

Enhancing Agitation Management Skills and Empathy in Healthcare Students through Virtual Reality–Based Experiential Learning

Man-Lin Huang^{1*}

¹Institute of Information Systems and Applications, National Tsing Hua University, Hsinchu, Taiwan.

*E-mail ✉ mlhuang@fcu.edu.tw

Abstract

Agitation is a common and growing issue in healthcare, especially within psychiatric services. However, many healthcare students report lacking adequate preparation to respond effectively, often due to fear, stigma, and limited real-world practice. Conventional training methods, such as lectures and standard simulations, are not only resource-heavy but also provide few chances for repeated, safe rehearsal. Virtual reality (VR) offers an alternative by enabling immersive, standardised, and repeatable exposure to challenging clinical situations. In this context, the education team at [redacted for peer review] introduced the *Managing Aggression using Immersive Content (MAGIC)* programme—a compulsory three-hour workshop in the psychiatry curriculum for medical and nursing students. The programme integrates classroom teaching, role-play, and the *Virtual Reality in Agitation Management (VRAM)* exercise to promote experiential learning. Its objectives are to build confidence, enhance empathy, increase mental health literacy, and improve competence in managing psychiatric agitation. Using a quasi-experimental design with pre- and post-intervention testing, 152 students participated in the evaluation. The findings showed significant improvements in confidence, self-rated skills, and knowledge, as well as reduced stigma towards individuals with mental illness. Students also rated the VRAM component positively for both usability and educational impact. These outcomes underscore the value of integrating VR technology with traditional pedagogy to enhance student learning, improve readiness for high-stress clinical encounters, and foster more effective patient care.

Keywords: Immersive learning, Virtual reality, Psychiatric education, Agitation management, Clinical training, Empathy

Introduction

Agitation, defined as inappropriate or excessive physical or verbal activity, is a widespread challenge across healthcare systems [1]. Prevalence studies report rates as high as 70.9% in Australia and New Zealand, 67.3% in North America, and 64.9% in Asia [2, 3]. The problem has intensified in recent years, with the COVID-19 pandemic contributing to rising cases of patient agitation and violence directed at healthcare workers (HCWs) [4–6]. Such encounters have profound implications for both staff well-being and the overall quality of patient care [7].

Although considerable attention has been directed toward behavioural strategies for managing agitation, the cultivation of communication and empathy—particularly among students—has received less emphasis. This gap is especially evident in psychiatry, where agitation commonly arises from conditions such as mania or psychosis and may present differently from other medical contexts [8, 9]. Patients experiencing agitation can at times confront or undermine clinicians' authority, underscoring the importance of equipping HCWs with compassionate, patient-centred approaches to de-escalation [9].

Traditionally, coercive interventions such as physical and pharmacological restraints have been used to control agitation [10–12]. While these methods may offer immediate containment, they are also associated with significant risks. Patients and HCWs may sustain physical injuries during restraint [13, 14], while psychological consequences include distress, loss of

Access this article online

<https://smerpub.com/>

Received: 02 March 2025; Accepted: 12 June 2025

Copyright CC BY-NC-SA 4.0

How to cite this article: Huang ML. Enhancing Agitation Management Skills and Empathy in Healthcare Students through Virtual Reality–Based Experiential Learning. *Ann Pharm Educ Saf Public Health Advocacy*. 2025;5:60-74. <https://doi.org/10.51847/xaNb8pCkQ4>

trust, and cognitive impairment [14, 15]. Furthermore, coercive experiences may damage therapeutic relationships and discourage patients from future engagement with care [13, 16].

For HCWs, frequent exposure to poorly managed agitation can lead to emotional exhaustion, trauma, and job dissatisfaction, which in turn may drive workforce attrition. In Singapore, turnover rates between 2020 and 2021 reached 7%–9% for nurses and 3%–5% for doctors in acute public hospitals [17]. Although multiple structural and organisational factors influence attrition [18, 19], agitation-related stress contributes to the cycle of burnout, staff loss, heavier workloads, and compromised patient safety [20, 21]. This reinforces the need for strategies that prioritise empathy and de-escalation, creating safer clinical environments and supporting workforce sustainability [22–24].

Empathy—the ability to recognise, understand, and respond to patients’ perspectives—is a cornerstone of therapeutic relationships. When effectively applied, it can reduce reliance on coercive interventions and improve patient experiences [25–28]. Yet, empathy and communication skills are not consistently embedded in undergraduate healthcare training, particularly within psychiatry. In Singapore, surveys reveal that although medical and nursing students value psychiatric training, many hold stigmatising attitudes towards mental illness and feel unprepared to manage agitation, citing fear, stigma, and insufficient clinical exposure as barriers [17, 29–32].

Conventional teaching approaches for empathy and communication, including lectures, case-based discussions, and simulated encounters, face limitations. These methods are resource-intensive, dependent on faculty expertise, and often lack consistency across sites [33, 34]. They may also provide limited realism and fail to engage learners actively [35, 36]. Importantly, they seldom allow repeated practice in high-stakes scenarios such as agitation, nor do they reliably provide safe environments in which students can rehearse de-escalation skills [37, 38]. Consequently, many students struggle to transfer theoretical knowledge into confident and empathetic clinical practice.

Virtual reality (VR) has become an increasingly relevant tool for health professions education, offering opportunities that traditional teaching methods often lack. Through immersive, standardised, and repeatable simulations, VR allows learners to practise decision-making, empathy, and communication in realistic clinical

contexts without exposing patients or trainees to risk. Unlike lectures or conventional simulations, VR encourages active participation and leverages narrative-driven experiences, which have been shown to foster stronger emotional engagement and greater self-efficacy [39, 40].

Evidence indicates that VR can support the development of both clinical competence and interpersonal skills [41]. It provides a safe and controlled environment in which learners can navigate complex encounters [42], experiment with de-escalation strategies, and build confidence in managing high-stress scenarios [43, 44]. In Singapore, for example, a randomised controlled trial demonstrated that VR-based interventions reduced stigma among mental health professionals and promoted more positive attitudes toward individuals with psychotic disorders [45]. Likewise, VR role-play exercises targeting medical students improved certain aspects of empathy toward patients with depression [46]. Collectively, these findings suggest that VR is particularly well-suited to preparing healthcare students to approach agitation with empathy and confidence. Although considerations such as financial costs and integration into curricula remain, VR’s reproducibility, realism, and safety make it a powerful complement to traditional pedagogy [47].

Beyond its pedagogical benefits, VR has practical advantages. Compared to conventional, resource-intensive approaches, VR offers scalability, supports self-directed learning, and reduces reliance on faculty availability [48, 49]. Its adaptability also allows for use across institutions and disciplines, improving equitable access to consistent training [48, 50]. Research further shows that VR-based education not only increases knowledge retention but also improves learner satisfaction, motivation, and emotional investment [51–53].

To address the lack of structured training in psychiatric agitation management, the education team at [redacted for peer review] developed the *Virtual Reality in Agitation Management (VRAM)* programme. VRAM presents students with time-sensitive and ethically complex psychiatric scenarios—including covert medication use, assessment of decision-making capacity, and prioritisation of care—within a safe and repeatable environment.

VRAM is embedded within the broader *Managing Aggression using Immersive Content (MAGIC)* initiative, a required psychiatry module for fourth-year medical

students and second-year nursing students. MAGIC integrates didactic video-based instruction, tutor-facilitated discussions, role-play activities, and structured debriefings alongside the VRAM experience [54].

