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Research Article

Are Artificial Intelligence Virtual Simulated Patients (AI-VSP) a Valid Teaching Modality for Health Professional Students?

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KEYWORDS
virtual simulation;
artificial intelligence;
learning tools;
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physician assistant

Abstract

Introduction: Simulation-based learning is robust, but the COVID pandemic created opportunities for novel modalities, including Artificial Intelligence Virtual Simulated Patient (AI-VSP) scenarios.

Methods: Between 2019 and 2022, the following health professional students experienced AI-VSP at one US university: (a) "Headache" scenario: 24 Family Nurse Practitioner (FNP) and 48 Physician Assistants (PA) students, (b) "Insomnia" scenario: 64 Bachelor of Science in Nursing (BSN) and 47 Accelerated Bachelor of Science in Nursing (ABSN) students. Each individually conducted a brief strongly encouraged encounter and subsequently optionally participated in our study.

Results: When asked about the scenario's realism, positive answers were 50% (FNP), 16% (PA), 63% (BSN), and 87% (ABSN). Also, 41% FNP, 52% PA, 65% BSN, and 82% ABSN felt capable of creating diagnoses and treatment plans as thoroughly as they would with human patients. Regarding improving diagnostic abilities, favorable responses were 73% (FNP), 74% (PA), 72% (BSN), and 90% (ABSN). When asked whether they would recommend AI-VSP encounters to others, 91% (FNP), 84% (PA), 93% (BSN), and 90% (ABSN) agreed.

Conclusions: AI-VSP scenarios were well accepted by students and demonstrated significant promise as a complementary simulation-based learning modality.

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Introduction

The outbreak of the humanitarian catastrophe of the COVID-19 pandemic magnified some of the challenges of health professions education, such as reduced lectures, technology-driven replacement of practical activities, and self-directed learning (Rose, 2020). In addition to losses, traumas, and scars, the threat to clinical practice and learning was dramatic (Nik Mohamed, Ab Aziz, Kamlun, & Othman, 2022). Lockdown and social isolation kept students away from universities (Hertrampf, Wenz, Kaduszkiewicz, & Goetz, 2022), and arguments for constructing innovative systems in a redesigned teaching experience included reduced patient encounters, shortened rotations, and the emergence of new curricular delivery methods. This situation demanded the expansion of pedagogical innovations, such as e-learning modules, virtual patients, and virtual reality simulators (Sahi, Mishra, & Singh, 2020).

Key Points
- After using AI-VSP, healthcare students self-reported improved history-taking and diagnosis ability.
- Students commented that the AI-VSP opportunity increased confidence before meeting real patients.
- Students agree that Artificial Intelligence-driven Virtual Simulation Patient (AI-VSP) is a supplemental learning tool but not a human interaction replacement.

Studies that evaluate the outcomes of simulation methods in nursing education date back to the early 1980s (McDowell et al., 1984). Simulation was introduced to assist clinical practice training and demonstrated advantages in improving learning motivation, communication ability, problem-solving, and nursing skills (Cant & Cooper, 2010; Warren et al., 2016). Later, virtual simulation proved a promising solution to fight against the high cost of standardized patients, manikins and the time-consuming and demanding nature of simulation (Shaikh et al., 2017). Various virtual simulation programs have been used in the nursing field (Farra et al., 2013; LaFond et al., 2015; Levett-Jones et al., 2015). Even prior to the start of the pandemic, there were calls for further exploration of virtual simulation in nursing education (Shin et al., 2019).

