SimCoach: an intelligent virtual human system for providing healthcare information and support

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ABSTRACT

Over the last 15 years, a virtual revolution has taken place in the use of Virtual Reality simulation technology for clinical purposes. Recent shifts in the social and scientific landscape have now set the stage for the next major movement in Clinical Virtual Reality with the "birth" of intelligent virtual humans. This paper will present an overview of the SimCoach project that aims to develop virtual human support agents to serve as online guides for promoting access to psychological healthcare information and for assisting military personnel and family members in breaking down barriers to initiating care. While we believe that the use of virtual humans to serve the role of virtual therapists is still fraught with both technical and ethical concerns, the SimCoach project does not aim to become a "doc in box". Rather, the SimCoach experience is being designed to attract and engage military Service Members, Veterans and their significant others who might not otherwise seek help with a live healthcare provider. It is expected that this experience will motivate users to take the first step – to empower themselves to seek advice and information regarding their healthcare (e.g., psychological health, traumatic brain injury, addiction, etc.) and general personal welfare (i.e., other non-medical stressors such as economic or relationship issues) – and encourage them to take the next step towards seeking other, more formal resources if needed.

1. INTRODUCTION

Over the last 15 years, a virtual revolution has taken place in the use of simulation technology for clinical purposes. Technological advances in the areas of computation speed and power, graphics and image rendering, display systems, tracking, interface technology, haptic devices, authoring software and artificial intelligence have supported the creation of low-cost and usable PC-based Virtual Reality (VR) systems. At the same time, a determined and expanding cadre of researchers and clinicians have not only recognized the potential impact of VR technology, but have now generated a significant research literature that documents the many clinical targets where VR can add value over traditional assessment and intervention approaches (Holden, 2005; Parsons & Rizzo, 2008; Powers & Emmelkamp, 2008; Rose, Brooks & Rizzo, 2005; Riva, 2005). This convergence of the exponential advances in underlying VR enabling technologies with a growing body of clinical research and experience has fueled the evolution of the discipline of Clinical Virtual Reality. And this state of affairs now stands to transform the vision of future clinical practice and research in the disciplines of psychology, medicine, neuroscience, physical and occupational therapy, and in the many allied health fields that address the therapeutic needs of those with clinical disorders.

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14. ABSTRACT

Over the last 15 years, a virtual revolution has taken place in the use of Virtual Reality simulation technology for clinical purposes. Recent shifts in the social and scientific landscape have now set the stage for the next major movement in Clinical Virtual Reality with the ?birth? of intelligent virtual humans. This paper will present an overview of the SimCoach project that aims to develop virtual human support agents to serve as online guides for promoting access to psychological healthcare information and for assisting military personnel and family members in breaking down barriers to initiating care. While we believe that the use of virtual humans to serve the role of virtual therapists is still fraught with both technical and ethical concerns, the SimCoach project does not aim to become a ?doc in box?. Rather, the SimCoach experience is being designed to attract and engage military Service Members, Veterans and their significant others who might not otherwise seek help with a live healthcare provider. It is expected that this experience will motivate users to take the first step ? to empower themselves to seek advice and information regarding their healthcare (e.g., psychological health, traumatic brain injury, addiction, etc.) and general personal welfare (i.e., other non-medical stressors such as economic or relationship issues) ? and encourage them to take the next step towards seeking other, more formal resources if needed.

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Concurrent with the emerging acknowledgement of the unique value of Clinical VR by scientists and clinicians, has come a growing awareness of its potential relevance and impact by the general public. While much of this recognition may be due to the high visibility of digital 3D games, the Ninetendo Wii, and massive shared internet-based virtual worlds (World of Warcraft, Halo and 2nd Life), the public consciousness is also routinely exposed to popular media reports on clinical and research VR applications. This evolving public awareness coupled with a growing body of evidence as to the added value of simulation technology has brought the field of Clinical VR past the point where skeptics can be taken seriously when they characterize Virtual Reality as a "fad technology".