The present study evaluates MAGIC's effectiveness in improving learners' confidence, competence, empathy, and mental health literacy in the management of psychiatric agitation. We hypothesised that participants would report greater assurance in applying de-escalation strategies, appropriate use of restraints, and more empathetic, less stigmatising views of individuals with mental illness compared with their peers. In addition, we assessed the usability and acceptability of the VRAM software using the *Virtual Reality Neuroscience Questionnaire (VRNQ)*, which examines immersion, comfort, and interface design—critical factors for the sustainability of VR in medical education.

Materials and Methods

Study design

A quasi-experimental pre–post design was employed to evaluate the *MAGIC* programme. The study aimed to measure changes in healthcare students' self-reported proficiency and confidence in managing patient agitation. Secondary objectives included assessing shifts in empathy, mental health literacy, and confidence in employing de-escalation and restraint strategies.

The MAGIC programme

MAGIC was embedded as a compulsory element of the psychiatry rotation for fourth-year medical students and second-year nursing students. Although participants were enrolled in different professional tracks, the curriculum was standardised across both groups, and teaching faculty collaborated closely to ensure alignment in content and delivery.

The intervention was delivered as a three-hour blended workshop. It began with a didactic session under the Empathetic CARE and REsponse (ECARE) programme, which introduced students to the principles of agitation management. This was followed by tutor-led role-play

exercises that provided opportunities to practise communication techniques and the safe application of physical restraint. The third component involved participation in the VRAM simulation, where students engaged with immersive clinical scenarios requiring rapid, real-time decision-making. The workshop concluded with a structured debrief, guided by tutors using the RC22 framework [55], which encourages learners to process their experiences through reaction, recollection, reflection, analysis, and application [56].

VRAM scenario

The VRAM exercise simulated a high-stakes clinical encounter adapted from real cases and refined by experienced clinicians. In this scenario, students assumed the role of an on-call healthcare provider confronted with a female patient in a state of drug-induced psychosis. During the escalation, the patient seized a child visitor as a hostage while demanding discharge against medical advice. Learners were required to manage the unfolding crisis, balancing efforts to de-escalate the patient with responding to distressed family members and coordinating nursing staff.

The scenario emphasised the recognition of early warning signs of agitation, such as erratic movements and escalating verbal aggression. It challenged students to apply verbal de-escalation as the first-line response. To mimic the urgency of real clinical practice, each decision point was limited to an eight-second response window; failure to act resulted in the system generating a random action, reflecting the risks of hesitation in actual practice. Critical decision-making tasks included determining whether to administer covert medication, assessing the patient's mental capacity to refuse treatment, removing potential hazards from the environment, and coordinating the team if chemical or physical restraint became necessary. Through this immersive design, students were exposed to the pressures, ethical dilemmas, and competing demands characteristic of managing psychiatric agitation.

Figure 1 shows the examples of prompts and questions encountered by participants of VRAM.

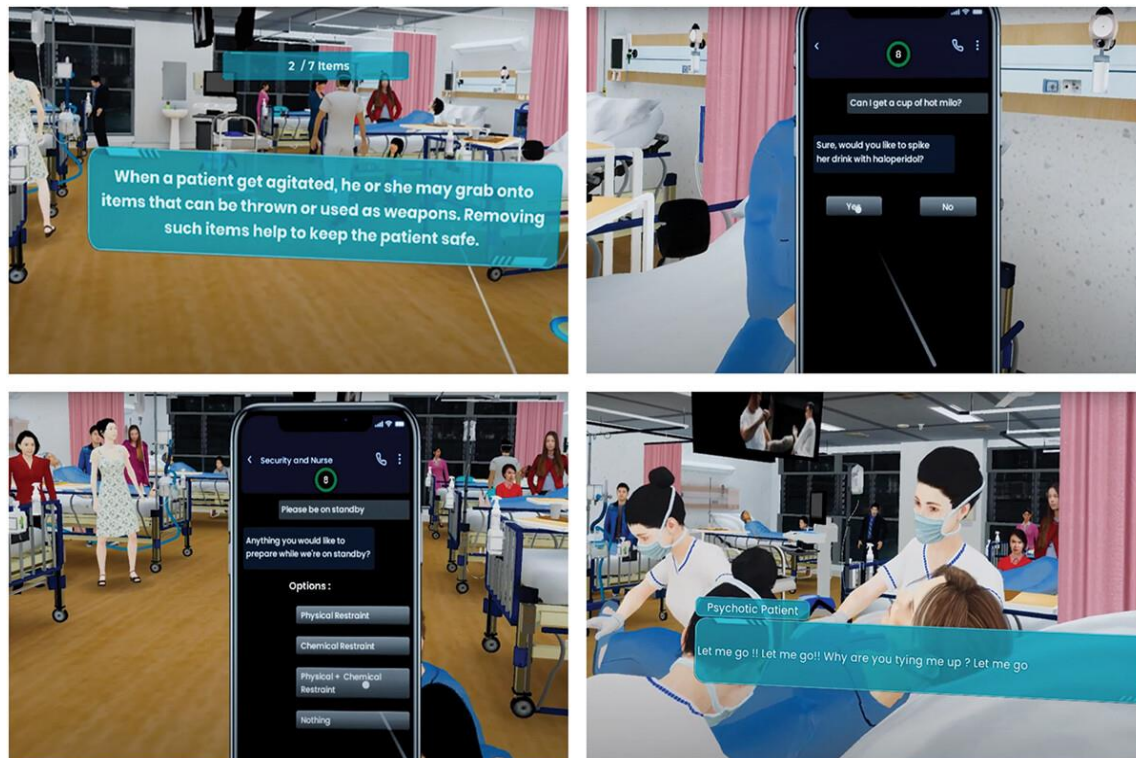


Figure 1. Examples of prompts and questions encountered by participants of VRAM

Through the VRAM scenario, students were provided with opportunities to practise not only de-escalation but also team-based approaches such as coordinating with nurses and security personnel to initiate physical restraint when required. Another essential learning outcome involved selecting and administering appropriate rapid tranquillisation medications. The immersive, real-time nature of the simulation allowed participants to rehearse key agitation management skills within a controlled and safe environment, preparing them for comparable situations in clinical practice. Notably, the design of the scenario enabled multiple potential outcomes. Ineffective or delayed decisions could escalate the situation and increase the risk of harm. At the same time, timely actions—such as effective teamwork and appropriate medication use—could calm the agitated patient and restore safety on the ward.

Data collection

The study was conducted among medical and nursing students enrolled in the compulsory MAGIC programme as part of their psychiatry rotations. Although programme participation was mandatory, involvement in the research was entirely voluntary. Recruitment was carried out immediately before each programme commenced, with

medical and nursing students approached separately. Students were reassured that their choice not to participate would not affect their course progression or assessment outcomes. Ethical approval was obtained from [redacted for peer review], and written informed consent was secured before enrolment.

Data were collected between August 2021 and July 2022 through anonymised pre- and post-intervention questionnaires. Post-programme assessments were administered immediately following the MAGIC workshop. The cohorts were broadly comparable in terms of age and year of study: medical students were primarily in their fourth year, typically aged 22–25 years, while nursing students were generally in their second year and between 20 and 25 years old. Demographic information, such as gender and ethnicity, was also collected and reported to ensure transparency.

Measures

A combination of validated scales and self-reported ratings was used to assess outcomes. Empathy was measured using the Jefferson Scale of Empathy (JSE), a 20-item instrument developed by Hojat *et al.* [57]. Items are rated on a seven-point Likert scale, with higher scores reflecting stronger empathic orientation. The JSE has

consistently demonstrated high reliability, with Cronbach's alpha values averaging around 0.80 [58, 59]. It has also been validated across multiple languages and cultural contexts, including Chinese and Turkish [60, 61]. Mental health literacy was assessed using the Mental Health Literacy Scale (MHLS), a 35-item questionnaire that measures knowledge, beliefs, and attitudes about mental health and help-seeking. Items are scored on four- or five-point Likert scales, with higher scores representing better literacy. The MHLS demonstrates robust psychometric properties, including Cronbach's alpha values of approximately 0.85 [62], and correlates strongly with other established literacy measures [63].