Since the COVID-19 pandemic outbreak, an increased number of studies have evaluated simulation and nursing students' knowledge, decision-making, and problem-solving skills. Despite the remaining concerns regarding the cost-effectiveness of simulation, a recent systematic review endorsed the promise of simulation-based teaching in enhancing cognitive, affective, and psychomotor domains of learning (Jarelnape & Sagiron, 2023)

There is limited literature on the use of simulation in physician assistant (PA) education. The first references antecede the early 2000s, including a call for manikin-based simulation in PA training (Issenberg et al., 2000), as well as the use of standardized patients (SP) as a formative evaluation of the objective structured clinical examination (OSCE) (Duerson & Multak, 1998; Fleek, 2003). A relatively recent US national survey on the use of simulation activities in PA education achieved a 36% response rate (Coerver et al., 2017). Respondent programs reported using simulation to assess interpersonal skills, medical knowledge, and psychomotor skills. They also reported an improvement in interprofessional skills when PA students practiced with other healthcare professions, such as medical students, nurses, pharmacists, paramedics, physical therapists, and respiratory therapists. There is still a lot to be explored regarding the relationship between PA education and simulation-based learning tools, but the pandemic has expanded the need for adaptation to the new normal in the training of these health professionals (Anderson, 2021; Hulsey et al., 2023).

It's been more than two decades since computer-assisted learning applications emerged as an essential part of undergraduate medical students' education (Greenhalgh, 2001). After almost a decade, virtual patients (VP) began to enter the mainstream of medical education. Reasons for the increased significance of simulation included: students' exposure to a broader range of patient scenarios than they were likely to encounter face-to-face during their training, providing safe alternatives to novices engaging in direct clinical practice, and using virtual patients as assessment tools (Ellaway, Poulton, Smothers, & Greene, 2009).

Despite technological limitations, the first publications involving Artificial Intelligence (AI) and its application

aiming to improve clinical skills date from the early 1990s (Klar & Bayer, 1990). Artificial Intelligence (AI) is a scientific domain focused on designing computer algorithms that mimic human tasks, such as clinical reasoning, experience-based learning, and interpretation (Bali, Garg, & Bali, 2019; Schinkel, Paranjape, Nannan Panday, Skyttberg, & Nanayakkara, 2019). Sapci and Sapci reviewed over three decades of peer-reviewed publications focused on AI education and proposed a framework for specialized AI training for different domains (Sapci and Sapci, 2020). Among publications analyzed, other authors have recommended strategies for AI operation, especially when simulated human patients were not an option. Combining AI and virtual reality (VR) in the healthcare education space leads to AI-driven Virtual Simulation Patients (AI-VSP) (Gowthaman et al., 2021). These developments enable more immersive training simulations, greater student critical thinking in a safe environment, and more natural "face-to-virtual-face" communication. Learners appear to connect with avatars (computer models that can interact and answer questions) similarly to their interactions with standardized or actual patients (Combs & Combs, 2019).

Consequently, we situate our work within the larger history of simulation-based innovations in health professions education. This study compares and analyzes healthcare students' impressions after encountering different AI-VSPs at a single US health sciences university. Our evaluation focused narrowly on: 1) scenario realism, 2) student willingness to be exposed to additional encounters, and 3) the impact on student self-perceived clinical reasoning capacities.

Methods

During 2019-2022, healthcare professional students from Samuel Merritt University (SMU) were exposed to Spark, a simulation tool developed by Patient Communication Simulators (PCS)(*PCS Spark*, 2024). PCS specializes in creating virtual patients, wearable simulations, and intelligent manikins for utilization within a web interface. As this research was conducted through a license agreement between PCS and SMU's Health Sciences Simulation Center, there was no direct cost to students. We used an observational cross-sectional study design to investigate the association between AI-VSP exposure in a classroom setting and students' self-perceived clinical reasoning capacities. To assess outcomes, in partnership with PCS, we designed a student-facing 13-item survey. The survey consisted of eight Likert-style, three open-ended, and two yes-no questions (Appendix 1). Our study was approved by SMU's Investigational Review Board (IRB).