These shifts in the social and scientific landscape have now set the stage for the next major movement in Clinical VR. With advances in the enabling technologies allowing for the design of ever more believable context-relevant "structural" VR environments (e.g. homes, classrooms, offices, markets, etc.), the next important challenge will involve *populating* these environments with Virtual Human (VH) representations that are capable of fostering believable interaction with *real* VR users. This is not to say that representations of human forms have not usefully appeared in Clinical VR scenarios. In fact, since the mid-1990's, VR applications have routinely employed VHs to serve as stimulus elements to enhance the realism of a virtual world simply by their static presence.

For example, VR exposure therapy applications have targeted simple phobias such as fear of public speaking and social phobia using virtual contexts inhabited by "still-life" graphics-based characters or 2D photographic sprites (Anderson et al., 2005; Pertaub et al., 2002; Klinger, 2005). By simply adjusting the number and location of these VH representations, the intensity of these anxiety-provoking VR contexts could be systematically manipulated with the aim to gradually habituate phobic patients and improve their functioning in the real world. Other clinical applications have also used animated graphic VHs as stimulus entities to support and train social and safety skills in persons with high functioning autism (Rutten et al., 2003; Padgett et al., 2006) and as distracter stimuli for attention assessments conducted in a virtual classroom (Parsons et al., 2007; Rizzo et al., 2006). Additionally, VHs have been used effectively for the conduct of social psychology experiments, essentially replicating and extending findings from studies with real humans on social influence, conformity, racial bias and social proxemics conducted (Blascovich et al., 2002; Bailenson & Beall, 2006; McCall et al., 2009). In an effort to further increase the pictoral realism of such VHs, *Virtually Better Inc.*, began incorporating whole video clips of crowds into graphic VR fear of public speaking scenarios (VBI, 2010). They later advanced the technique by using blue screen captured video sprites of individual humans inserted into graphics-based VR social settings for creating social phobia, public speaking and cue exposure substance abuse treatment and research applications. The sprites were drawn from a large library of blue-screen captured videos of actors behaving or speaking with varying degrees of provocation. These video sprites could then be strategically inserted into the scenario with the aim to modulate the emotional state of the patient by fostering encounters with these 2D video VH representations.

The continued quest for even more realistic simulated human interaction contexts led other researchers to the use of panoramic video capture (Macedonio et al., 2007; Rizzo et al., 2003) of a real world office space inhabited by hostile co-workers and supervisors to produce VR scenarios for anger management research. With this approach, the VR scenarios were created using a 360-degree panoramic camera that was placed in the position of a worker at a desk and then actors walked into the workspace, addressed the camera (as if it was the targeted user at work) and proceeded to verbally threaten and abuse the camera, vis-à-vis, the worker. Within such photorealistic scenarios, VH video stimuli could deliver intense emotional expressions and challenges with the aim of the research being to determine if this method would produce emotional reactions in test participants and if it could engage anger management patients to role-play a more appropriate set of coping responses.

However, working with such fixed video content to foster this form of *faux* interaction or exposure has significant limitations. For example, it requires the capture of a large catalog of possible verbal and behavioral clips that can be tactically presented to the user to meet the requirements of a given therapeutic approach. As well, this fixed content cannot be readily updated in a dynamic fashion to meet the challenge of creating credible real time interactions with a virtual human, with the exception of only very constrained social interactions. This process can only work for clinical applications where the only requirement is for the VH character to deliver an open-ended statement or question that the user can react to, but is lacking in any truly fluid and believable interchange following a response by the user. Consequently, the absence of dynamic interaction with these virtual representations without a live person behind the "screen" actuating new clips in response the user's behavior is a significant limiting factor for this approach. This has led some researchers to consider the use of artificially intelligent VH agents as entities for simulating human-to-human interaction in virtual worlds.

