Medical Student Satisfaction Using a Virtual Patient System to Learn History-Taking and Communication Skills

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Abstract. Virtual patients (VPs) have the potential to augment existing medical school curricula to teach history-taking and communication skills. A goal of our current efforts to study virtual characters in health professions education is to develop a system that can be independently accessed and thus user satisfaction is an important factor in how readily this technology will be adopted. Twenty-three medical students participated in a study in which they interviewed a virtual patient and were asked to rate the educational value of the experience. Despite some of the limitations in this developing technology, students were generally receptive to its use as an educational tool. Further enhancements to the system, including increased fidelity of the interaction and novel feedback mechanisms, should improve learner satisfaction with and adoption of the virtual patient system.

Keywords. Virtual Patients, Medical Education, Communication Skills

1. Introduction

Virtual patients (VPs) have the potential to enhance the efforts of health professions students in learning history-taking and communication skills by providing a means for standardized, repetitive practice in a safe environment. We have previously reported on a multidisciplinary effort involving medical students, clinical faculty, professional educators, and computer scientists to create and study interactive, life-sized virtual clinical scenarios in medical education, including an analysis of the use of synthesized vs. recorded speech in this venue [1-3]. With respect to medical education, VPs can elicit empathetic responses from students when compared to standardized patients (SPs) and can help reduce student anxiety when performing sensitive topic interviews, such as the sexual history, for the first time [4,5]. One goal of this project is to develop a system that can be independently accessed and thus user satisfaction will be an important factor in how readily this technology will be adopted. The purpose of this study was to examine learner perceptions of the virtual patient experience and their relationship to satisfaction with and potential future use of this system.

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2. Methods

2.1. System Description

The VP system allows learners to interact with a life-sized avatar who presents with a medical complaint via speech recognition and tracking systems. The novelty of our system lies in the use of natural interaction and immersive virtual reality techniques. Speech recognition, natural language processing, body tracking systems, and a large-screen or head-mounted display enable students to interact (through speech and gestures) with a life-sized VP, who, through these inputs, is "aware" of the student. The technology that drives this interaction consists largely of commodity hardware and software; two desktop computers, two cameras, a data projector, and a wireless microphone are needed to enable immersive, interactive virtual patient experiences (Figure 1).
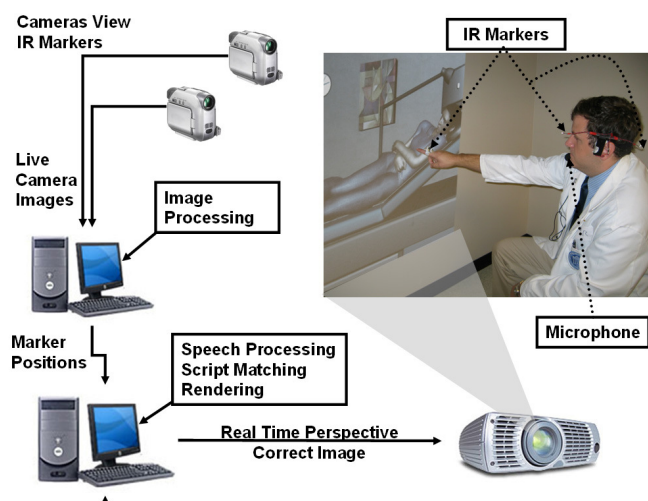
Figure 1. Virtual patient system configuration

2.2. Study Design

Twenty-three third year medical students volunteered for the study. Baseline information on demographics and self-rated skill in history-taking was collected and students were randomized with respect to race of the VP (African American or Caucasian) and type of display (projection or head-mounted display). Each student completed a practice interview with Diana, a 23 year-old female who presents with abdominal pain and then completed an interview with Edna, a 55 year-old female with a breast mass. Subjects were asked to rate the authenticity of the VP and the examination room and the educational value of the experience. These outcomes were dichotomized and compared using Fischer's exact test ($\alpha=0.05$).