Stigma was evaluated using the Opening Minds Scale for Healthcare Providers (OMS-HC-15), a 15-item tool that employs a five-point Likert scale [64, 65]. Higher scores indicate more stigmatising attitudes toward people with mental health conditions. The OMS-HC-15 has shown good reliability, with Cronbach's alpha coefficients around 0.82 [66], strong convergent validity with other stigma measures [65], and a clear factor structure consistent with stigma theory [67]. A reduction in OMS-HC-15 scores after an intervention indicates a positive shift towards less stigmatising views.

Finally, the Virtual Reality Neuroscience Questionnaire (VRNQ) was used in the post-programme survey to examine students' perceptions of the VRAM software. The VRNQ evaluates domains such as user experience, interface quality, in-game guidance, and symptoms associated with virtual reality use (VRISE). Each domain contains five items rated on a seven-point Likert scale. Higher scores correspond to better usability in all domains except VRISE, where higher values denote more potent side effects such as nausea or disorientation. The VRNQ has demonstrated satisfactory internal consistency, with Cronbach's alpha values exceeding the 0.70 threshold [68].

The VRNQ has also undergone validation, demonstrating strong correlations with established measures of user experience and cybersickness. This confirms its utility as a comprehensive tool for assessing both the quality of VR-based educational platforms and the severity of VR-induced side effects [69].

Data analysis

Statistical analyses were conducted using IBM SPSS Statistics version 28.0. All tests were two-tailed, with statistical significance set at $P < 0.05$. Paired-samples *t*-tests were applied to compare changes in continuous variables such as pre- and post-programme questionnaire scores. In contrast, independent-samples *t*-tests were used to evaluate subgroup differences, for example, between medical and nursing students on VRNQ outcomes.

To evaluate the acceptability of VRAM, two benchmark cut-off scores for the VRNQ were adopted, following Kourtesis *et al.* [68]. A minimum cut-off was defined as 25 per sub-domain and 100 overall, corresponding to a median item rating of 5 ("high"). In contrast, a more stringent cut-off was set at 30 per sub-domain and 120 overall, equivalent to a median item rating of 6 ("very high"). These thresholds ensured the VRAM platform met standards of usability, safety, and appropriateness for implementation in medical education.

Results and Discussion

Participant characteristics

Data from 152 students who completed both pre- and post-programme questionnaires were included in the analysis. The sample was predominantly female (60.6%) and primarily of Chinese ethnicity (90%). Medical students comprised 69.1% ($n = 105$) of the cohort, with the remainder consisting of nursing students.

Empathy, mental health literacy, and stigma

Completion of the MAGIC programme did not produce a statistically significant change in scores on the Jefferson Scale of Empathy (JSE). In contrast, considerable pre-post improvements were observed on both the Opening Minds Scale for Healthcare Providers (OMS-HC-15) and the Mental Health Literacy Scale (MHLS), indicating a reduction in stigma and an enhancement of mental health literacy following participation in the program (**Figure 2**).

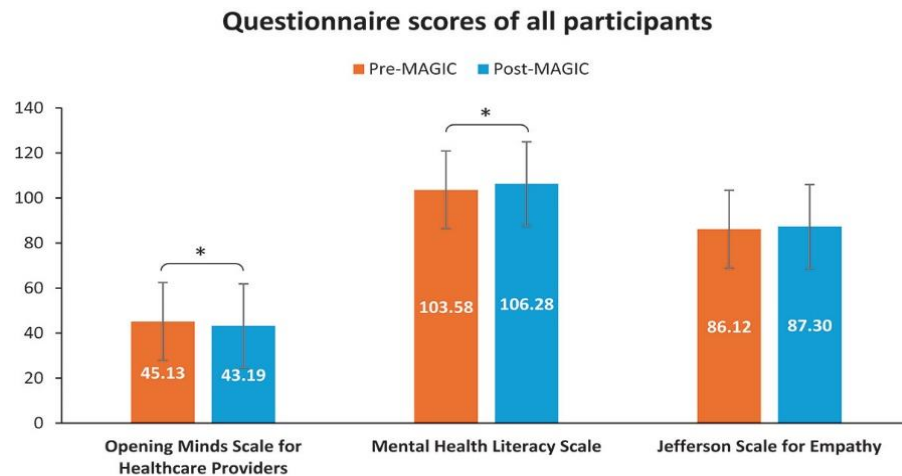


Figure 2. Comparison between participants' (a) Opening Minds Scale for Healthcare Providers (OMS-HC-15), (b) Mental Health Literacy Scale (MHLS), and (c) Jefferson Scale for empathy (JSE) questionnaire scores pre- and post-MAGIC

Participation in MAGIC was associated with measurable improvements in students' knowledge and attitudes. Mental health literacy scores rose significantly after the programme (pre-MAGIC mean = 103.58, SD = 48.10; post-MAGIC mean = 106.28, SD = 60.68; $t = -3.59$, $P < 0.001$), suggesting a greater understanding of mental health concepts. Attitudes toward mental illness also shifted positively, as reflected in lower OMS-HC-15 scores following the intervention (pre-MAGIC mean = 45.13, SD = 16.94; post-MAGIC mean = 43.19, SD = 20.35; $t = -1.64$, $P < 0.001$). In contrast, levels of empathy, as measured by the JSE, remained largely unchanged, with mean scores shifting only slightly from

86.12 (SD = 41.12) to 87.30 (SD = 45.96; $t = 3.86$, $P > 0.05$).

When medical and nursing students were analysed separately, their outcomes mirrored the overall trends, and no significant differences emerged between the two subgroups.

Confidence in managing agitation

Students expressed increased assurance in their ability to communicate with and de-escalate agitated patients following the programme. Post-MAGIC responses indicated significantly higher levels of perceived competence and confidence in managing agitation-related encounters (**Figure 3**).

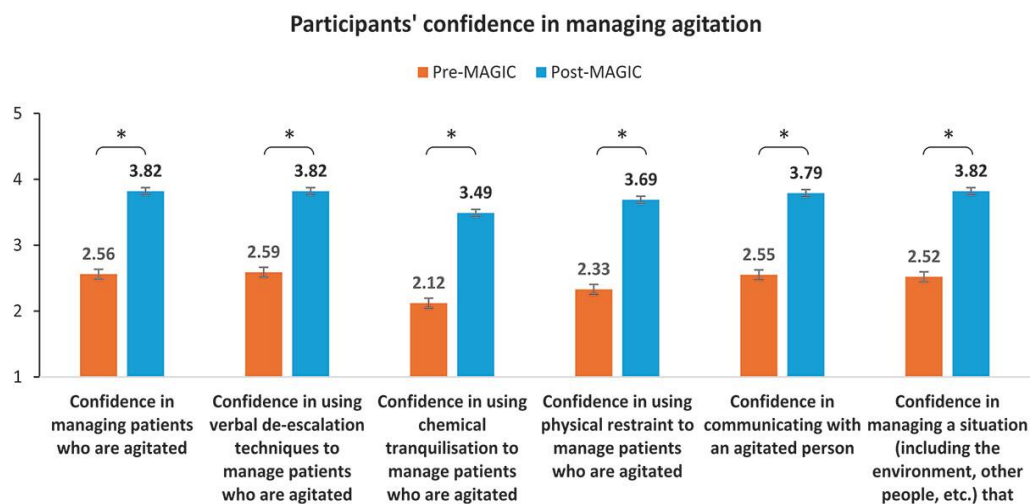


Figure 3. Comparison between confidence levels of participants (as measured based on a 7-point Likert scale) pre- and post-MAGIC

Following participation in MAGIC, students reported marked gains in their confidence to manage agitation. Mean confidence ratings increased from 2.56 (SD = 1.24) before the intervention to 3.82 (SD = 1.24) afterwards ($t = -11.12$, $P < 0.001$). A similar trend was observed in communication-related confidence, with scores rising from a pre-MAGIC mean of 2.55 (SD = 1.23) to 3.79 (SD = 1.03) post-MAGIC ($t = -11.37$, $P < 0.001$).