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Clinical interest in artificially intelligent agents designed for interaction with humans can trace its roots to the work of MIT AI researcher, Joe Weizenbaum. In 1966, he wrote a language analysis program called ELIZA that was designed to imitate a Rogerian therapist. The system allowed a computer user to interact with a virtual therapist by typing simple sentence responses to the computerized therapist's questions. Weizenbaum reasoned that simulating a non-directional psychotherapist was one of the easiest ways of simulating human verbal interactions and it was a compelling simulation that worked well on teletype computers (and is even instantiated on the internet today; *http://www-ai.ijs.si/eliza-cgi-bin/eliza_script*). In spite of the fact that the illusion of Eliza's intelligence soon disappears due to its inability to handle complexity or nuance, Weizenbaum was reportedly shocked upon learning how seriously people took the ELIZA program (Howell & Muller, 2000). And this led him to conclude that it would be immoral to substitute a computer for human functions that "...involves interpersonal respect, understanding, and love." (Weizenbaum, 1976).

More recently, seminal research and development has appeared in the creation of highly interactive, artificially intelligent (AI) and natural language capable virtual human agents. No longer at the level of a prop to add context or minimal faux interaction in a virtual world, these VH agents are designed to perceive and act in a 3D virtual world, engage in face-to-face spoken dialogues with real users (and other VHs) and in some cases, they are capable of exhibiting human-like emotional reactions. Previous classic work on virtual humans in the computer graphics community focused on perception and action in 3D worlds, but largely ignored dialogue and emotions. This has now changed. Artificially intelligent VH agents can now be created that control computer generated bodies and can interact with users through speech and gesture in virtual environments (Gratch et al., 2002). Advanced virtual humans can engage in rich conversations (Traum, et al., 2008), recognize nonverbal cues (Morency et al., 2008), reason about social and emotional factors (Gratch & Marsella, 2004) and synthesize human communication and nonverbal expressions (Thiebaux et al., 2008). Such fully embodied conversational characters have been around since the early 90's (Bickmore & Cassell, 2005) and there has been much work on full systems to be used for training (Evans et al., 1989; Kenny et al., 2007; Kenny et al., 2007; Rickel et al., 2001), intelligent kiosks (McCauley & D'Mello, 2006), virtual receptionists (Babu et al., 2006) and virtual patients for clinical training (Kenny et al., 2008; Rizzo, et al., in press). Both in appearance and behavior, VHs have now evolved to the point where they are usable tools for a variety of clinical and research applications.

What follows in this paper is an overview of the *SimCoach* project that aims to develop virtual human support agents to serve as online guides for promoting access to psychological healthcare information and for assisting military personnel and family members in breaking down barriers to initiating the healthcare process. While we believe that the use of virtual humans to serve the role of virtual therapists is still fraught with both technical and ethical concerns, the SimCoach project does not aim to become a "doc in box". Rather, the SimCoach experience is being designed to attract and engage military Service Members (SMs), Veterans and their significant others who might not otherwise seek help. It aims to create an experience that will motivate users to take the first step – to empower themselves to seek information and advice with regard to their healthcare (e.g., psychological health, traumatic brain injury, addiction, etc.) and general personal welfare (i.e., other non-medical stressors such as economic or relationship issues) – and encourage them to take the next step towards seeking more formal resources that are available, when the need is determined.

2. CHALLENGES FOR BREAKING DOWN BARRIERS TO CARE IN MILITARY POPULATIONS AND VETERANS

Research suggests that there is an urgent need to reduce the stigma of seeking mental health treatment in SM and Veteran populations. One of the more foreboding findings in an early report by Hoge et al. (2004), was the observation that among Iraq/Afghanistan War veterans, "…those whose responses were positive for a mental disorder, only 23 to 40 percent sought mental health care. Those whose responses were positive for a mental disorder were twice as likely as those whose responses were negative to report concern about possible stigmatization and other barriers to seeking mental health care." (p. 13). While US military training methodology has better prepared soldiers for combat in recent years, such hesitancy to seek treatment for difficulties that emerge upon return from combat, especially by those who may need it most, suggests an area of military mental healthcare that is in need of attention.

