019;73, 63-8.
20. Bobade P. VR Simulation in Intravenous Cannulation Training: A Comparative Study With Traditional Methods. *Nurs Educ Perspec*. 2021;42(6):E121-6.
21. Abarghouie M. Student Satisfaction in Virtual Versus Traditional Learning Environments. *BMC Medical Educ.* 2023;23(1):226.
22. Chen F. Q. Limitations of Virtual Reality Simulation in Developing Clinical Judgment Skills in Nursing. *Clin Simul Nurs.* 2023;79,101683.

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