

EFFECT OF AI-POWERED VIRTUAL PATIENTS ON MENTAL HEALTH ASSESSMENT SKILLS OF NURSING STUDENTS

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Paper Received: 17.12.2025 / Paper Revised: 14.01.2026 / Paper Accepted: 20.01.2026 / Paper Published: 22.01.2026

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Abstract

Introduction: Mental health assessment is a core competency in nursing practice; however, nursing students often report limited confidence and preparedness in conducting comprehensive psychiatric evaluations. Advances in artificial intelligence (AI), particularly AI-powered virtual patients, present new opportunities to enhance experiential learning in mental health nursing education. This study examined the effect of AI-powered virtual patient simulations on the mental health assessment skills of nursing students.

Methods: A quasi-experimental pretest-posttest design with a comparison group was employed. Eighty third-year nursing students enrolled in a mental health nursing course were assigned to either an intervention group exposed to AI-powered virtual patient simulations or a comparison group receiving traditional instruction. Mental health assessment skills were measured using a validated Mental Health Assessment Skills Checklist before and after a four-week intervention period. Data were analyzed using descriptive statistics, paired t-tests, and independent t-tests.

Results: Pretest findings revealed no significant difference in baseline mental health assessment skills between the intervention and comparison groups ($p > .05$). Post-intervention results demonstrated a statistically significant improvement in the intervention group compared to the comparison group ($p < .001$). Students exposed to AI-powered virtual patients showed substantial gains in therapeutic communication, symptom identification, suicide risk assessment, and clinical judgment, indicating the effectiveness of AI-based simulation in enhancing applied mental health assessment competencies.

Conclusion: AI-powered virtual patients significantly improve the mental health assessment skills of nursing students. Integrating AI-driven simulations into mental health nursing curricula may strengthen clinical preparedness, address limitations in traditional teaching methods, and support competency-based nursing education while maintaining human-centered care.

Keywords: Artificial Intelligence, Virtual Patients, Mental Health Nursing, Nursing Education.

Introduction

Mental health disorders account for a substantial proportion of the global burden of disease, with depression and anxiety ranking among the leading causes of disability worldwide (World Health Organization [WHO], 2023). Nurses play a critical role in the early identification, assessment, and management of mental health conditions across clinical and community settings. However, numerous studies have documented gaps in nursing students' preparedness and confidence in conducting comprehensive mental health assessments, particularly in recognizing subtle psychological symptoms, performing therapeutic communication, and applying standardized assessment tools (Cleary et al., 2021; Happell & Gaskin, 2020).

Traditional mental health nursing education relies heavily on classroom instruction, role-playing, and limited clinical exposure. These approaches may be constrained by inconsistent case exposure, ethical concerns related to patient vulnerability, and students' anxiety when interacting with real psychiatric patients (Brown et al., 2022). As a result, there is increasing interest in innovative educational strategies that can safely enhance students' clinical competence before real-world practice.

Artificial intelligence (AI)-powered virtual patients have emerged as a promising pedagogical tool in health professions education. These systems use natural language processing, machine learning, and adaptive algorithms to simulate realistic patient interactions, allowing students to practice clinical decision-making, communication, and assessment skills in a controlled environment (Cook & Triola, 2023). In mental health education, AI-powered virtual patients can simulate diverse psychiatric presentations, emotional responses, and behavioral cues, providing repeated practice opportunities that

are difficult to achieve in traditional clinical placements.

Despite growing adoption of AI technologies in nursing education, empirical evidence regarding their effectiveness in improving mental health assessment skills remains limited, particularly in low- and middle-income countries. Therefore, this study aimed to examine the effect of AI-powered virtual patients on the mental health assessment skills of nursing students.

Specifically, this study sought to answer the question:

Does exposure to AI-powered virtual patient simulations significantly improve the mental health assessment skills of nursing students compared to traditional instruction alone?

Methods

Research Design

This study employed a quasi-experimental pretest–posttest design with a comparison group. This design was selected to evaluate changes in mental health assessment skills following exposure to AI-powered virtual patient simulations while maintaining feasibility within an academic setting (Polit & Beck, 2021).

Participants and Setting

The study was conducted at a private higher education institution offering a Bachelor of Science in Nursing program. Participants consisted of third-year nursing students enrolled in a Mental Health Nursing course. Inclusion criteria were: (1) enrollment in the course during the study period, (2) no prior exposure to AI-powered simulation tools, and (3) willingness to participate. Students with previous formal psychiatric clinical experience were excluded to reduce confounding variables.