Moreover, the dissemination of healthcare information to military SMs, Veterans and their significant others is a persistent and growing challenge. Although medical information is increasingly available over the web, users can find the process of accessing it to be overwhelming, contradictory and impersonal. At the same time, the need for military-specific health information is growing at an astounding rate. Recent statistics indicate that a growing percentage of military personnel are surviving wounds and injuries received in

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OIF/OEF compared to the conflicts of the past. For example, one report suggests that of all those wounded in Iraq, Afghanistan and nearby staging locations – there is a ratio of 16 wounded servicemen for every fatality. This compares with the Vietnam and Korean wars where there were 2.6 and 2.8 injuries per fatality, respectively, and WWs I and II, which had fewer than 2 wounded servicemen per death (Bilmes, 2007). Advances in training, tactics, body/vehicle armor technology and military battlefield medicine have led to this unprecedented number of survivors of severe battlefield trauma. However, along with these successes in force protection and survivability have come significant challenges in the form of providing health care for these survivors of trauma. In this regard, the reports over the last few years of a surge in U.S. Army suicide rates have again thrust the challenges of military mental health care into the public spotlight. With annual suicide rates steadily rising since 2004, the month of January, 2009 saw 24 suspected suicides, compared to five in January of 2008, six in January of 2007 and 10 in January of 2006 (Jelinek & Hefling, 2009).

In spite of a Herculean effort on the part of the U.S. Department of Defense (DOD) to produce and disseminate behavioral health programs for military personnel and their families, the complexity of the issues involved continue to challenge the best efforts of military mental health care experts, administrators and providers. Since 2004, numerous blue ribbon panels of experts have attempted to assess the current DOD and Veterans Affairs (VA) healthcare delivery system and provide recommendations for improvement (DOD Mental Health Task Force (DOD, 2007), National Academies of Science Institute of Medicine (IOM, 2007), Dole-Shalala Commission Report (Dole et al., 2007), the Rand Report (Tanielian et al., 2008), American Psychological Association (APA, 2007). Most of these reports cite two major areas in need of improvement:

1) Support for randomized controlled trials that test the efficacy of treatment methodologies, leading to wider dissemination of evidenced based approaches

2) Identification and implementation of ways to enhance the healthcare dissemination/delivery system for military personnel and their families in a fashion that provides better awareness and access to care while reducing the stigma of help-seeking.

For example, the American Psychological Association Presidential Task Force on Military Deployment Services for Youth, Families and Service Members (APA, 2007) presented their preliminary report in February of 2007 that poignantly stated that they were, "…not able to find any evidence of a well-coordinated or well-disseminated approach to providing behavioral health care to service members and their families." The APA report also went on to describe three primary barriers to military mental health treatment: *availability, acceptability and accessibility.* More specifically:

1) Well-trained mental health specialists are not in adequate supply (*availability*)

2) The military culture needs to be modified such that mental health services are more *accepted* and less stigmatized,

3) And even if providers were available and seeking treatment was deemed acceptable, appropriate mental health services are often not readily *accessible* due to a variety of factors (e.g. long waiting lists, limited clinic hours, a poor referral process and geographical location).

The overarching goal reported from this and other reports is to provide better awareness and access to existing care while concurrently reducing the complexity and stigma in seeking psychological help. In essence, new methods are needed to reduce such barriers to care.