3. Results

Overall, the response to the VP was positive: the majority felt that it was a worthwhile educational experience (61%) and that they would use the system to practice their history-taking skills (65%). There were no significant differences in these outcomes by race of the VP, display type, learner gender, video game-playing experience, self-rated skill in history-taking, or number of patients (live or SP) previously seen with a breast mass. While the majority of students felt that the VP appeared authentic (78.3%) and that she simulated physical complaints realistically (82.6%) and answered questions in a natural manner (56.5%), they also felt that she appeared to withhold information unnecessarily (69.6%) and that she was not able to communicate how she felt during the session (52.2%) (Table 1). While a slight majority of students felt that they had a sense of "being there" in the virtual examination room (52.2%), they often had a stronger sense of being in the simulation laboratory than the virtual examination room (73.9%).

Table1. Student ratings of the virtual patient system

Statement	Agree (%)	Disagree or Neutral (%)
The VP appears authentic.	**18 (78.3)**	5 (21.7)
The VP is challenging/testing the student.	**16 (72.7)**	6 (27.3)
The VP simulates physical complaints realistically.	**19 (82.6)**	4 (17.4)
The VP answers questions in a natural manner.	**13 (56.5)**	10 (43.5)
The VP appears to withhold information unnecessarily.	**16 (69.6)**	7 (30.4)
The VP's appearance fits the role.	**18 (78.3)**	5 (21.7)
The VP communicates how she felt during the session.	11 (47.8)	**12 (52.2)**
I had a sense of "being there" in the virtual examination room.	**12 (52.2)**	11 (47.8)
I had a stronger sense of being in the virtual examination room than in the lab.	6 (26.1)	**17 (73.9)**

Students were less likely to rate their interaction a worthwhile experience if they felt that the virtual patient appeared to withhold information unnecessarily (29% vs. 75%, p<0.05) or if they felt more like they were in the lab rather than the virtual examination room (47% vs. 100%, p<0.05). Students were also less likely to use the VP for practice in the future if they felt that the VP did not answer questions in a natural manner (40% vs. 85%, p<0.05).

4. Conclusions

The purpose of this study was to examine learner satisfaction with the virtual patient system and its perceived educational value, as these two end points will have an impact on the success of this technology. Some of the frustrations expressed by the subjects related to the responsiveness of the VP had an impact on whether they found the experience worthwhile and would use the system in the future. Because of this, a great deal of effort has been made to increase the fidelity of the interactions. The process of refining the scenarios is an iterative one, involving analysis of log files for each interaction to continually enhance the virtual patient scripts.

Despite some of the limitations in this developing technology (failures of speech recognition, limited expressivity of the virtual patient compared to a live patient, etc.), students are generally receptive to its use as an educational tool. VPs could serve as an adjunct to existing medical school curricula that make use of SPs, providing students another venue to practice their history-taking skills. The opportunity to use a system that is easily accessible will increase learner autonomy, which is an important concept in adult education theory [6]. In addition, a visualization feedback system (Figure 2) is under development, which will enhance the educational value of the VP system as feedback is one of the most important elements in learning [7]. This feedback will include video of the interview, a transcript of the interview with links to each moment, a plot of the topics discussed in the interview and a 3D view of the interaction, which allows the student to see the interview from the patient's perspective. With continuing endeavors to increase the fidelity of the interaction, VPs have great promise to augment current efforts to teach history-taking and communication skills.

Figure 2. Visualization feedback system

5. References

[1] R. Dickerson, K. Johnsen, A. Raij, et al, Virtual Patients: Assessment of Synthesized versus Recorded Speech, *MMVR* **14** (2006), 114-119.

[2] A. Raij, K. Johnsen, R. Dickerson, et al, Interpersonal Scenarios: Virtual ≈ Real*? IEEE Virtual Reality* (2006), 59-66.

[3] A. Stevens, J. Hernandez, K Johnsen, et al, The Use of Virtual Patients to Teach Medical Students Communication Skills, *Am J Surg* **191** (2006), 806-811.

[4] A.M. Deladisma, M. Cohen, A. Stevens, et al, Do Medical Students Respond Empathetically to a Virtual Patient? *Am J Surg* **193** (2007), 756-760.

[5] A.M. Deladisma, D. Mack, T. Bernard, et al, Virtual Patients Reduce Anxiety and Enhance Learning When Teaching Medical Students Sexual History-Taking Skills, Association for Surgical Education Annual Meeting (2007), Washington, DC.

[6] G. C. Williams and E.L. Deci, The Importance of Supporting Autonomy in Medical Education, *Ann Intern Med* **129** (1998), 303-308.

[7] J. Ende, Feedback in Clinical Medical Education, *JAMA* **250** (1983), 777-781.