

Extending the Reach of Health Care for Obesity and Diabetes Using Virtual Worlds

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Abstract

Today's epidemic of obesity and diabetes poses challenges to health care similar to those facing soldiers who return with postdeployment mental health issues. These include geographic barriers, social stigma, and the need for behavioral change. Researchers at University of Southern California's Institute for Creative Technologies are adapting their extensive experience in technological solutions for training to techniques that can aid veterans in need. These techniques show promise for concerns in the growing crisis of "diabesity." Virtual reality (VR) has already demonstrated itself as an impactful treatment method for several behavioral and mental health domains. Virtual worlds, the successor technology of original VR, inherited many of its predecessor's strengths but also presents the new affordances of accessibility, social connectivity, and avatar usage, which pave the way toward future treatment options on a broader scale.

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Introduction

We face a health care crisis today that may ultimately prove more devastating than a viral pandemic. While a viral episode might affect hundreds of thousands of people, its time period is typically measured in months, whereas the emerging epidemic in obesity and diabetes will be with us for decades to come. Changes in our eating patterns and activity behaviors over the past several decades are among the factors that have contributed to a precipitous rise in the American population that now faces a lifetime of living with what is being called "diabesity and metabolic disorder." This pattern shows no sign of abating.

As the affected population increases, the burden on the health care community also approaches crisis mode. The increasing number of patients threatens to outstrip

available specialized medical facilities that can service them. In addition, a study by Lutfiyya and colleagues¹ in 2009 showed that people who live in rural areas are 16% more likely to have these conditions. Lack of local facilities and inability to travel to medical centers in the cities means that many people who need attention for these conditions may not receive the scope of treatment they require. New methods are required for bringing needed health care to those most affected by the "diabesity" condition and its associated health concerns.

Virtual Worlds for Veterans' Issues

In our work at the University of Southern California's Institute for Creative Technologies, we are researching a health care emergency that has much in common

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Abbreviations: (3D) three-dimensional, (MBSR) mindfulness-based stress reduction, (SL) *Second Life*, (TORC) Texas Obesity Research Center, (VHIL) Virtual Human Interaction Laboratory, (VR) virtual reality, (VRET) virtual environment exposure therapy, (VW) virtual worlds

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with obesity and diabetes: helping soldiers with post-deployment mental health issues. Mental health and diabetes both have a growing number of patients, often involve stigmas attached to getting help, and disproportionately affect those in rural areas. As well, promising treatments for diabetes and postdeployment stress issues often include a behavioral change goal. We chose to address these issues by using a technology that has grown out of today's social networks coupled with ideas from virtual reality (VR). Virtual worlds (VWs) combine the advantages of VR's three-dimensional (3D) immersive perceptual environments with the connectivity and peer support offered by social networks. In this article, we discuss how this technology has worked for our research and its numerous advantages. We also address how VWs can be potentially powerful additions to obesity and diabetes therapies.

In looking at current technologically based treatment approaches, one must certainly acknowledge the educational and diagnostic Web-based offerings that already exist for health care, such as diabetes risk assessment tools and physician diagnoses through videoconferencing (which share a comparable diagnostic agreement to diagnoses from real-world visits).^{2,3} However, these tools are typically intended to inform, not elicit permanent change.

However, VR—a prominent, computer-based technology—is becoming an effective tool for clinical psychologists treating certain mental health conditions, for rehabilitation therapy, and also for changing one's self-outlook. Virtual reality is a highly immersive, usually custom-built, single-purpose, repeatable environment that can be experienced in first person, often with a head-mounted display. It typically supports a single participant per episode. Researchers like Anderson and associates⁴ and Rizzo and coworkers⁵ have shown that VR can be used to treat veterans with virtual reality exposure therapy (VRET) to reduce the symptoms of post-traumatic stress disorder. In a clinical trial using VRET, 62% of the patients demonstrated a clinically meaningful reduction in symptoms. Comparatively, only 28% of patients who underwent a more traditional cognitive behavioral therapy program of similar length had a meaningful reduction in symptoms.⁵