When examined by discipline, medical students consistently rated themselves as more confident than their nursing counterparts in both managing agitated patients and handling agitation-related scenarios, with

subgroup analyses confirming significant differences across pre- and post-intervention ratings.

Experiences with VRAM

Students' feedback on the VRAM simulation was overwhelmingly favourable. The vast majority of participants achieved scores above the recommended thresholds on the VRNQ, with 98.6% surpassing the minimum standard (≥ 100) and 95.4% exceeding the more stringent cut-off (≥ 120), underscoring both the acceptability and usability of the VR platform (**Figure 4**).

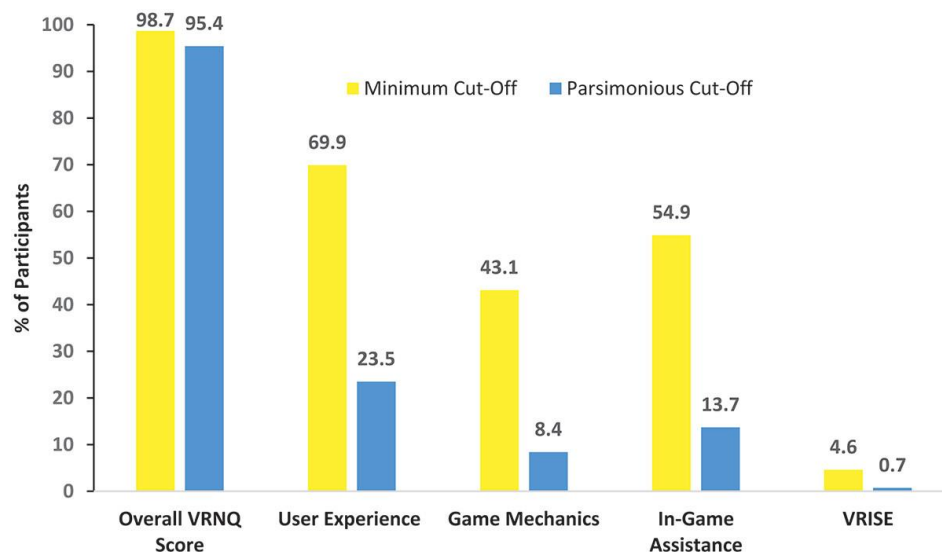


Figure 4. Proportion of participants whose scores surpassed the minimum and parsimonious thresholds for each VRNQ sub-domain and the overall scale; *VRISE* = virtual reality-induced symptoms and effects

Most students reached the benchmark values for user experience, game mechanics, and in-game assistance, which correspond to a median item score of 5 or higher. These results suggest that the VRAM programme was not only intuitive and accessible but also sufficiently robust for use in teaching contexts. In contrast, very few participants exceeded the cut-offs for VRISE (4.6% at the minimum level and 0.7% at the parsimonious level), indicating that adverse effects such as dizziness or disorientation were rarely encountered and did not compromise usability.

Feedback on the overall VRAM experience was strongly positive. Nearly all participants (90.8%, $n = 138$) considered the simulated encounters both authentic and pedagogically valuable (**Figure 5**). A substantial majority (84.9%, $n = 129$) also perceived VR-based training as more effective than conventional formats such as lectures. Importantly, three-quarters of respondents (75.7%, $n = 115$) expressed a willingness to engage with the software again, highlighting its potential for ongoing application in healthcare education.

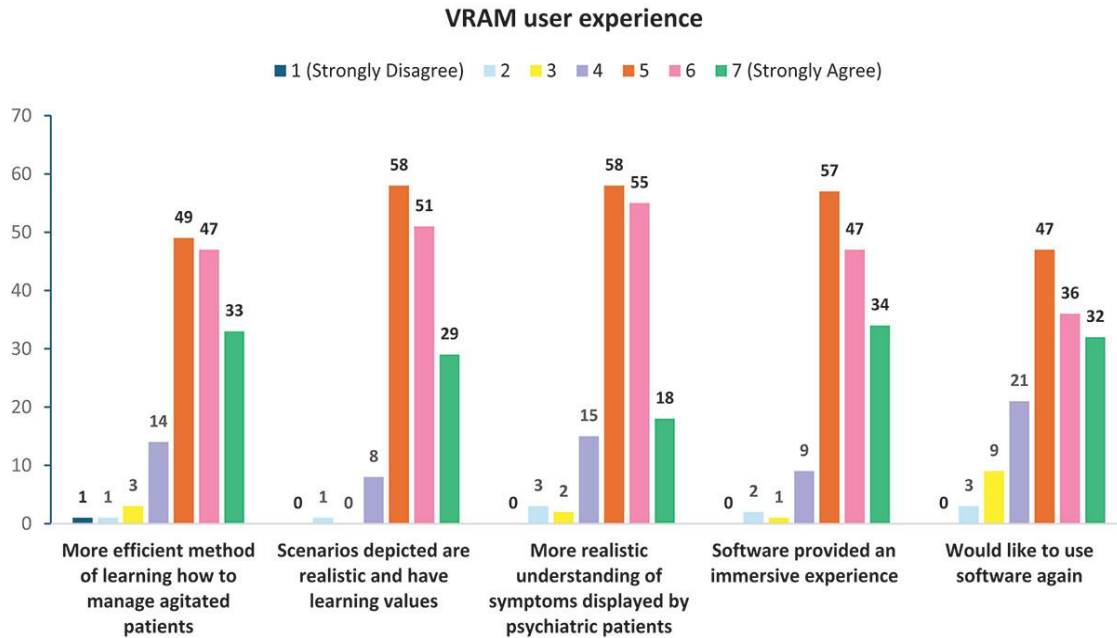


Figure 5. Distribution of participants' ratings (on a 7-point Likert scale) of statements elucidating their experiences with using the VRAM software

No notable differences emerged between medical and nursing students in how they rated their experience with VRAM, suggesting that the simulation was equally well received across disciplines.

Evaluation of the MAGIC programme

Three-quarters of the cohort ($n = 115$) reported that the programme improved their understanding of how to approach and manage agitation in patients. A significantly larger proportion, 87.5% ($n = 133$), indicated that they would recommend MAGIC to their peers, citing its usefulness and relevance (**Figure 6**).

