Objective Structured Clinical Interview Training using a Virtual Human Patient

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Abstract. Effective interview skills are a core competency for psychiatry residents and developing psychotherapists. Although schools commonly make use of standardized patients to teach interview skills, the diversity of the scenarios standardized patients can characterize is limited by availability of human actors. Further, there is the economic concern related to the time and money needed to train standardized patients. Perhaps most damaging is the "standardization" of standardized patients—will they in fact consistently proffer psychometrically reliable and valid interactions with the training clinicians. Virtual Human Agent (VHA) technology has evolved to a point where researchers may begin developing mental health applications that make use of virtual reality patients. The work presented here is a preliminary attempt at what we believe to be a large application area. Herein we describe an ongoing study of our virtual patients (VP). We present an approach that allows novice mental health clinicians to conduct an interview with a virtual character that emulates an adolescent male with conduct disorder. This study illustrates the ways in which a variety of core research components developed at the University of Southern California facilitates the rapid development of mental health applications.

Keywords. virtual reality, virtual patient, standardized patients, mental health, psychology

1. Introduction

Effective interview skills are a core competency for psychiatry residents and developing psychotherapists. Especially challenging is the task of developing effective methods for training clinicians to interview and perform differential diagnosis of persons with mental health issues. Current therapeutic training systems resort to using real persons (hired actors or resident students) acting as standardized patients to portray patients with given mental health problems. The problem could be physical or psychological. Whilst training programs commonly make use of standardized patients to teach interview skills, the diversity of the scenarios standardized patients can characterize is limited by availability of human actors. Further, there is the economic concern related to the time and money needed to train standardized patients. Perhaps most damaging is the "standardization" of standardized patients—will they in fact consistently proffer psychometrically reliable and valid interactions with the training clinicians.

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Virtual Human Agent (VHA) technology has evolved to a point where researchers may begin developing mental health applications that make use of virtual reality patients.[1-5] As underlying enabling technologies continue to evolve and allow us to design functional and usable "structural" clinical virtual environments (VE), the next important challenge will involve "populating" these environments with virtual representations of humans. Over the last five years, the technology for creating virtual humans (VHs) has evolved to the point where they are no longer regarded as simple background characters, but rather can serve a functional interactional role.[10-11] This will be vital to create mental health training tools that leverage the use of VHs for applications that require human-to-human interaction and communication.

Virtual patients (VPs) are virtual interactive agents who are trained to simulate a particular clinical presentation of a patient with a high degree of consistency and realism. VPs have commonly been used to teach bedside competencies of bioethics, basic patient communication and history taking, and clinical decision making.[1-4] Virtual patients can provide valid, reliable, and applicable representations of live patients.[5] Research into the use of virtual patients in psychotherapy training is very limited.[8-9, 12-13] Beutler and Harwood describe the development of a VR system for training in psychotherapy and summarize training-relevant research findings.[7] Such applications may be valuable for assessment, intervention, and training of novice therapists.[6-9] This technology offers exciting potential for rich interactive experiences. The use of technology to replace or augment standardized patients has not been widely applied or accepted. A search of the literature of interactive virtual characters reveals only a handful of studies. Part of the problem has been the difficulty of building complex interactive virtual characters that can act as simulated patients. An additional complication has been the technological issues involved in trying to get interactive virtual characters to act like real patients. Finally, there has been a limited breadth of expertise in designing effective training systems that can teach the relevant material.

The work presented here is a preliminary attempt at what we believe to be a large application area. Herein we describe an ongoing study of our VPs. We present an approach that allows novice mental health clinicians to conduct an interview with a virtual character that emulates an adolescent male with conduct disorder.

2. Tools and Methods

The purpose of the study was two fold: 1) "general assessment" of the system's capacity for interactive response to questions posed to the VP; and 2) "specific application" of the system's performance when interacting with a novice clinician obtaining an intake interview and relevant psychiatric history of the VP. Thus far our sample (currently recruiting participants and plan to have an N=30) has included six persons from the University of Southern California's Keck School of Medicine. Initial inclusion criteria for these evaluations required that participants have previous clinical therapy skills. Two staff members administered the evaluations.

The VP system is based on our existing virtual human architecture.[10-13] The general architecture supports a wide range of virtual humans from simple question/answering to more complex ones that contain cognitive and emotional models with goal oriented behavior. The architecture is a modular distributed system with many components that communicate by message passing. Because the architecture is modular it is easy to add, replace or combine components as needed. For example in the larger virtual human architecture the natural language section is divided into three

components: 1) a segment for language understanding, 2) a segment to manage the dialog, and 3) a segment to generate text output. This is all combined into one component for the VP system.

