Spoken vs. typed questioning in a conversational medical interview with virtual standardized patients

Merrick Bautista, BS[1], Andrew Leeds[2], Tugba Tokel, PhD[2], & Thomas B. Talbot, MD[1,2]

[1]-Keck School of Medicine of University of Southern California; [2]-University of Southern California Institute for Creative Technologies

Introduction

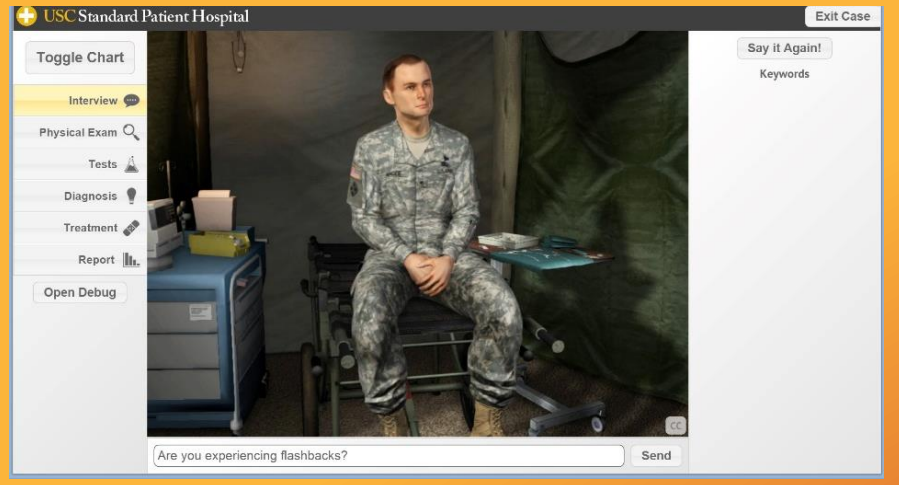
There have been numerous attempts to replicate the experience of human standardized patient (Barrows & Anderson, 1964) on a computer for anytime-anywhere access to the experience.

USC Standard Patient seeks to:

- improve clinic-based medical encounter simulation with the goal to create engaging virtual standardized patient (VSP) encounters,
- enable objective and meaningful assessment of learner interview performance and mature physician interviewing & diagnostic skills.

Virtual standardized patients (VSP):

- A conversational simulated patient used for medical training and capable of natural language interaction with verbal and nonverbal behavior responses
- Offers consistent, objective experience and detailed user feedback to learners



Purpose/Hypothesis

The purpose of the study was to examine the effects of Spoken and Typed version of USC Standard Patient. Specifically, the study was designed to examine the following research question:

- Does two versions affect the type of questions asked, learning performances, and total turns asked during the medical interview with virtual standardized patients?
- Does two versions affect the NLU performance?

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Materials & Methods

- A total of 29 third-year medical students were recruited from Keck School of Medicine under the IRB exempt protocol and USAMRMC human protections approval.
- Participants were randomly assigned to either Spoken or Typed group. VSP were the same for both groups except the communication was either by voice or typing.
- All participants first watched the orientation video and completed the orientation survey. Afterwards, they interacted with two cases with two 5-minute attempts for each of them followed by viewing system feedback. 26 participants completed both attempts were included in the analysis. A repeated measure multivariate analysis of variance was conducted in SPSS Statistics v24.
- Also, qualitative analysis of the transcripts were done to assess natural language understanding (NLU) system performance.

Results

Case 1: Otisis Externa *for Question asked, Performances, and Total turns*:

- No significant main effects of Condition, no significant multivariate effect of Attempt X Condition, but significant effect of Attempt

Case 2: Schizophrenia *for Performance*:

- Significant main effects of Condition (Typed group showed higher performance than Speech group), significant effect of Attempt, but no significant multivariate effects of Attempt X Condition

NLU Performance:

- Typed input is more accurate for NLU understanding
- Typed errors are uncommon and are not too likely to result in an NLU error
- Typed NLU improves upon second iteration of a case
- Verbal input is 15 points less accurate (consistent with prior studies)
- Verbal recognition errors are likely to result in NLU error

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Discussion

Overall, participants liked the system and found it easy to operate. Participants in both conditions improved their learning performance from attempt one to two for both VSP cases. Performance improvements with the Typed and Speech groups showed similar pattern over time.

Despite the overall learning gain, the results suggest that Typed group scored higher than Speech group. More accurate NLU understanding of Typed group and verbal recognition errors in NLU in Spoken group could have an affect the learning performances. However, participants perceived less sense of privacy w/ voice input.

Conclusion

In clinical settings, diagnostic interviewing skills are enhanced through repeated interactions with real standardized patients. VSP provides an opportunity for students to practice numerous case-based scenarios in a reproducible, objective learning environment prior to the challenge of actual patient interaction.

Contact Information

www.standardpatient.org
Email: talbot@ict.usc.edu
Telephone: 240-397-5140

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