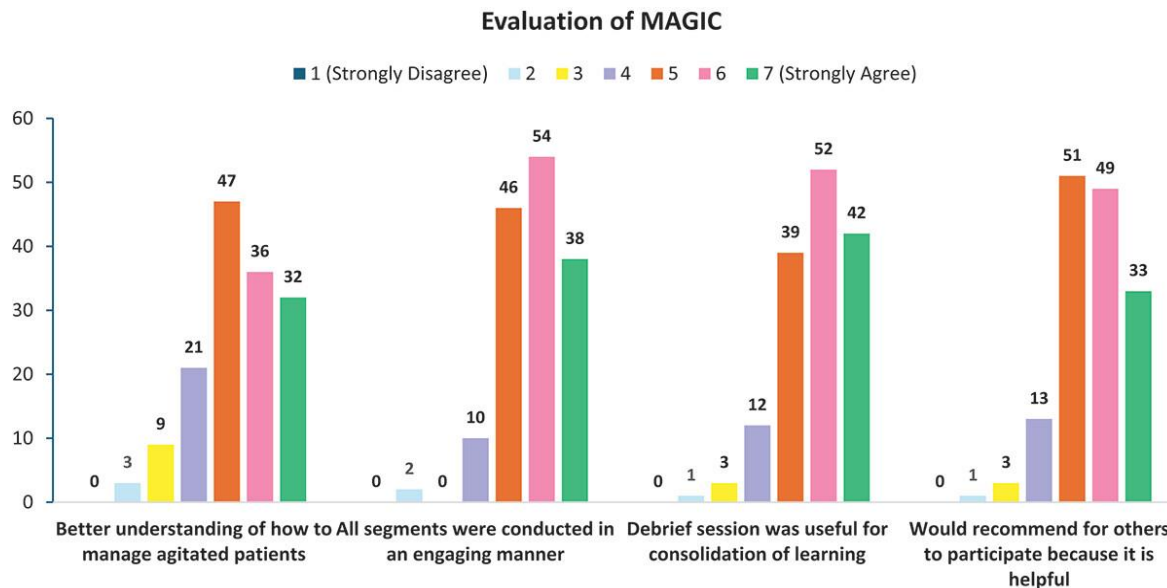


Figure 6. Distribution of participants' ratings (on a 7-point Likert scale) of statements evaluating the MAGIC program

Additionally, 90.8% ($n = 138$) of students agreed that the different components of the MAGIC programme were engaging, while 87.5% ($n = 133$) felt that the tutor-led debrief was especially effective in consolidating their learning. Comparative analyses revealed no significant differences between medical and nursing students in their evaluation of the programme.

The overall response to both VRAM and MAGIC was highly favourable. Students highlighted the realism of the VR scenarios and the integration of explicit learning objectives as key strengths, and many viewed VR as a more effective tool for mastering agitation management than traditional methods. These findings align with prior work demonstrating that authentic, immersive learning environments can deepen engagement, enhance knowledge retention, and better equip students for clinical practice [49, 70]. As Olufunke *et al.* [71] argue, realism fosters motivation and supports long-term learning by providing experiences that are both practical and directly relevant to clinical care.

In line with this, the present study found improvements in mental health literacy, a reduction in stigma, and an increase in confidence in managing agitation. Many participants felt that MAGIC broadened their understanding of agitation management and expressed a strong willingness to recommend the programme to peers, underscoring its perceived educational value.

The significant gains in MHLS scores suggest that MAGIC improved students' understanding of mental health conditions, while reductions in OMS-HC-15 scores indicate diminished stigmatising attitudes. These outcomes are consistent with research showing that practical and experiential learning helps healthcare students better recognise symptoms, evaluate treatment approaches, and understand the multifaceted nature of mental health [72, 73]. Seow *et al.* [72], for instance, note that clinical exposure sharpens awareness of the complexity of patient care, which in turn may explain the improvements observed here. Engaging with a simulated patient experiencing drug-induced psychosis through VRAM likely encouraged participants to consider patients' lived experiences in greater depth, thereby fostering empathy and reinforcing learning [74–76].

As students progressed through MAGIC, their existing assumptions and stereotypes may have been challenged, leading to attitudinal shifts. This interpretation is supported by earlier studies showing that clinical placements in mental health settings can enhance student confidence and attitudes towards psychiatric care [77, 78]

and that simulation-based experiences can reduce stigma and discriminatory behaviours towards individuals with mental health conditions [78, 79]. Such changes are critical, as reducing stigma is central to improving the quality and accessibility of care for patients with psychiatric conditions.

Given the short three-hour interval between the pre- and post-MAGIC assessments, it is unsurprising that no measurable changes were observed in empathy scores on the JSE. Empathy is widely recognized as a multidimensional construct that develops gradually through repeated and sustained exposure to interventions designed to cultivate perspective-taking and compassionate behavior [80, 81]. A single workshop is unlikely to produce detectable shifts, particularly when individual factors such as baseline empathy, personality traits, and prior clinical exposure strongly influence outcomes [82, 83]. Students entering the programme with already high empathy levels, for instance, would have limited scope for measurable gains. Nevertheless, MAGIC provides a vital starting point by introducing empathy-related frameworks and strategies, which may serve as a foundation for deeper skills development over the course of clinical training.

By contrast, significant gains were observed in participants' self-rated competence and confidence in both managing agitation and communicating with agitated patients. These improvements can be attributed to the immersive qualities of VRAM, which extend learning beyond what can be achieved in traditional lectures [84]. The Cognitive Affective Model of Immersive Learning (CAMIL) suggests that VR environments promote the integration of factual, conceptual, and procedural knowledge, supporting both skill acquisition and transfer [85]. Consistent with this model, simulation-based training has repeatedly been shown to enhance students' confidence, decision-making ability, and clinical performance [84, 86]. In particular, VR offers a safe but realistic context for practising rapid assessment and intervention in high-pressure situations, allowing students to refine their responses under time constraints [47, 87, 88]. Evidence from controlled studies further supports these outcomes, showing that simulation-based exposure significantly improves knowledge and proficiency in managing acute psychiatric agitation [86].

Repeated practice in simulated environments appears especially valuable for consolidating decision-making skills and strengthening clinical competence [39, 42]. VR

not only supports iterative practice but also accelerates the mastery of specific techniques, as demonstrated in studies showing improved procedural efficiency and confidence through repetition [89, 90]. Nursing students in psychiatric care placements have similarly reported heightened confidence following simulation-based training [91], reinforcing the importance of experiential approaches. By combining didactic instruction with immersive VR scenarios, MAGIC equips students to transition more effectively from classroom learning to real-world clinical encounters.

Another important finding relates to the role of VR in reducing learners' anxiety during challenging patient interactions. Simulation can help students develop coping mechanisms and emotional regulation strategies, preparing them to remain calm in the face of unpredictable behaviours, a critical skill in psychiatric contexts [91, 92].

The overwhelmingly favourable VRNQ ratings and the very low incidence of cybersickness provide further evidence of VRAM's acceptability and usability [68, 69]. Participants consistently endorsed its design features, including user experience, game mechanics, and in-game support, emphasising the tool's intuitive and engaging nature. Taken together, these findings indicate that VRAM represents a safe and effective educational platform. Expanding the repertoire of scenarios beyond agitation could broaden its utility as a flexible resource for psychiatric education, enabling learners to develop a broader range of competencies while safeguarding the well-being of both patients and students.

VRAM represents an innovative addition to psychiatric medical education, enriching traditional didactic teaching with experiential learning. By providing a safe, controlled environment, the simulation allows students to practise managing agitation without the risk of patient harm or the pressure to make flawless decisions. This fosters greater confidence, competence, and readiness for real-world interactions. Importantly, the need to make rapid, context-sensitive decisions during VR scenarios also encourages continuous reflection, reinforcing learning, sharpening critical thinking, and supporting the development of effective management strategies [7, 93, 94].

Nevertheless, VR training has inherent limitations. Simulations, while realistic, cannot fully replicate the complexity of clinical settings or the variability of patient presentations. Learners' experiences may also differ depending on their comfort with technology, learning

styles, or susceptibility to disorientation, which can influence engagement and outcomes [95]. These factors must be acknowledged when interpreting the findings.