Therapies using VR have proven useful in other ways. A preliminary study published by an international team in the *Annals of General Psychiatry* measured the reactions of patients with eating disorders, as well as healthy subjects, to real food, photographs, and virtual food.⁶ The study found that reactions to virtual food were

comparable to that of real food and were more effective than photographs in eliciting emotional responses similar to those in a real-life situation. The principal investigator on the study commented on the results, "Since real and virtual exposure elicit a comparable level of stress, higher than the one elicited by static pictures, we may eventually see VR being used to screen, evaluate, and treat the emotional reactions provoked by specific stimuli in patients affected by different psychological disorders."⁷ Although this study specifically focused on patients with a problematic aversion to food, the results suggest that VR could be used to influence others who need to alter their behavior toward food, such as those with obesity. An additional study using VR showed that tobacco addiction can be reduced and retention for treatment programs improved when utilizing a VR therapy where participants crush virtual cigarettes.⁸

Virtual worlds grew from VR technologies and echo many of their strengths but have key differences that provide unique affordances to enhance virtual therapies. Virtual worlds are persistent, usually large spaces occupied by many users and, because of this, are primarily social in nature. People entering a VW typically take on a new (fictitious) name within the world, which can provide a sense of protection through anonymity for the participant. Importantly, people "use" VWs by means of a 3D personal representation called an avatar, which they can customize to portray specific aspects of their own self-image (using VWs typically means creating an account on a Web site, downloading a software client to one's computer that connects to the VW's server system, and then running and logging into that client; more information can be found at VW sites like www.secondlife.com). Often this image is very telling about how the person internalizes his or her own core being and what that person wants to show to the world.

These aspects, the social yet anonymous nature of VWs coupled with the embodied personal representation, constitute a potential for VWs to have a strong effect on people. Indeed, the effect of one's experience in the VW on one's being in the physical world has been termed the "Proteus effect," first described by researchers at the Virtual Human Interaction Laboratory (VHIL) at Stanford University.⁹ This phenomenon results in a user transferring expectations or understanding of their avatar's behavior to their own real-world behavior. Studies by the VHIL have shown that people observing their own avatar running will run longer in subsequent real-world exercises, and people with taller avatars will negotiate more aggressively in subsequent real world

negotiation scenarios. In addition to the power of the Proteus effect, the anonymity available in VWs can help overcome barriers of embarrassment or fear that hold some people back from seeking or continuing help.

People use these spaces for many things, including gaming, entertainment, social networking, and education and training. Schools and universities are holding classes in *Second Life* (SL), a prominent VW, and organizations such as the National Aeronautics and Space Administration and the Jet Propulsion Laboratory have museums and informational settings there. There are also interest groups that leverage the social nature of VWs to form active support groups for many conditions, which would not be possible in traditional (nonsocial) VR. These groups might focus, for example, on disability, cancer, attention deficit/hyperactivity disorder, or Asperger syndrome. The VW affordances of anonymity and social interaction combine to allow people to build and maintain these networks with less stigma than might be associated with searching for help or support in the real world.

A special word should be said about the social nature and future sustainability of VWs. According to the virtual consulting firm KZero, the number of active VW users in 2009 was 136 million and is expected to be 357 million by the end of 2010.¹⁰ This number is projected to rise to almost 2 billion users by 2013. Despite the closure of some VWs that could not sustain a profitable business model, others are doing well and even growing.^{11,12} This is especially true for VWs being utilized for children's entertainment (Habbo Hotel has passed the 10-year mark with 3 million new characters created each month) and for educational and government activities. However, the question must be asked: should VWs be used when some are losing ground and closing? The simple answer is that early commercial volatility of an emerging technology is not representative of its viability. The Gartner hype cycle, a research methodology used to describe the commercial enthusiasm that emerges with the introduction of new technologies and new media, illustrates how emerging technologies are victims of a boom of inflated expectations.¹³ Virtual worlds are solidly within a natural progression that results when a new technology is inundated with investors who buy into the hype without a strategy for return on investment. It has little to do with the potential of a technology to make impactful social, psychological, or behavioral changes. The growth of this technology will continue at a slow and steady pace, according to projections of the hype cycle, and new advances in 3D online Web functionality means that soon such worlds will be available totally

online and, therefore, even accessible through mobile platforms.