3. SIMCOACH – AN ONLINE VIRTUAL HUMAN GUIDE FOR PROMOTING ACCESS TO HEALTHCARE INFORMATION AND FOR SUPPORT IN INITIATING LIVE CARE

While advances in technology has begun to show promise for the creation of new and effective clinical assessment and treatment approaches, from Virtual Reality to computerized prosthetics, improvements in the military health care dissemination/delivery system are required to take full advantage of these evolving treatment methodologies, as well as for promoting standard proven intervention options. In response to the clinical health care challenges that the conflicts in Iraq and Afghanistan have placed on the burgeoning population of service members and their families, the U.S. Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury (DCoE) have recently funded our development of an intelligent, interactive, online Virtual Human (VH) healthcare guide program currently referred to as SimCoach. The DCoE's primary mission is to assess, validate, oversee and facilitate sharing of critical information relative to the areas of injury prevention, resilience, identification, treatment, outreach, rehabilitation, and reintegration programs for psychological health and traumatic brain injury. In line with this mission, the SimCoach project is DCoE's first effort to support the development of an online embodied VH presence to serve as a guide for

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assisting Service Members, Veterans and their significant others in their efforts to seek behavioral health information, advice and ultimately, actual care if needed with a clinical provider.

Rather than being a traditional web portal, SimCoach allow users to initiate and engage in a dialog about their healthcare concerns with an interactive VH. Generally, these intelligent graphical characters are being designed to use speech, gesture and emotion to introduce the capabilities of the system, solicit basic anonymous background information about the user's history and clinical/psychosocial concerns, provide advice and support, direct the user to relevant online content and potentially facilitate the process of seeking appropriate care with a live clinical provider. An implicit motive of the SimCoach project is that of supporting users determined to be in need, to make the decision to take the first step toward initiating psychological or medical care with a live provider.

Figure 1. *SimCoach Archetypes – Female Aviator, Battle Buddy, Retired Sergeant Major*

It is not the goal of SimCoach to breakdown all of the barriers to care or to provide diagnostic or therapeutic services that are best delivered by a real clinical provider. Rather, SimCoach will foster comfort and confidence by promoting users' efforts to understand their situations better, to explore available options and initiate treatment when appropriate. Coordinating this experience will be a VH SimCoach, selected by the user from a variety of archetypic character options (See Figure 1), who will answer direct questions and/or guide the user through a sequence of user-specific questions, exercises and assessments. This interaction between the VH and the user will provide the system with the information needed to guide users to the appropriate next step of engagement with the system or to initiate contact with a live provider. Again, the SimCoach project is not conceived to deliver diagnosis or treatment or as a replacement for human providers and experts. Instead, SimCoach will aim to start the process of engaging the user by providing support and encouragement, increasing awareness of their situation and treatment options, and in assisting individuals, who may otherwise be initially uncomfortable talking to a "live" care provider, in their efforts to initiate care.

Users can flexibly interact with this character by typing text, clicking on character generated menu options and have some limited speech interaction during the initial phases of development. The feasibility of providing the option for full spoken natural language dialog interaction on the part of the user will be explored in the later stages of the project. Since this is designed to be a web-based system that will require no downloadable software, it is felt that voice recognition is not at a state where it could be reliably used at the current time. The options for SimCoach appearance, behavior and dialog is being designed to maximize user comfort and satisfaction, but also to facilitate fluid and truthful disclosure of medically relevant information. Focus groups and "Wizard of OZ" user studies are currently in progress in order to prepare the SimCoach interaction system for a wide range of potential dialog.

Based on the issues delineated in the initial interview, the user will be given access to a variety of general relevant information on psychology, neurology, rehabilitation, the military healthcare system, and also to other SMs and Veterans by way of a variety of social networking tools (e.g., 2nd Life, Facebook, etc.). When relevant, users will also be directed (in later SimCoach interations) to experts on specific areas such as stress,

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brain injury, marriage counseling, suicide, rehabilitation, reintegration and other relevant specialties. The user can progress through the system at their own pace over days or even weeks as they feel comfortable and the SimCoach will be capable of "remembering" the information acquired from previous visits and build on that information in similar fashion to that of a growing human relationship. However, the persistence of the SimCoach's memory for previous sessions will require the user to sign into the system with a user name and password, but that is optional for use of the system. Interspersed within the program will be the option to allow the user to perform some simple neurocognitive and psychological testing to inform the SimCoach's creation of a model of the user to enhance the reliability and accuracy of the SimCoach output to the user, to support user self-awareness, and better guide the delivery of initial referral options. Users will also have the option to print out a summary of the computerized sessions to bring with them when seeking clinical care to enhance their comfort level, armed with knowledge, when dealing with the "real" human clinical care providers and experts. We are also creating software authoring tools that will allow other clinical professionals to create SimCoach "content" to enhance the likelihood that the program will evolve based on other care perspectives and emerging needs in the future.