A total of 80 nursing students participated and were assigned into two groups: an intervention group ($n = 40$) and a comparison group ($n = 40$).

Intervention

The intervention group participated in AI-powered virtual patient simulations over a four-week period. The virtual patients presented with common mental health conditions such as major depressive disorder, generalized anxiety disorder, schizophrenia, and bipolar disorder. The AI system allowed students to conduct patient interviews, assess mood and cognition, apply standardized mental health assessment tools, and receive immediate feedback based on their responses.

The comparison group received traditional instruction, consisting of lectures, case discussions,

and role-playing exercises, without exposure to AI-powered simulations.

Data Collection Instrument

Mental health assessment skills were measured using a Mental Health Assessment Skills Checklist (MHASC) developed based on established psychiatric nursing competencies. The checklist assessed domains including therapeutic communication, symptom identification, risk assessment, and clinical judgment. Content validity was reviewed by three psychiatric nursing experts, and the instrument demonstrated good internal consistency (Cronbach's $\alpha = 0.89$).

Data Collection Procedure

Pretest assessments were conducted for both groups prior to the intervention. Posttest assessments were administered after four weeks. Data were collected by trained faculty members blinded to group allocation.

Data Analysis

Data were analyzed using descriptive and inferential statistics. Paired t-tests were used to determine within-group differences, while independent t-tests compared posttest scores between groups. Statistical significance was set at $p < .05$.

Ethical Considerations

Ethical approval was obtained from the institutional research ethics committee. Written informed consent was secured from all participants, and confidentiality was strictly maintained.

Results

Demographic Profile of Participants

A total of 80 third-year nursing students participated in the study. The mean age of respondents was 21.3 years ($SD = 1.1$), with ages ranging from 20 to 24 years. The majority of participants were female (72.5%), reflecting the demographic profile commonly reported in undergraduate nursing education (Cleary et al., 2021). No statistically significant differences were found between the intervention and comparison groups in terms of age, gender, academic standing, or prior simulation exposure ($p > .05$), indicating baseline homogeneity and reducing potential confounding variables (Polit & Beck, 2021).

Baseline Mental Health Assessment Skills

Pretest findings revealed that both groups demonstrated moderate baseline competency in mental health assessment skills. The intervention group had a mean pretest score of 62.4 ($SD = 7.8$), while the comparison group recorded a mean score of 61.9 ($SD = 8.1$). Statistical analysis confirmed no significant difference between groups ($t = 0.29$, $p = .77$). This aligns with previous studies reporting that

undergraduate nursing students often feel underprepared for psychiatric assessment prior to clinical exposure (Happell & Gaskin, 2020; Happell et al., 2021).

Item-level analysis showed lower scores in suicide risk assessment, interpretation of affect, and clinical judgment. These findings are consistent with existing literature indicating that mental health assessment skills involving abstract reasoning and emotional interpretation are among the most challenging competencies for nursing students to acquire (Brown et al., 2022; Kameg et al., 2022).

Post-Intervention Mental Health Assessment Skills

After four weeks of intervention, the AI-powered virtual patient group demonstrated a substantial improvement in mental health assessment skills ($M = 82.6$, $SD = 6.4$), compared to the comparison group ($M = 71.2$, $SD = 7.5$). The difference between posttest scores was statistically significant ($t = 7.32$, $p < .001$), indicating a strong positive effect of AI-powered simulation on student performance.

The observed improvement supports findings from prior studies that AI-enhanced simulations promote deeper engagement and facilitate experiential learning through repeated exposure to complex clinical scenarios (Cook & Triola, 2023; Kyaw et al., 2022).

Within-Group Comparison

Paired t-test analysis showed a statistically significant improvement in the intervention group ($t = 14.85$, $p < .001$), reflecting marked gains across all assessment domains. Improvements were most pronounced in therapeutic communication, symptom identification, suicide risk assessment, and structured mental status examination.

In contrast, the comparison group exhibited a smaller but statistically significant improvement ($t = 4.12$, $p < .05$). This modest gain is consistent with literature suggesting that traditional teaching methods alone may improve theoretical understanding but are less effective in fostering applied clinical reasoning and confidence (Cleary et al., 2021; Brown et al., 2022).