What We Have Done with Transitional Online Postdeployment Soldier Support for Veterans

A successful example of therapeutic activities implemented in a VW is the Chicoma healing center for veterans in the online VW SL, built by the "Coming Home" Project at the University of Southern California's Institute for Creative Technologies. Briefly, this center provides a social space for veterans to get together on an informal basis. More importantly, we offer activities and stress relief sessions that can reach people who otherwise cannot access traditional medical facilities. For example, we have translated the physical world practice of mindfulness-based stress reduction (MBSR; a type of meditation proven to reprogram how a person deals with stress) to sessions in the VW. Initial results show that people were able to get the same type of behavioral changes as is typically gained from the real-world MBSR practice. We also have a running path where one's avatar can be made to "run" the path simply by regular, rhythmic breathing into their home microphone. This too has shown a significant reduction in stress among participants. While more studies must be done to confirm how this effect relates to health care, there are already several notable examples of projects in VWs showing successful outcomes.

Examples of Current Health Care Offerings in Virtual Worlds

Club One, Inc., a real-world health program designed to educate people about nutrition and exercise, created a virtual health club in SL to host a support network of peers and virtual training tools to help battle obesity. One of the main ideas behind the project, following the idea of the Proteus effect, is that users can more easily incorporate new behaviors into their daily routine after watching their avatar perform the same actions.¹⁴ Their 12-week pilot study showed that, when 60 U.S. adults were given the same program components in the physical world or in the VW (four 1 h sessions per week), the virtual members lost an average of 2.1 lbs more than the group who had only the physical sessions.¹⁵ Other real-world health services are also providing unexpected benefits. One group that has made impressive headway is the Preferred Family Health Care clinic in St. Louis, MO. Teens with addiction problems do their intake visits at the clinic but attend their follow-up

sessions within the VW “OpenSim,” an open source version of SL. The Preferred Family Health Care clinic has seen their retention rates in this program go from 30–35% for those who attend in-person sessions to 90% for those who utilize the VW sessions.¹⁶ The reason why this works may be because teens are more comfortable connecting through online networks than they are with coming into physical contact with their peers and counselors, but whatever the reason, the results are impressive.

Finally, the Texas Obesity Research Center (TORC) at the University of Houston was an award finalist in the University of Southern California’s Annenberg School Network Culture Project (2008) for projects that use the VW of SL to do real-world good. The TORC provided opportunities for avatars to earn Linden dollars (SL currency) for performing activities in the VW: walking on treadmills, riding bikes, and trying new fruits and vegetables.^{17,18} The TORC’s International Health Challenge (2010) allowed Canada, Mexico, Switzerland, and the United States to compete in SL by earning “challenge points” for their health behaviors.¹⁹ This kind of offering begs for a longitudinal study to determine if benefits derived from the VW experience are long lasting or persistent.

Conclusion

While use of VWs for health activities and therapies is in its infancy, there are encouraging signs that it may be a highly motivating mechanism, especially for younger people who have grown up and feel “at home” with computer technologies for all types of uses. The affordances inherent in VW technology—accessibility from anywhere, anonymity, social support through broad networking, and the Proteus effect elicited via one’s avatar representation—can be powerful means to bring assistance to more people who need it. And if gaps between appropriately staffed care facilities, geographical accessibility, and increasing needs continue to widen, a rise in remote care and monitoring through VWs can provide welcome extensions to traditional care.

We predict a rise in the number of both support groups and online therapies in the VW, as not only are they great motivators for the younger patients, but they can often be more time- and cost-effective than real-world counterpart treatments. Virtual worlds are not just a flash in the pan, but, as is increasingly being demonstrated, a lifestyle intervention that provides peer support, motivation, and positive self-imagery. Already VWs have diet- and eating-based therapies, behavioral change

approaches, and approaches that increase real-world physical activity. In this digital generation, VWs are a strong contender to be another successful mechanism for lifestyle interventions that can aid those suffering from many health issues, including diabetes and obesity.

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