The target population for the study was healthcare professional students from the Family Nurse Practitioner (FNP), Physician Assistant (PA), Bachelor of Science in Nursing (BSN), and Accelerated Bachelor of Science in Nursing (ABSN) programs. This population was selected based on a convenience sample of students exposed to AI-VSP scenarios during the 2019-2022 academic years. Each pilot study was designed in partnership with the faculty course director (e.g., location within the course, specific scenario selected, etc.). Some faculty elected to encourage student use by creating extra course credit for students who completed the AI-VSP encounters. Other faculty made the experience an ungraded but mandatory assignment. Regardless of the implementation strategy within any given course, students were not required to participate in our research. The final eligible study population was the following student groups: 1) Second-year FNP students (Sacramento) enrolled in a 'Clinical Practicum' course in fall 2019 (N = 24 students), 2) First-year PA students (Oakland) enrolled in an 'Integrating Seminar II' course in spring 2020 (N = 48), 3) First-year BSN students (Oakland) enrolled in a 'Psychiatric Mental Health Nursing' course in fall 2021 (N = 64), and 4) First-year ABSN students (San Francisco-Peninsula) enrolled in a 'Psychiatric Mental Health Nursing' course in spring 2022 (N = 47). There was a single wave of data collection; no follow-up was done regarding downstream outcomes. We did not have a control group of students for comparison.

All students participated in a planned prebriefing activity co-facilitated by an SMU simulation educator and the course director who embedded this simulation experience. This prebriefing, a synchronous 30-minute group orientation, included: 1) best practices in simulation-based education (e.g., fiction contract, psychological safety, commitment to confidentiality, etc.), 2) situating AI-VSPs within the spectrum of simulation modalities, 3) a brief demo of an encounter using the simulation product, and 4) solicitation to participate in this research study. There were two separate AI-VSP scenarios presented to the students. The FNP and PA students received a scenario with a patient's chief concern of 'headaches'. In contrast, the BSN and ABSN students' patient's chief concern was 'insomnia' (though the underlying cause was a major depressive episode). Subsequently, each student conducted a 10-20 minute encounter on their own screen device sometime during their active course dates. Shortly after completing their encounters, all students were invited to voluntarily complete our post-AI-VSP encounter research survey. To maximize candor and response rate, students were allowed to leave all demographic questions blank per their preference.

The study population consisted of healthcare professional students from four different programs at different semesters with differing levels of education at the point of AI-VSP exposure. Furthermore, students were exposed to two different case scenarios. To address these potential confounders, we analyzed each cohort separately and