Several methodological considerations further qualify the results of this study. First, as MAGIC was a compulsory part of the curriculum, it was not possible to include a control group, restricting causal inference. Second, outcomes were assessed immediately post-intervention, which prevented conclusions about the durability of the effects. Third, reliance on self-reported measures introduces the possibility of response bias. Fourth, only a single VR scenario was used, limiting generalisability across different psychiatric contexts. Fifth, data from medical and nursing students were combined to reflect the programme's interdisciplinary design; however, the differing emphases of their training—pharmacological knowledge in medicine versus behavioural and therapeutic approaches in nursing—may have influenced engagement with MAGIC. Lastly, the relative homogeneity of the sample limited the scope for meaningful subgroup analyses. Future work should therefore include control conditions, longer-term follow-up, objective performance-based measures, a broader range of VR scenarios, and stratified analyses by discipline.

Despite these limitations, the MAGIC programme demonstrated significant educational value. Participants reported enhanced mental health literacy, reduced stigma, and increased self-perceived competence and confidence in managing agitation. These findings highlight the promise of integrating VR into psychiatric healthcare education as part of a blended approach that balances didactic, experiential, and reflective learning. Beyond immediate skill acquisition, embedding such training in curricula may help cultivate empathy, resilience, and preparedness among future healthcare workers, potentially reducing burnout and attrition while strengthening the workforce's ability to deliver effective, compassionate care.

Acknowledgments: None

Conflict of Interest: None

Financial Support: None

Ethics Statement: None

References

- Manning T, Bell SB, Dawson D, Lyman M, Keane J, Lin J, et al. The utilization of a rapid agitation scale and treatment protocol for patient and staff safety in an inpatient psychiatric setting. *Psychiatr Q*. 2022;93(3):915–25.
- Alharbi AA, Alqassim AY, Alharbi AA, Alzahrani SH, Alzahrani A, Alghamdi SA, et al. Variations in length of stay of inpatients with COVID-19: a nationwide test of the new model of care under Vision 2030 in Saudi Arabia. *Saudi J Biol Sci*. 2021;28(11):6631–8.
- Liu J, Gan Y, Jiang H, Li L, Dwyer R, Lu K, et al. Prevalence of workplace violence against healthcare workers: a systematic review and meta-analysis. *Occup Environ Med*. 2019;76(12):927–37.
- Elsaid N, Ibrahim O, Abdel-Fatah ZF, El-Sherbiny M, El-Awady S, Salem H, et al. Violence against healthcare workers during coronavirus (COVID-19) pandemic in Egypt: a cross-sectional study. *Egypt J Forensic Sci*. 2022;12(1):45.
- Nyangulu W, Sadimba C, Nyirenda J, Chizimba M, Chirwa T, Banda P, et al. Prevalence, forms, risk factors, and impact of violence towards healthcare workers during the COVID-19 pandemic in Malawi. *Res Square* [Preprint]. 2022. Available from: <https://www.researchsquare.com/article/rs-2095847/v2>
- Gharib C, Mefteh-Wali S, Jabeur SB. The bubble contagion effect of COVID-19 outbreak: evidence from crude oil and gold markets. *Finance Res Lett*. 2021;38:101703.
- Alobaidan F, Al-Bazroun MI, Al Aman H, Alharthi F, Alabdulwahab A, Alqahtani S, et al. Emergency department violence: a growing challenge for healthcare workers in Saudi Arabia. *Cureus*. 2024;16(1):e52455.
- Holloman GH, Zeller SL. Overview of project BETA: best practices in evaluation and treatment of agitation. *West J Emerg Med*. 2012;13(1):1–2.
- Cummings J, Mintzer J, Brodaty H, Katona C, Schneider LS, Tariot PN, et al. Agitation in cognitive disorders: international psychogeriatric association provisional consensus clinical and research definition. *Int Psychogeriatr*. 2015;27(1):7–17.
- Teece A, Baker J, Smith H. Identifying determinants for the application of physical or chemical restraint in the management of psychomotor agitation on the critical care unit. *J Clin Nurs*. 2020;29(1–2):5–19.
- Hine K. The use of physical restraint in critical care. *Nurs Crit Care*. 2007;12(1):6–11.
- Suliman M, Aljezawi M. Nurses' work environment: indicators of satisfaction. *J Nurs Manag*. 2018;26(5):525–30.
- Allen DE, Fetzer S, Siefken C, Carr R, Shuster J, Jones S, et al. Decreasing physical restraint in acute inpatient psychiatric hospitals: a systematic review. *J Am Psychiatr Nurses Assoc*. 2019;25(5):405–9.
- Cain P, Chejor P, Porock D. Chemical restraint as behavioural euthanasia: case studies from the Royal Commission into aged care quality and safety. *BMC Geriatr*. 2023;23(1):444.
- Chieze M, Hurst S, Kaiser S, Sentissi O, Gholam-Rezaee M, de Roten Y, et al. Effects of seclusion and restraint in adult psychiatry: a systematic review. *Front Psychiatry*. 2019;10:491.
- Fugger G, Gleiss A, Baldinger P, Dalkner N, Ratheiser I, Spiel G, et al. Psychiatric patients' perception of physical restraint. *Acta Psychiatr Scand*. 2016;133(3):221–31.
- Koh Poh Koon. Speech by Dr Koh Poh Koon, Senior Minister of State for Health, at the Ministry of Health Committee of Supply Debate 2022 [press release]. Singapore: Ministry of Health; 2022.
- Peng X, Ye Y, Ding X, Li X, Zhang L, Wang J, et al. The impact of nurse staffing on turnover and quality: an empirical examination of nursing care within hospital units. *J Oper Manag*. 2023;69(7):1124–52.
- Poon YR, Lin YP, Griffiths P, Yong KK, Wong ELY, Tiong WW, et al. A global overview of healthcare workers' turnover intention amid COVID-19 pandemic: a systematic review with future directions. *Hum Resour Health*. 2022;20(1):70.
- Bae SH. Noneconomic and economic impacts of nurse turnover in hospitals: a systematic review. *Int Nurs Rev*. 2022;69(3):392–404.
- Samadi SA, Biçak CA, Osman N, Ali M, Farooq F, Ahmad R, et al. Organizational challenges in healthcare services providers for individuals with autism spectrum disorder (ASD) considering personnel turnover rate. *Brain Sci*. 2023;13(4):544.