The project involved the development of a virtual patient, "Justin", as well as the clinical virtual environment (VE) in which the trainees learn interviewing techniques and knowledge of signs and symptoms of conduct disorder. The environment was modeled after a typical clinician's office and was meant to represent a place that would make the patient feel at home. The model representing "Justin" the virtual patient was meant to represent a typical 16 year old boy with jeans and a baseball hat. The virtual patient is capable of responding to clinical questions with verbal behavior and non-verbal human-like emotions and body postures that one might typically observe in a client with this disorder. Several role-playing scenarios between humans were conducted and recorded to gather the verbal and non-verbal behavior and voice of the virtual patient. The preliminary goal is to use the virtual patient to teach diagnostic skills training specifically for conduct disorder, as described below. The eventual goal is to have the virtual patient be utilized in individual trainee interviews, small group and classroom settings.

The structure of the individual trainee interview targets an interview of 30 minutes duration during which there may be pauses for guidance from live supervisors who are in attendance, however, the interview may progress successfully without interruption guided by verbal and emotional interactions between virtual patient and trainee doctor. At the end of the 30 minute period, the trainee is expected to be able to make the diagnosis, having elicited the appropriate signs and symptoms, and conducted a sensitive and effective interview. If the diagnosis or the interview process is not successful within the expected time allotted, the trainee will need additional practice to be considered competent in the clinical diagnosis of conduct disorder.

The virtual human, "Justin", and the clinician's activity and verbal behavior can be recorded during the interview and the entire 30 minute interview process may be re-played for review, critique and commentary by child and adolescent psychiatry attendings, as a teaching tool for other residents, or for groups of medical students learning about conduct disorder.

A competency-based set of questions and a scoring system is being developed in order to help child and adolescent psychiatry residents, psychiatry residents, and medical students utilize the recorded versions of the interviews as learner-centered educational tools. A library of various clinician-recorded interviews can be available to be viewed by students who have not actually participated in the interview, and can be interrupted at various points to assess the viewer's own diagnostic skill and response to the interview as it progresses. An example of a scoring system may include demonstration of knowledge of the core features of the disorder (in this case, conduct disorder) and measures of perceived strength and weakness of the interviewer's rapport with the virtual patient. Diagnostic questions can prompt the viewer with respect to missing diagnostic symptoms or additional information as needed.

3. Conduct Disorder Diagnosis Skills Training

Teaching interviewing skills with VHs and VPs is still a young discipline. There are no standard methods and metrics. The larger problem of teaching general interviewing skills is even vaguer as there are many techniques and it is not well understood how to properly implement those with a virtual patient. To alleviate this problem we are

concentrating on teaching skills required to diagnose a particular disorder, in this case conduct disorder. Our goal is to obtain objective data from an initial intake interview. This will be accomplished by evaluating the questions asked by the trainee to the virtual patient and the corresponding answers. The trainee's interview questions should be guided by the need to determine if the patient is internalizing or externalizing their behaviors and for eliciting information regarding the four general symptom categories prevalent in conduct disorder: 1) Aggressive behavior (e.g. fighting, bullying, being cruel to others or animals); 2) Destructive behavior (e.g. arson, vandalism); Deceitful behavior (e.g. repeated lying, shoplifting, breaking into homes or cars); and 4) Violation of rules (e.g. running away, engaging in non appropriate behavior for age).

The virtual patient is modeled after a conduct disorder case found in the *DSM-IV Casebook*. The virtual Justin is a 16 year old patient residing in psychiatric unit of a general hospital in the wealthy Los Angeles suburb in which he lives. He had slashed his wrist with a knife, severing nerves and tendons in his left hand, and drifted in and out of consciousness during the night, finally calling a friend's mother for help in the morning. Justin is the son of a Vietnamese mother and an American serviceman. He lived with his mother in Saigon until he was two, when he came to the United States to be adopted by an American family through an agency specializing in adoption of Vietnamese children. He was apparently abused (burned and beaten) in this family, removed to a foster home for a brief period, and, at age four, placed with his current adoptive parents. Although Justin initially did well in his new surroundings and got along well with his friends, his relationship with his parents was turbulent, and they describe him as difficult. Shortly after starting junior high, Justin began spending the majority of his time with a group of students who were many times truant from school. He also began adopting the behaviors of these students: smoking marijuana, shoplifting beer from the local supermarket, and belittling the values of parents and teachers. During this time his academics suffered and he was placed on academic probation. His parent's attempts to redirect his attitude and relations were met with hostility. Justin got into trouble for fighting in school, blowing up mailboxes with firecrackers, and throwing darts at the neighbor's cat. During this time, Justin's parents separated and he decided to stay with his father. The disruption of his parent's separation was accompanied by increased "acting out" behaviors. He and his friends were arrested for "borrowing" a car to go joyriding. Additionally, his truancy escalated to the point that he was absent more days than he was in school. While truant from school he and his friends would actively use drugs—mostly LSD, mescaline, glue, and marijuana.