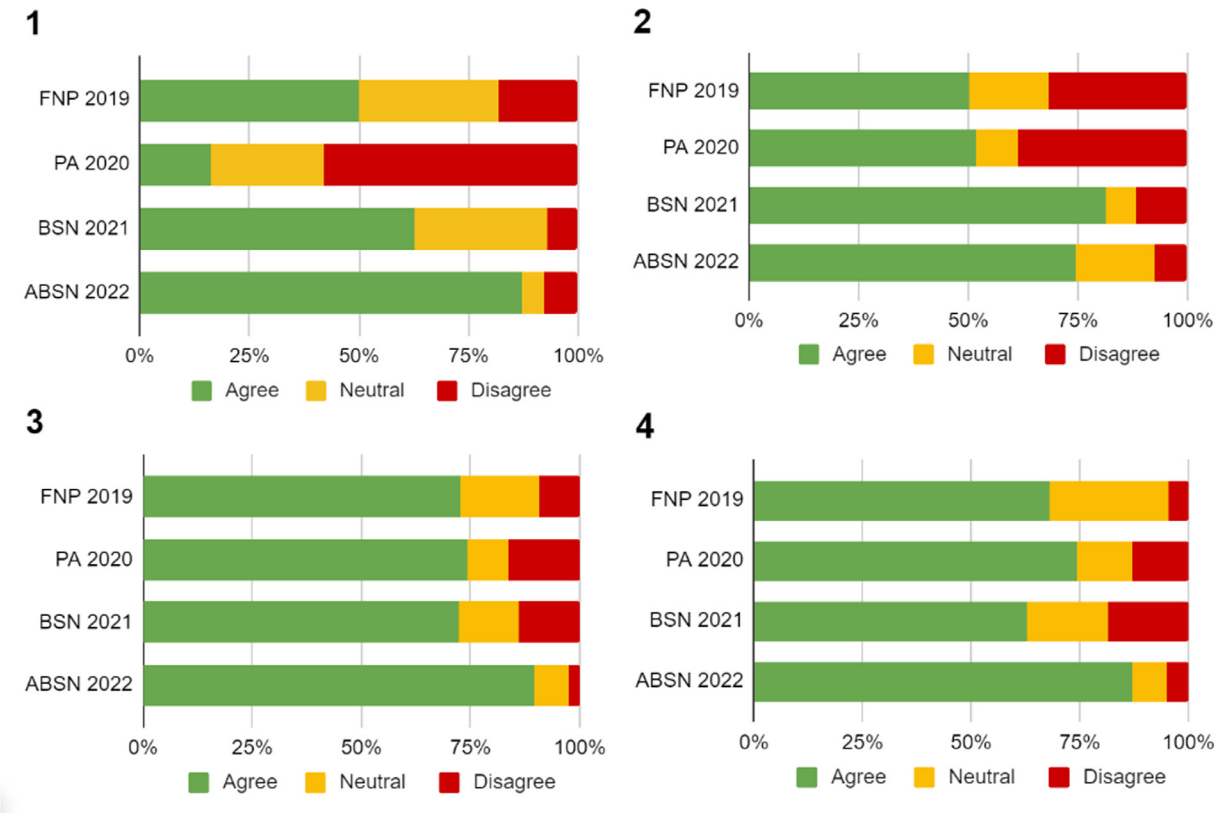

Figure 1 (1) Students' answers regarding the Likert-Item *"My interaction with Spark felt realistic (e.g., environment, avatar, voices)."* (2) Students' answers regarding the Likert-Item *"I gave this virtual patient my full attention and developed a diagnosis and plan of care for the chief complaint just as thoroughly as I would have done with a human patient in clinic."* (3) Students' answers regarding the Likert-Item *"I feel virtual patient experiences could help me improve my diagnosis ability."* (4) Students' answers regarding the Likert-Item *"I would recommend Spark to other healthcare learners interested in practicing history-taking."* Note: ABSN =Accelerated Bachelor of Science in Nursing; BSN =Bachelor of Science in Nursing; FNP =Family Nurse Practitioner; PA =Physician Assistant.

did not combine results across different cohorts that were exposed to identical scenarios. This biased our results towards the null hypothesis, therefore minimizing the risk of falsely positive results.

Results

Response rates for the 'headache' scenario were 91.6% for FNP (22/24) and 64.5% for PA (31/48). Response rates for the 'insomnia' scenario were 67.2% for BSN (43/64) and 82.9% for ABSN (39/47).

We have elected to summarize here only key highlights from our results. Some students reported technical problems regarding their internet connection and computer updates. We did not include those comments in this summary because they were unrelated to our outcomes of interest. To further simplify, we consolidated Likert responses as follows: 'Strongly Disagree' and 'Disagree' responses were pooled into 'Disagree', and 'Strongly Agree', and 'Agree' were pooled into 'Agree'.

Figure 1 and Table 1 summarize four of the eight Likert-style items across all four cohorts of learners.

The item "*My interaction with Spark felt realistic (e.g., environment, avatar, voices)*" was agreed upon by 50% of FNP and 16.1% of PA ("headache" scenario), as well as 62.7% of BSN, and 87% of ABSN ("insomnia" scenario).

When confronted with the item *"I gave this virtual patient my full attention and developed a diagnosis and plan of care for the chief complaint just as thoroughly as I would have done with a human patient in clinic,"* the positive answers were 41% for FNP, 51.6% for PA, 65% for BSN and 82% for ABSN.