22. Pompili M, Ducci G, Galluzzo A, Serafini G, Girardi P. The management of psychomotor agitation associated with schizophrenia or bipolar disorder: a brief review. *Int J Environ Res Public Health*. 2021;18(8):4368.
23. Wong AW, Combellick J, Wispelwey BA, Anderson C, Cohen R, Levitt J, et al. The patient care paradox: an interprofessional qualitative study of agitated patient care in the emergency department. *Acad Emerg Med*. 2017;24(2):226–35.
24. Duncan G, Gable B, Schabbing M. Interdisciplinary simulation training reduces restraint use in the emergency department: a pilot study. *Cureus*. 2023;15(6):e39847.
25. Hojat M. Empathy and patient outcomes. In: Hojat M, ed. *Empathy in health professions education and patient care*. Cham: Springer; 2016. p. 189–201.
26. Beach MC, Inui T. Relationship-centered care: a constructive reframing. *J Gen Intern Med*. 2006;21(Suppl 1):S3–8.
27. Gerace A, Muir-Cochrane E. Perceptions of nurses working with psychiatric consumers regarding the elimination of seclusion and restraint in psychiatric inpatient settings and emergency departments: an Australian survey. *Int J Ment Health Nurs*. 2019;28(1):209–25.
28. Ye J, Wang C, Xiao A, Wu H, Zhang Y, Zhao L, et al. Physical restraint in mental health nursing: a concept analysis. *Int J Nurs Sci*. 2019;6(3):343–8.
29. Yildiz A, Ercan A, Müftüoğlu S. An evaluation of empathic tendencies of dietitians working in Ankara. *Nutr Diet*. 2019;76(4):438–43.
30. Chang S, Ong HL, Seow E, Abdin E, Samari E, Chua BY, et al. Stigma towards mental illness among medical and nursing students in Singapore: a cross-sectional study. *BMJ Open*. 2017;7(12):e018099.
31. O'Connor M, Casey L. The mental health literacy scale (MHLS): a new scale-based measure of mental health literacy. *Psychiatry Res*. 2015;229(1–2):511–6.
32. Samari E, Seow E, Chua BY, Ong HL, Abdin E, Chong SA, et al. Attitudes towards psychiatry amongst medical and nursing students in Singapore. *BMC Med Educ*. 2019;19(1):91.
33. Elendu C, Amaechi DC, Okatta AU, Chukwuma EC, Ezeoke CC, Nwachukwu SO, et al. The impact of simulation-based training in medical education: a review. *Medicine* (Baltimore). 2024;103(27):e38813.
34. Das V, Daniels B, Kwan A, George S, Sahu S, Kumar A, et al. Simulated patients and their reality: an inquiry into theory and method. *Soc Sci Med*. 2022;300:114571.
35. Baugh RF, Hoogland MA, Baugh AD. The long-term effectiveness of empathic interventions in medical education: a systematic review. *Adv Med Educ Pract*. 2020;11:879–890.
36. Bearman M, Palermo C, Allen LM, Williams B. Learning empathy through simulation: a systematic literature review. *Simul Healthc*. 2015;10(5):308–19.
37. Kiegaldie D, Shaw L. Virtual reality simulation for nursing education: effectiveness and feasibility. *BMC Nurs*. 2023;22(1):488.
38. Goh ZZS, Chan LG, Lai JY, Lim ZX, Tan EY, Abdin E, et al. Impact of COVID-19 on mental health and social service provision in Singapore: learnings from a descriptive mixed-methods study for future resource planning. *Ann Acad Med Singap*. 2023;52(5):239–48.
39. Koblar S, Cranwell M, Koblar S, Radford J. Developing empathy: does experience through simulation improve medical-student empathy? *Med Sci Educ*. 2018;28(1):31–6.
40. Shin D. Empathy and embodied experience in virtual environment: to what extent can virtual reality stimulate empathy and embodied experience? *Comput Hum Behav*. 2018;78:64–73.
41. Indarwati F, Primanda Y. Determinants of nursing students' confidence in peripheral intravenous catheter insertion and management. *Open Access Maced J Med Sci*. 2021;9(T4):152–7.
42. Lee Y, Kim SK, Eom MR, Lee JY, Park SY, Kang Y, et al. Usability of mental illness simulation involving scenarios with patients with schizophrenia via immersive virtual reality: a mixed methods study. *PLOS ONE*. 2020;15(9):e0238437.
43. Davidson C, Ewert A, Chang Y. Multiple methods for identifying outcomes of a high challenge adventure activity. *J Exp Educ*. 2016;39(2):164–78.
44. Isaak J, Devine M, Gervich C, Slattery A, Boyd D, Patrick S, et al. Are we experienced? Reflections on the SUNY experiential learning mandate. *J Exp Educ*. 2018;41(1):23–38.
45. Tay JL, Qu Y, Lim L, Koh HL, Sim K, Verma S, et al. Impact of a virtual reality intervention on stigma,

- empathy, and attitudes toward patients with psychotic disorders among mental health care professionals: randomized controlled trial. *JMIR Ment Health*. 2025;12:e66925.
46. Lin HL, Wang YC, Huang ML, Chang CW, Hsu YH, Lin YT, et al. Can virtual reality technology be used for empathy education in medical students: a randomized case-control study. *BMC Med Educ*. 2024;24(1):1254.
 47. Owens K, Keller S. Exploring workforce confidence and patient experiences: a quantitative analysis. *Patient Exp J*. 2018;5(1):97–105.
 48. Pottle J. Virtual reality and the transformation of medical education. *Future Healthc J*. 2019;6(3):181-5.
 49. Hamilton D, McKechnie J, Edgerton E, Wilson C. Immersive virtual reality as a pedagogical tool in education: a systematic literature review of quantitative learning outcomes and experimental design. *J Comput Educ*. 2021;8(1):1–32.
 50. Chung JJ, Qiu JM, Chaikof EL, Oklu R, Ganguli S, Walker TG, et al. Multidisciplinary care initiative: a paradigm shift in the pre-clinical curriculum. *Med Educ*. 2021;55(5):644.
 51. Waluyo B, Balazon FG. Exploring the impact of gamified learning on positive psychology in CALL environments: a mixed-methods study with Thai university students. *Acta Psychol*. 2024;251:104638.
 52. Vesisenaho M, Juntunen M, Häkkinen P, Pöysä-Tarhonen J. Virtual reality in education: focus on the role of emotions and physiological reactivity. *J Virtual Worlds Res*. 2019;12(1):12.
 53. James W, Oates G, Schonfeldt N. Improving retention while enhancing student engagement and learning outcomes using gamified mobile technology. *Acc Educ*. 2024;34(3):366–86.
 54. Goh YS, Seetoh YM, Chng ML, Chew SY, Wang W. Using empathetic CARE and REsponse (ECARE) in improving empathy and confidence among nursing and medical students when managing dangerous, aggressive and violent patients in the clinical setting. *Nurse Educ Today*. 2020;94:104591.
 55. Guimbarda N, Boghani F, Tews M, Salib S, Reilly K, Reiter DA, et al. A comparison of two debriefing rubrics to assess facilitator adherence to the PEARLS debriefing framework. *Simul Healthc*. 2024;19(6):358–66.
 56. Wilson A, Asbury E. Improving simulation debriefing in paramedic education: the Paramedic Debrief Model. *Australas J Paramed*. 2019;16:1–10.
 57. Hojat M, Mangione S, Nasca TJ, Cohen MJM, Gonnella JS, Erdmann JB, et al. The Jefferson scale of physician empathy: development and preliminary psychometric data. *Educ Psychol Meas*. 2001;61(2):349–65.
 58. Hojat M, DeSantis J, Shannon SC, Mortensen LH, Speicher MR, Bragan L, et al. The Jefferson scale of empathy: a nationwide study of measurement properties, underlying components, latent variable structure, and national norms in medical students. *Adv Health Sci Educ Theory Pract*. 2018;23(5):899–920.
 59. Mahoney AEJ, Hobbs MJ, Newby JM, Mason EC, McAloon J, Andrews G, et al. The worry behaviors inventory: assessing the behavioral avoidance associated with generalized anxiety disorder. *J Affect Disord*. 2016;203:256–64.
 60. Hojat M, Gonnella JS, Mangione S, Nasca TJ, Veloski JJ, Erdmann JB, et al. Empathy in medical students as related to academic performance, clinical competence and gender. *Med Educ*. 2002;36(6):522–7.
 61. Hsiao CY, Tsai YF, Kao YC. Psychometric properties of a Chinese version of the Jefferson scale of empathy-health profession students. *J Psychiatr Ment Health Nurs*. 2013;20(10):866–73.
 62. ElKhalil R, AlMekawi M, O'Connor M, Khansa I, Al-Shami M, Ibrahim H, et al. Measurement properties of the mental health literacy scale (MHLS) validation studies: a systematic review protocol. *BMJ Open*. 2024;14(4):e081394.
 63. McLuckie A, Kutcher S, Wei Y, Weaver C. Sustained improvements in students' mental health literacy with use of a mental health curriculum in Canadian schools. *BMC Psychiatry*. 2014;14(1):379.
 64. Moreira MBP, Pereira HP, Torres IN, Teles L, Ramos T, Lima I, et al. The stigma towards mental illness: Portuguese validation of the Opening Minds stigma scale for healthcare providers (OMS-HC). *Front Psychol*. 2024;15:1359483.
 65. Kassam A, Papish A, Modgill G, Patten S. The development and psychometric properties of a new scale to measure mental illness related stigma by health care providers: the Opening Minds Scale for