4. SIMCOACH USE-CASE

The following is a use-case of how SimCoach will interact with a potential user.

Maria was the 23-year old wife of Juan, an OIF veteran who had completed two deployments before leaving the service. After his return, she noticed something different. He had become distant, never discussed his experiences in Iraq, and when asked, he would answer, "that was then, this is now, case closed". He also wasn't as involved with their two children (the 2nd one was born while he was in Iraq), only playing with their oldest boy after hours of begging. For the most part, Juan stayed home and had yet begun to look for a civilian job. He didn't sleep much and when he did manage to fall asleep, he would often wake up after an hour, highly agitated claiming that he heard someone trying to get in the bedroom window. When this happened, he would sometimes sit till dawn, peering through slits in the closed blinds, watching for the "imaginary" intruder to return. He seemed jumpy when not drinking and watching TV. He drank heavily during the day and Maria would often find him asleep or passed out on the couch when she got home from her job after picking the kids up from her mother's house. She told her mother that it felt like she was living with a ghost, but that she still loved him. She just wanted the "old Juan" back. However, each day things got worse and she was feeling like she couldn't live like this much more. She felt guilty for the increasing resentment that she felt but didn't know how (or was afraid) to talk to Juan about what she was feeling. Juan also kept a pistol in the house and one time she had moved it off the dresser while cleaning and when Juan couldn't find it, he went ballistic and ran frantically around the house, screaming, "how am I gonna protect my family without my weapon!"

Maria was at a loss as to what to do when her mother mentioned hearing on Oprah about a way to find help for these kinds of problems on the internet with a thing called "SimCoach". Maria had only occasionally "played" on the AOL games site before and she didn't own a computer, but her older sister's son was a "computer nut" and agreed to let her come over to use his computer and try out SimCoach. She couldn't understand how a computer could help her, but she was desperate for any help she could get. So her nephew showed her how to type in the address for www.simcoach.mil on his computer and then went out with his friends to a movie.

Maria was intrigued when the screen lit up and created the illusion of standing in front of a "craftsman"-like building with the sign above it reading, "DCoE Helpcenter". Immediately the "virtual" director of the center walked out onto the porch and beckoned her to come in. The director stated that "we are here to understand your needs and get you started on the path to help" and showed Maria a poster just inside the door that had images and short biographies of the staff. Pointing towards the poster, she said, "here is our staff, have a look and click on the picture of who you think you would feel comfortable meeting with." Maria paused when she noticed a staff member that reminded her of a teacher she had in high school who was always helpful and kind to her. She clicked on this picture and was then guided through the hallway of the center that actually looked quite warm and peaceful with virtual people in the hall smiling and talking to each other softly. The program whisked her into a room where Dr. Hartkis, sitting in a thick fabric chair next to a fireplace, smiled, and softly asked her how he could help. Maria knew that this was just a virtual human, but for some reason she felt comforted by his soft voice and kind facial expressions. She had never been to a clinician before for this kind of help and was surprised by how safe and comfortable she felt. Not knowing what to expect, she described how her husband, Juan, was having problems ever since he came back from the war. She was surprised when the doctor said in a reassuring voice, "If you want

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to tell me more about it, I think I can help you and your family." After requesting some basic information, Dr. Hartkis then asked Maria some questions that seemed like he really might "understand" some of what she was going through. Eventually, after answering a series of thoughtful questions, Dr. Hartkis reassuringly smiled and then pointed to a wall in the room and said, "Here are some websites that have information that is available to help folks that are going through what you are feeling. We can pull up one of them and take a look at what is available or I can find a care provider in or near your zip code that we can make an appointment with right now so you can begin to find the help that both you and Juan could benefit from. Or, if you're not ready for that yet, we can still talk more about what you're going through now."