The third Likert item was, "*I feel virtual patient experiences could help me improve my diagnosis ability*," and 72.7% of FNPs, 74% of PAs, 72% of BSN, and 89.7% of ABSN acknowledged. Although we are aware that BSN students do not perform clinical diagnosis in the traditional sense of the word, some educators refer to "nursing diagnosis" when accessing patients. For this reason, we chose to use 'diagnosis' throughout this manuscript across all student groups.

The last Likert item was "*I would recommend Spark to other healthcare learners interested in practicing history-taking*." The positive percentages for the 'headache'

Table 1 – Likert-Item Responses Across Study Population

	FNP			PA			BSN			ABSN		
Case/Scenario	"Headache"						"Insomnia" (depression)					
Year of encounter	Fall 2019			Spring 2020			Fall 2021			Spring 2022		
N of respondents	22 (91.6%)			31 (64.5%)			43 (67.2%)			39 (82.9%)		
	A	N	D	A	N	D	A	N	D	A	N	D
My interaction with Spark felt realistic (e.g., environment, avatar, voices).	11	7	4	5	8	18	27	13	3	34	2	3
I gave this virtual patient my full attention and developed a diagnosis and plan of care for the chief complaint just as thoroughly as I would have done with a human patient in clinic.	11	4	7	16	3	12	35	3	5	29	7	3
I feel virtual patient experiences could help me improve my diagnosis ability.	16	4	2	23	3	5	31	6	6	35	3	1
I would recommend Spark to other healthcare learners interested in practicing history-taking.	15	6	1	23	4	4	27	8	8	34	3	2

Note. A = agree or strongly agree; ABSN = Accelerated Bachelor of Science in Nursing; BSN = Bachelor of Science in Nursing; D = disagree or strongly disagree; FNP = Family Nurse Practitioner; N = neutral; PA = Physician Assistant.

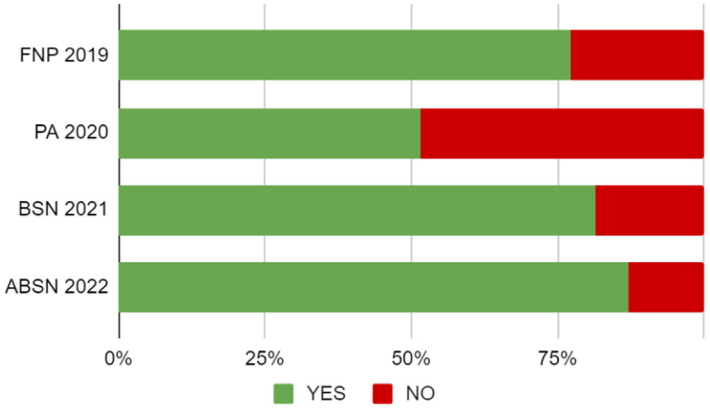

Figure 2 Students' answers regarding the yes-no item *"This scenario helped me with history-taking and developing a differential diagnosis shortlist."* Note:ABSN =Accelerated Bachelor of Science in Nursing; BSN =Bachelor of Science in Nursing; FNP =Family Nurse Practitioner; PA = Physician Assistant.

scenario were 90% and 84% (FNP and PA, respectively), and the positive percentages for the 'insomnia' scenario were 93% and 90% (BSN and ABSN, respectively).

Figure 2 compares the responses to the yes-no item *"This scenario helped me with history-taking and developing a differential diagnosis shortlist"* to which 77% of FNP, 51.6% of PA, 81% of BSN, and 87% of ABSN said 'yes'.

Figure 3 compares answers to the yes-no item *"Would you like to be exposed to other AI-VSP's with different health conditions?"* After the encounter, 91% of FNP, 83.8% of PA, 93% of BSN, and 89.7% of ABSN were interested in more exposure.