- Health Care Providers (OMS-HC). *BMC Psychiatry*. 2012;12(1):62.
66. Carrara BS, Sanches M, Bobbili SJ, Diniz JB, Zuardi AW, Loureiro SR, et al. Validation of the Opening minds scale for health care providers (OMS-HC): factor structure and psychometric properties of the Brazilian version. *Healthcare (Basel)*. 2023;11(7):1049.
 67. Modgill G, Patten SB, Knaak S, Kassam A. Opening minds stigma scale for health care providers (OMS-HC): examination of psychometric properties and responsiveness. *BMC Psychiatry*. 2014;14(1):120.
 68. Kourtesis P, Collina S, Doulas LAA, MacPherson SE. Validation of the virtual reality neuroscience questionnaire: maximum duration of immersive virtual reality sessions without the presence of pertinent adverse symptomatology. *Front Hum Neurosci*. 2019;13:417.
 69. Kourtesis P, Collina S, Doulas LAA, MacPherson SE. Validation of the virtual reality everyday assessment lab (VR-EAL): an immersive virtual reality neuropsychological battery with enhanced ecological validity. *J Int Neuropsychol Soc*. 2021;27(2):181–96.
 70. Herrington J, Reeves T, Oliver R. Immersive learning technologies: realism and online authentic learning. *J Comput High Educ*. 2007;19(1):80–99.
 71. Olufunke O-F, Harun JB, Zakaria MAZM. The benefits of implementing authentic-based multimedia learning in higher education institutions. *Open J Soc Sci*. 2022;10(9):74–86.
 72. Seow LSE, Verma SK, Mok YM, Chang S, Chong SA, Subramaniam M. Evaluating DSM-5 insomnia disorder and the treatment of sleep problems in a psychiatric population. *J Clin Sleep Med*. 2018;14(2):237–44.
 73. Saito AS, Creedy DK. Determining mental health literacy of undergraduate nursing students to inform learning and teaching strategies. *Int J Ment Health Nurs*. 2021;30(5):1117–26.
 74. Yang J, Li Y, Gao R, Xu Q, Zhang J, Chen H, et al. Relationship between mental health literacy and professional psychological help-seeking attitudes in China: a chain mediation model. *BMC Psychiatry*. 2023;23(1):956.
 75. van Loon A, Bailenson J, Zaki J, Bostick J, Willer R. Virtual reality perspective-taking increases cognitive empathy for specific others. *PLOS ONE*. 2018;13(8):e0202442.
 76. Ung TX, O'Reilly CL, Moles RJ, Wheeler AJ. Co-designing psychosis simulated patient scenarios with mental health stakeholders for pharmacy curricula. *Int J Clin Pharm*. 2023;45(5):1184–91.
 77. Wedgeworth ML, Ford CD, Tice JR. “I’m scared”: journaling uncovers student perceptions prior to a psychiatric clinical rotation. *J Am Psychiatr Nurses Assoc*. 2020;26(2):189–95.
 78. Foster K, Withers E, Blanco T, Lupson C, Steele M, Giandinoto JA, et al. Undergraduate nursing students’ stigma and recovery attitudes during mental health clinical placement: a pre/post-test survey study. *Int J Ment Health Nurs*. 2019;28(5):1068–80.
 79. Skoy ET, Eukel HN, Frenzel JE, Schmitz TM. Use of an auditory hallucination simulation to increase student pharmacist empathy for patients with mental illness. *Am J Pharm Educ*. 2016;80(8):142.
 80. Ghazwani S, Alshowkan A, AlSalah N. A study of empathy levels among nursing interns: a cross-sectional study. *BMC Nurs*. 2023;22(1):226.
 81. Yu CC, Tan L, Le MK, Leung K, Chan YH, Sim K, et al. The development of empathy in the healthcare setting: a qualitative approach. *BMC Med Educ*. 2022;22(1):245.
 82. Yang KT, Yang JH. A study of the effect of a visual arts-based program on the scores of Jefferson scale for physician empathy. *BMC Med Educ*. 2013;13(1):142.
 83. Tavakol S, Dennick R, Tavakol M. Empathy in UK medical students: differences by gender, medical year and specialty interest. *Educ Prim Care*. 2011;22(5):297–303.
 84. Virani S, Jarazadeh N, Kuo C, Keeva M, Boita C, Raysin A, et al. Avoiding the chill pill- results from a simulation-based verbal de-escalation training for psychiatry residents in a community mental health center. *J Intern Med Emerg Res*. 2023;4(1):27–44.
 85. Makransky G, Petersen GB. The cognitive affective model of immersive learning (CAMIL): a theoretical research-based model of learning in immersive virtual reality. *Educ Psychol Rev*. 2021;33(3):937–58.
 86. Vestal HS, Sowden G, Nejad S, Hughes T, Dyer E, Resnick M, et al. Simulation-based training for residents in the management of acute agitation: a

- cluster randomized controlled trial. *Acad Psychiatry*. 2017;41(1):62-7.
87. Sim JJM, Rusli KDB, Seah B, Ang ENK, Liaw SY. Virtual simulation to enhance clinical reasoning in nursing: a systematic review and meta-analysis. *Clin Simul Nurs*. 2022;69:26–39.
88. Al Gharibi MKA, Mnpdj A. Repeated simulation experience on self-confidence, critical thinking, and competence of nurses and nursing students – an integrative review. *Sage Open Nurs*. 2020;6:2377960820927377.
89. Mok TN, Chen J, Pan J, Ming WK, He Q, Sin TH, et al. Use of a virtual reality simulator for tendon repair training: randomized controlled trial. *JMIR Serious Games*. 2021;9(3):e27544.
90. Tang YM, Gwy N, Chia NH, Chan E, Lee ZY, Wang Q, et al. Application of virtual reality (VR) technology for medical practitioners in type and screen (T&S) training. *J Comput Assist Learn*. 2020;37(2):359–69.
91. Hudgins T, Camp-Spivey L, Lee S. Leveraging innovation to design a psychiatric mental health simulation for undergraduate nursing students during the COVID-19 global pandemic. *Nurs Educ Perspect*. 2021;44(1):59–60.
92. Hsiao CY, Lu HL, Chiu CK, Chen SH, Yang MY, Wu YT, et al. Factors associated with attitudes of mental health nurses towards the importance of families in mental health nursing care. *Int J Ment Health Nurs*. 2023;32(5):1429–38.
93. Mulkey MA, Munro CL. Calming the agitated patient: providing strategies to support clinicians. *Medsurg Nurs*. 2021;30(1):9–13.
94. Chaffkin J, Ray JM, Goldenberg M, Gurevich I, Stern TA. Impact of a virtual simulation-based educational module on managing agitation for medical students. *Acad Psychiatry*. 2022;46(4):495-9.
95. Macnamara AF, Bird K, Rigby A, Latif A, Vangala S. High-fidelity simulation and virtual reality: an evaluation of medical students' experiences. *BMJ Simul Technol Enhanc Learn*. 2021;7(6):528–35.