Maria couldn't believe that this computer character seemed so genuine in his face and his manner, and that she felt like she wanted to tell him more. Perhaps he might really be able to get her started on the road to help both her and Juan? Suddenly she realized that she had been online for an hour and needed to go home. As she was leaving, she wondered aloud if she could think about the options that she learned about today and then come back to make a decision on what to do. Dr. Hartkis smiled and said, "Of course we can meet again…you see, I will always be here to guide you to the help you need, whenever you're ready."

5. INTERACTION STRATEGY

While the use-case presented above is fictional, it illustrates one of a myriad of forms of confidential interaction that a tireless and always-available virtual human can foster. A fundamental challenge of the SimCoach project will be to better understand the diverse needs of the user base such that appropriate individual user experiences can be delivered to promote better healthcare access. At the most basic level, there are immense differences in the needs of service members and their families. Further, there are likely large differences in the level of awareness that users will have of existing resources and in their own need/desire to engage such resources. Within the service member population there is a high likelihood that individual users will have had very diverse combat experiences, help-seeking histories and consequent impact on significant others. The net result of attempting to engage such a diverse user base is that the system will need to be able to employ a variety of general strategies and tactics to be relevant to each individual user.

In this regard, the SimCoach project is employing a variety of techniques to create the user experience. One relevant clinical model is the PLISSIT clinical framework (**P**ermission, **L**imited **I**nformation, **S**pecific **S**uggestions, and **I**ntensive **T**herapy) (Annon, 1976), which provides an established model for encouraging help-seeking behaviors in persons who may feel stigma and insecurity regarding a clinical condition. In the SimCoach project, the aim is to address the "PLISS" components, leaving the intensive therapy component to live professionals to which users in need of this level of care can be referred. Another source of knowledge is social work practice. Such models take a case management approach, serving both as an advocate and a guide. The SimCoach development team is also leveraging knowledge from the entertainment/gaming industry. While knowledge from this community is not typically applied towards healthcare, a primary aim by this community is in the explicit attraction and engagement of individuals' attention. As we work to develop this web-based VH interactive system we are working closely with experts in all three of these models to achieve our goal of engaging and focusing this unique user base on the steps to initiate care as needed. Additionally, all interactions will be consistent with findings that suggest that interventions with individuals with PTSD and other psychosocial difficulties achieve the following: 1) promotion of perceptions of self-efficacy and control 2) encouragement of the acceptance of change; 3) encouragement of positive appraisals; and 4) an increase in the usage of adaptive coping strategies (Whealin et al., 2008). These principles of intervention will be implicit in all of the interactions between the SimCoach and its users.

6. CONCLUSIONS

The systematic use of artificially intelligent virtual humans in Clinical Virtual Reality applications is still clearly in its infancy. But the days of limited use of VH's as simple props or static elements to add realism or context to a VR application are clearly in the past. In this paper we have presented our general approach to the design and development of the SimCoach VH project envisioned to serve as an online clinical healthcare guide or coach. This work is focused on breaking down barriers to care (stigma, unawareness, complexity, etc.) by providing military SMs, Veterans, and their significant others with confidential help in exploring and accessing healthcare content and for promoting the initiation of care with a live provider if needed. This work will also afford many research opportunities for investigating the functional and ethical issues involved in the process of creating and interacting with virtual humans in a clinical context. While the ethical challenges may

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be more intuitively appreciated, the functional technology challenges are also significant. However, although this project represents an early effort in this area, it is our view that the clinical aims selected can still be usefully addressed in spite of the current limits of the technology. As advances in computing power, graphics and animation, artificial intelligence, speech recognition, and natural language processing continue to develop at current rates, the creation of highly interactive, intelligent VHs for such clinical purposes is not only possible, but probable.

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