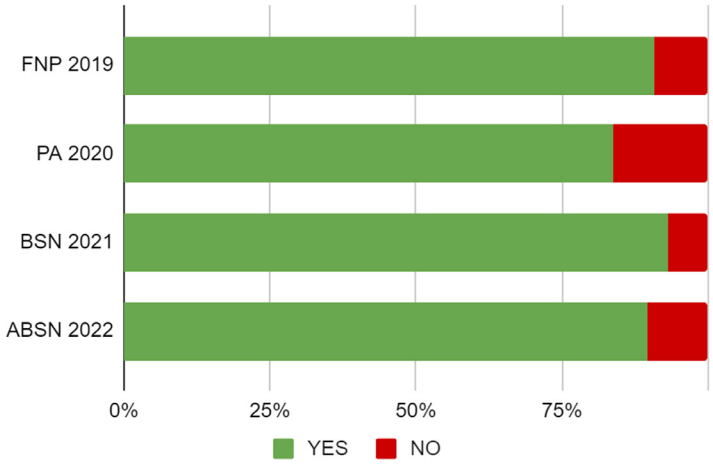

Figure 3 Students' answers regarding the yes-no item *"Would you like to be exposed to other AI-VSP's with different health conditions?"* Note. ABSN = Accelerated Bachelor of Science in Nursing; BSN = Bachelor of Science in Nursing; FNP = Family Nurse Practitioner; PA = Physician Assistant.

Open-Ended Questions

One question asked for recommendations to improve the AI-VSP encounter experience. In 2019, FNP answers included a "*larger database of questions,*" "*better language recognition,*" students "*being able to ask more complex questions,*" and *a "greater question bank and phrasing she [the AI] can answer to.*" Applicants thought the AI had potential, but it took much work to figure out how to ask the correct question.

In 2020, many PA students complained about issues with AI-VSPs' capacity to understand the questions and provide the correct answer. Some examples include: *"My questions were not answered appropriately or at all due to lack of understanding on the AI side."*, "*It is hard when the AI can't answer a question, and then you get stuck and figure out a better way to ask the question and still not get the right answer.*" Other students reported a desire to improve the scenario's realism. Some of their suggestions included "*Give the avatars more of a personality so that it feels more realistic*," "*Could they show distress, emotions and ill appearance?*" and "*If the virtual reality patient can be more real like, with emotions, facial expressions and less of an animated voice.*"

In 2021, we received less detailed answers from BSN students. Many said N/A (nothing to add) or, "*I think a detailed feedback at the end of the assignment would be great,*" and "*Just a little more help with navigating what to do with the patient.*"

In 2022, the ABSN students who answered the survey asked for feedback on improving their encounters and offered ways to improve the platform. Examples included:

"*At the end of each encounter, have a list of items that you should be covering to show what you missed so that we can go back and practice and get better,*" "*More physical assessment tools and being able to order labs,*" and "*At the end of the encounter, offer ways to improve.*" One student also complained, "*AI's voice was not as realistic.*"

Another open-ended question asked students to describe other simulation scenarios where they felt an AI-VSP would benefit their training. Examples of FNP ideas: "*I think it would be beneficial during the first semester when we are first trying to do a focused exam.*", "*When first learning and practicing SOAP format simple diagnosis with a clear plan, like allergic rhinitis, knee pain, etc.*"

A year later, some PA students gave detailed responses to our query for feedback about the AI-VSPs: "*I think history taking is probably the most pertinent use of these patients at this point.*" "*I think a virtual patient would be beneficial in taking virtual physical exams.*" Other participants answered positively and were inclined to practice more: "*I think it is a pressure/judgmental-free way to become more confident in asking questions. If this was available all semester, it could really help us with our questioning and patient interviews regardless of the flaws in the AI's understanding/ answering.*", "*I accessed the virtual patient many times with the same scenario, but I would like an opportunity to practice my patient interview, differential diagnosis, and plan/prescription skills with other clinical scenarios.*", "*I would love to use these all the time. Honestly, it would be great to make one for every IS [Integrating Seminar] case we have, so before we discuss it as a class, we would practice the scenario and share what we think. May reduce the time frame of IS in the future as well.*"

