Preliminary Assessment of Neurologic Symptomatology Using an Interactive Physical-Virtual Head with Touch.

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BACKGROUND

Healthcare educators typically rely on role players and physical mannequins (e.g., Meti-Man, SimMan3G) for education and simulation. Role players and mannequins can be very powerful, but they cannot display neurologic symptomatology such as facial asymmetry, muscle coordination and lid lag. Some researchers display videos of real (stroke) patients next to a mannequin, and found increased learner self-confidence (1). Researchers developed the *physical-virtual head*, a system that integrates interactive virtual (computer graphics) imagery and audio of patients into a touch sensitive head-shaped physical object (2).

PURPOSE

We present a formative qualitative study to get initial feedback from nursing students on the technology. Our long term goal is to compare nurses' ability to assess neurologic symptomatology when interacting with a physical-virtual head with automatic touch sensing (PVHT) (See Fig. 4) vs. a mannequin with nearby virtual imagery on a flat screen (MV) (See Fig. 3).

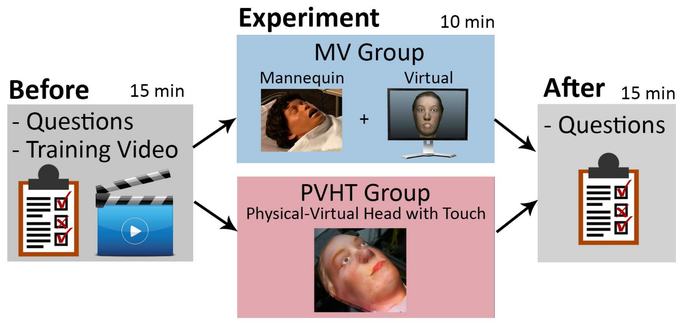

Fig1: Method illustrated above

MATERIALS AND METHODS

We ran a between-subjects pilot experiment involving mid-level nursing students that were randomly assigned to the mannequin with nearby virtual imagery on a flat screen (MV) condition or the physical-virtual head with automatic touch sensing (PVHT) condition (See Fig. 1).

Before the Experiment each subject was:
- Asked about their previous experience and expectations regarding virtual humans' realism
- Exposed to a brief introduction of the capabilities of MV/PVHT simulator
- ***Not*** told about the patient's condition.

During the experiment each subject was:
- Presented with the same scenario presenting neurologic symptomatology and acted out by the same person, with the same virtual imagery (See Fig.2) shown either on a nearby flat display (MV) (See Fig. 3) or integrated into the head (PVHT) (See Fig. 4). - Recorded and observed for recognition of facial asymmetry, response to touch, diagnostic questions asked, and speech evaluation.

After the Experiment each subject was:
- Asked Questions regarding their experience, interaction, perception of realism, and expectations.

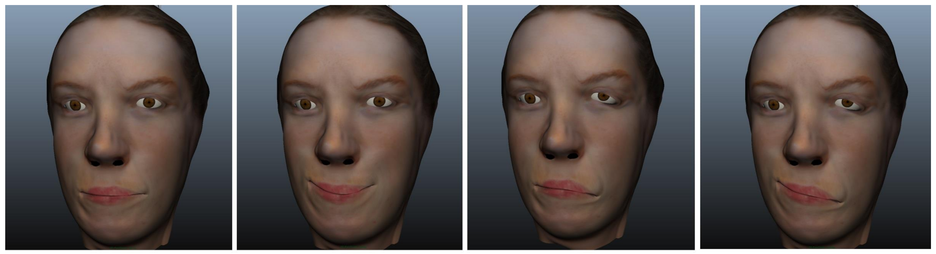

Fig. 2: Facial Expressions for the patient simulated using computer graphics

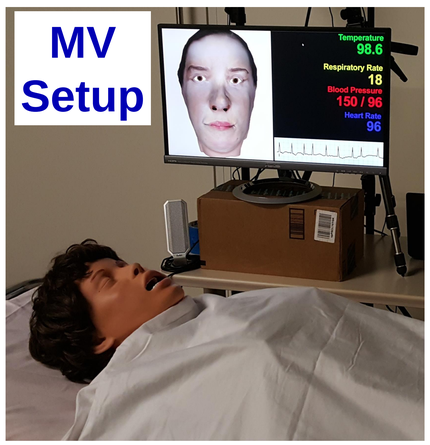

Fig.3: Setup for the Control Group: Mannequin and a TV screen with a virtual character

Fig.4: Setup for the Experiment Condition with a close up on the head with projection on (top right image)

RESULTS

PVHT Group: In general nurses like the realism and interaction ability "as if she were a real person", and think that it is useful for teaching sessions. The majority of subjects appreciated the **facial expressions**' reaction and communication commenting that the facial expressions were much more **realistic** than previous simulators and the voice matched the clinical presentation. One nurse added that the facial expressions are so important when putting together the whole clinical picture making sure **the verbal and non-verbal cues lined up** to provide accurate care. One person expressed that it is **easier** to work with and much more realistic than any of the mannequins she has ever used and that the PVHT seemed to react to the vast majority of the neurological and head assessment they were taught to do. When asked "what would you have done differently if that was a human patient instead of a simulator?", the answers were mixed: one person could not think of anything to do differently, one subject "would have felt more pressured", another would have called a physician quicker, and the rest self-reflected on more tests they would have done on the body. Many nurses expressed that it would be much more beneficial if the PVHT could be a whole body system since most conditions are rarely isolated to the head.
MV Group: Nurses thought that the addition of the "TV" was a **"great bonus"** and that would be very helpful. The facial expressions on the screen were appreciated. The subjects indicated that the face on the monitor and its ability to express right-sided sagging, non-reactivity of the right pupil, the inability of the right eyebrow to raise, and the right side of the face to smile were all very realistic. The patient was perceived as responding in a timely manner, but **not communicating freely**, for example not speaking unless spoken to. When asked what "what would you have done differently if that was a human patient instead of a simulator?" most of the subjects mentioned they would have called a doctor or a charge nurse for a real patient. One subject reasoned that because it was a simulated patient she perceived the condition as ***not*** urgent. This could be attributed to the quality of the simulator or could be a reflection about what they did or didn't do earlier, or could be because they didn't think that calling someone is an option during this study.

CONCLUSIONS

Subjects from both groups appreciated the realism of the facial expressions. Subjects from the PVHT group perceived it as easier to work with than mannequins they have used. They also mentioned benefits of extending this technology to a whole body. More subjects from the MV group mentioned that they would have called someone for help if the patient was real, while subjects form the PVHT had mixed responses. This could be attributed to the quality of the simulator, or what they would have liked the simulator to have, or could be attributed to a reflection of their behavior and what they forgot to do. It is possible that students would respond more quickly given additional enhanced cues; in that case the enhancements would make a viable teaching tool. We think if nurses are given the opportunity to train using a realistic interactive physical simulator such as the PVHT, they may give more weight to taking cues from their patient's appearance and they may feel they are interacting with a more real patient as opposed to a simulator. Findings from this study provided pilot data to further explore the importance of realism in certain health related conditions and symptomology that can be depicted using a PVHT. In the future we can assess the importance of healthcare provider-patient engagement with a PVHT simulator.

BIBLIOGRAPHY

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