4. Virtual Justin: DSM-IV-TR Diagnosis

Although Justin's ticket of admission to a psychiatric hospital seemed to be a suicide attempt, he later tells us that it was a clever way of avoiding being arrested. Whether or not he is also depressed and did intend to kill himself, there does not seem to be evidence of a full Major Depressive Episode that would justify that diagnosis. Further, we do not have enough information to make a positive diagnosis of Dysthymic Disorder, although his feeling that life is pointless suggests that this is likely.

Justin has a history of a chronic pattern of antisocial behavior in which the basic rights of others and age-appropriate societal norms are violated. He has stolen, been truant, broken into someone's car, been cruel to animals, and initiated physical fights. These behaviors warrant the diagnosis of Conduct Disorder of Adolescent-Onset Type with Moderate Severity. It is understood to be of Adolescent-Onset Type because

onset of conduct disturbance was in adolescence. The label of Moderate Severity is applied because Justin does not cause considerable harm to others or engage in extensive vandalism or theft.

It is also important to note that Justin certainly has abused various drugs. We do not have sufficient information to know whether he was ever dependent on drugs. Given that his suicide attempt was related to his use of LSD, it appears that his use of hallucinogens is certainly having negative consequences, justifying the diagnosis of LSD Abuse (see DSM-IV-TR). Similarly, the extensive use of marijuana, leading to repeated absences from school, would justify the diagnosis of Cannabis Abuse (see DSM-IV-TR). We realize that careful questioning would probably reveal abuse of other drugs. The diagnosis that best accounts for the current admission is Adjustment Disorder, With Depressed Mood because his depressed mood and suicide attempt seem to have been triggered by the stress of what he believed was an impending arrest.

5. Results

Although in the early stages of system development, initial outcomes have been favorable. We have collected (and continue to collect) quantitative and qualitative results. The VP fit well into usability testing. Clinicians in training had positive response to the VP and behaved as they normally would during a clinical encounter. Although training clinicians reported being impressed with the VP's visual design and believability, they felt the functionality was difficult in some areas. Based on these results, we are modifying the VP.

6. Conclusions/Discussion

This study was our initial prototype of building an interactive VP that was capable of discourse with novice clinicians so that they may establish the VPs clinical history and differential diagnosis. We described the domain, the architecture, the subject testing and evaluation conducted. The plan is to take the results and lessons learned from the evaluation and apply those to a more formal study. For the current study, we acknowledge that this may have some bearing on the overall interpretation of results. Furthermore, these findings are based on a fairly small sample size. As a necessary next step, the reliability and validity of the test needs to be established using a larger sample of participants. This will ensure that the current findings are not an anomaly due to sample size.

This is an initially prototype system that we are currently using as an assessment tools to make a differential diagnosis of a virtual patient. In order to build a system like this to be effective for general clinical interviewing a minimal set of requirements should be considered. It's hard to state all that is needed without more subject testing and evaluations. But these requirements should address the technology, the learning objectives and the virtual patients. The technology needs to support face to face interaction, ideally using speech recognition. The system needs to respond in a natural amount of time for the character, response times that are too slow distract from the process. The system needs to allow the characters to respond and express themselves with verbal and non-verbal behavior. Understanding the learning objectives and how best to enable that in the system is valuable, however it can be quite a complex and difficult process. The technology needs to support those objectives. The characters need to be believable and responsive for the type of mental disorder they

posses and designing the surface level verbal and nonverbal behavior is still an area of research.

We believe that virtual patients will play an important role in the future of psychotherapy education for psychiatry residents and psychology trainees. The use of virtual patients could be implemented in several ways. For example, virtual patients could be developed to recognize the essential features and common pitfalls of an initial psychotherapy interview so that they could give more specific, relevant, and reliable verbal feedback to the residents involved. In addition, the use of virtual patients illustrating common problems such as acting out, transference, intrusive questions, or seductive behavior would allow residents to have an experience with these anxiety-provoking situations in a simulated setting before they occur in their practice. Finally, performance in virtual patient scenarios could be used as an additional source of data for the assessment of resident competency in the psychotherapy domain.

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