Despite the willingness to practice with the VPs, other PA students clarified that actual patients were critical: "*I think it is a good practice, though it is not as great as the real thing. I think it is a great way to get comfortable asking specific questions related to the CC [Chief Concern] and developing your DDx [Differential Diagnosis]. I think it is a quick and easy way to practice, and by making us*

practice helps us tremendously." Additionally, one PA student anticipated that COVID would change the healthcare environment, and practice with VPs would be necessary: "*With COVID, I know it's highly likely that telemedicine will be preferred and utilized more commonly for future patient encounters. So, I think it will be good practice and training session to perform virtual physical exams.*"

BSN and ABSN students reported practical applications for the AI-VSPs in 2021 and 2022, respectively. For example, "*Cardiac Assessment or Respiratory Assessment,*" "*Patient with a psychotic disorder,*" "*Assessing wounds and lesions,*" "*Prepare for exams,*" and "*Any sensitive topics like death would be helpful to be practiced on a virtual patient.*" One ABSN student recognized the impact of COVID on his education and proposed a way to ease it: "*Well, since I also only got like 1/2 of the in-person clinical hours I was supposed to, I would recommend the school do everything they can to get more virtual opportunities for the students*."

Our final open-ended question invited students to share whatever they wanted about their simulation experience. Consistent with the percentages of students willing to try other scenarios, the comments were mostly positive: *"I think it's a good learning experience for the students because it forces us not to use our materials and come up with differentials on our own," "I think it is a great tool for success. It just lacks real human response/ the ability to understand what we're sometimes asking. But if that gets fixed, this would be extremely beneficial. I enjoyed the experience a lot, and I think more time to play around with the program with numerous scenarios gives us a fun way to practice.*" Students were aware of the burden caused by social isolation, but they also reported that AI should be used as a complementary learning tool: *"Overall, it was amazing. I feel like this opportunity helped boost my confidence a bit, considering I'm unable to practice these skills otherwise due to distance learning." "I think it's a great tool to help practice history-taking skills. I think it definitely is difficult and not as great as the real thing, but it works for the times we are in. It reinforces repetition and practice." "This is great for PRACTICE. I do not think it should be used for grading and absolutely does not replace really patient interactions. Rather it is a nice supplement in addition to human encounters."*

Discussion

We situate our study results within the long trajectory of technology-enhanced learning. Modest and mixed evidence suggests that VPs can more effectively improve skills and, sometimes, be as effective as traditional methods in improving learning outcomes (Kononowicz et al., 2019). Online learning materials can be reused with no additional costs and updated easily (Combs & Combs, 2019). The COVID-19 pandemic compelled many programs to seek ways to overcome the social barrier and continue to provide high-quality education (Almarzooq et al., 2020; (Saunders et al., 2022). In a lockdown scenario, AI-VSP was explored as a complementary method to ameliorate history-taking, clinical reasoning, and diagnostic ability. With the programming teams' expertise, AI-VSPs become more intelligent and can perceive subtleties in pronunciation, grammar, and popular expressions, selecting the most accurate answers after every session (Paranjape et al., 2019). Despite that, many studies still affirm that these tools are unsuitable for developing countries due to the high costs of implementing, for example, a simulation laboratory. They also insist that VPs should be supplemental and not replace traditional learning methods (Sahi et al. 2020).

Our study occurred at the nexus of AI-VSP development at the height of the COVID-19 pandemic and was naturally impacted by that snapshot in time. Consequently, our work has several limitations. First, we exposed students to two distinct case scenarios in different years. It's possible that nursing students had been exposed to e-learning in high school before applying to university, which could influence their comfort with technology. Second, the learners were in different professional programs, making direct comparisons of their responses subject to inherent differences across student cohort types. Third, students were at different stages of professional development (e.g., early vs. later in their training years). Fourth, the students who did not complete our optional surveys may disproportionately dislike this tool or learning modality. In addition to the difference in participants' level of education, the AI self-learning system evolved over time. As the BSN and ABSN groups were the last exposed to the AI-VSP, their satisfaction and impressions were inherently based on a different (and presumably improved) product. Following student cohorts longitudinally over time could mitigate this limitation. Lastly, future studies would benefit from a designated control group.