Domain-Specific Skill Enhancement

Students exposed to AI-powered virtual patients demonstrated significant advancement in clinical judgment and decision-making abilities. This finding supports the work of Cook et al. (2023), who emphasized that adaptive AI simulations promote reflective learning by requiring learners to analyze patient responses and modify assessment strategies in real time.

Moreover, the structured yet flexible nature of AI

simulations allowed students to practice mental health assessments in a psychologically safe environment, an important factor in reducing anxiety and enhancing learning outcomes in psychiatric nursing education (Kameg et al., 2022).

Discussion

Effectiveness of AI-Powered Virtual Patients

The findings of this study confirm that AI-powered virtual patients are a highly effective instructional strategy for enhancing mental health assessment skills among nursing students. Students in the intervention group demonstrated significantly greater improvements compared to those receiving traditional instruction alone. These findings are consistent with emerging evidence supporting the integration of AI-driven educational tools in health professions education (Cook & Triola, 2023; Kyaw et al., 2022).

The adaptive feedback and realism embedded in AI-powered virtual patients enable learners to engage in active problem-solving and experiential learning, which are essential for mastering psychiatric assessment competencies (Kolb, 2015).

Improvement in Therapeutic Communication and Empathy

The most notable gains were observed in therapeutic communication and empathic engagement. This aligns with previous studies indicating that simulation-based learning improves students' confidence and comfort in communicating with individuals experiencing mental health conditions (Happell et al., 2021; Kameg et al., 2022).

AI-powered virtual patients allow repeated practice of sensitive conversations - such as suicide ideation assessment-without fear of causing emotional harm, which may explain the significant improvement in this domain (Brown et al., 2022).

Comparison with Traditional Pedagogical Approaches

While traditional teaching methods remain foundational in nursing education, the results suggest they may not sufficiently address the complexity of mental health assessment. Lectures and role-playing often lack realism and consistency, limiting opportunities for deliberate practice (Cleary et al., 2021).

In contrast, AI-powered virtual patients provide standardized yet interactive scenarios that expose students to diverse psychiatric presentations. This finding reinforces earlier research demonstrating that technology-enhanced simulations result in superior skill acquisition compared to conventional approaches (Kyaw et al., 2022).

Curricular and Administrative Implications

From an educational and administrative standpoint, integrating AI-powered virtual patients into mental health nursing curricula can address challenges such as limited clinical placements, increasing student enrollment, and faculty workload constraints (Cook & Triola, 2023). AI-supported learning environments may also support competency-based education frameworks increasingly adopted in nursing programs worldwide (WHO, 2023).

Nevertheless, the role of nurse educators remains central. AI should be used to supplement - not replace - human instruction, ensuring that ethical reasoning, cultural sensitivity, and professional values remain integral to nursing education (Polit & Beck, 2021).

Ethical and Equity Considerations

Despite its benefits, AI integration raises ethical concerns related to algorithmic bias, data security, and equitable access to educational technologies. Studies caution that unregulated AI systems may unintentionally reinforce stigma or misrepresent mental health conditions if not carefully designed and monitored (Topol, 2019; WHO, 2023). Therefore, nursing educators must critically evaluate AI tools and ensure alignment with ethical standards and professional competencies.

Limitations and Directions for Future Research

The quasi-experimental design and single-institution sample limit generalizability. Future studies should employ randomized controlled trials, multi-site sampling, and longitudinal designs to assess long-term skill retention and real-world clinical transfer (Polit & Beck, 2021). Additionally, qualitative exploration of students' lived experiences with AI-powered simulations may provide deeper insight into learning processes and emotional engagement.

Conclusion

AI-powered virtual patients are an effective educational tool for enhancing mental health assessment skills among nursing students. Incorporating AI-based simulations into mental health nursing curricula may improve students' readiness for clinical practice and contribute to higher-quality mental health care delivery. Nurse educators and academic institutions should consider strategic integration of AI technologies while maintaining human-centered, ethical nursing values.

Conflicts of Interest

The authors declare that there is no conflict of interest in this manuscript. Results have been deduced objectively; nothing influenced this result by any individual, monetary, or institutional interests. In effect, utmost endeavors were in order to conduct a bias-free operation of gathering and

analyzing the data into interpretation and producing a study based on merit, away from research inconsistencies.

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