Despite these limitations, PA students offered in-depth responses to their experiences. Some considered this learning modality "judgemental free" and an excellent opportunity to increase confidence. Quail (2016) previously concluded that students' confidence could positively affect their social communication competence (Quail et al., 2016). We received testimonials from students who critically analyzed the context of COVID-induced isolation and the damage it caused them. One PA student anticipated that virtual patients would be an important learning tool for patient encounters after the pandemic, so their training should be encouraged. Almarzooq reached the same conclusion in 2020 (Almarzooq et al., 2020). Regardless of their skepticism, the vast majority of ALL our student cohorts wanted more AI-VSP scenarios in their learning trajectories (BSN, FNP, ABSN, and PA, respectively at 93%, 91%, 89.7%, and 83.8%). Additionally, the relative consistency across all 4 cohorts and each of the 2 scenarios

suggests our results may be broadly generalizable across health professional student types as well as different AI-VSP scenarios.

Naturally, computers cannot substitute a healthcare professional's reflective and emotional evaluation (De Leon, 2018). It seems straightforward for students that AI-VSPs are a supplemental learning tool, not a human interaction replacement. Nevertheless, these results complement earlier work suggesting evidence of simulation-based teaching's positive impact on healthcare education, encompassing knowledge, skills, confidence, critical thinking, and clinical performance outcomes (Jarelnape & Sagiron, 2023).

Conclusion

Based on these results, we will continue exploring AI-VSP at our institution and encourage other institutions to do the same. High-quality provider-patient interaction is one mainstream of health professional education, and over the last decades, experts have discussed technology support to improve health professions' education training. The COVID-19 crisis isolated students from universities, impacting the standard forms of simulation and face-to-face interaction. While future studies and replication of these results are certainly valuable, we believe our results extend the literature demonstrating the value of technology-enhanced learning in the healthcare education community. Even as the COVID-19 pandemic begins receding and face-to-face instruction earnestly returns, AI-VSP scenarios demonstrate significant promise as a complementary learning method in health professions education.

Disclosure Statements

Dr. Azzam is a simulation educator (Faculty Member) at Samuel Merritt University, where the study was conducted. In addition, he serves on the Clinical Advisory Board of Patient Communication Simulators—the company that produces Spark. Spark is the simulation product used in this study. In his advisory board role to PCS, he receives equity shares in the company based on hours worked providing various services to the company.

We know of no other conflicts of interest associated with this publication, and this research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Appendix 1: Research survey

Likert-Items

1. My interaction with Spark felt realistic (e.g., environment, avatar, voices).
2. Spark did a good job at answering most of my questions.
3. I gave this virtual patient my full attention and developed a diagnosis and plan of care for the chief complaint just as thoroughly as I would have done with a human patient in clinic.
4. This virtual patient experience helped prepare me for real-world patient encounters.
5. I feel virtual patient experiences could help me improve my diagnosis ability.
6. If given the opportunity, I would choose to utilize virtual patient encounters to help me prepare for the *[national licensing exam]* at the end of my SMU program.
7. Spark makes me feel better prepared before seeing a Standardized Patient.
8. I would recommend Spark to other healthcare learners interested in practicing history-taking.

Yes/No Items

1. With the goal of increasing your history taking and developing a differential diagnosis shortlist, did you feel that this virtual patient scenario helped you hone those skills?
2. Would you be interested in seeing other virtual patients with different health conditions in the remainder of your SMU program?

Free-text Items

1. What recommendations do you have to improve this virtual patient encounter experience?
2. Describe other simulation scenarios where you feel a virtual patient would be especially beneficial to your training.
3. Anything else you'd like to share with us about your experience?

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