

# HCI Prototyping and Modeling of Future Psychotherapy Technologies in Second Life

Sheryl Brahnam

Department of Computer Information Systems,  
Missouri State University,  
901 S. National, Springfield, MO 65804, USA  
sbrahnam@missouristate.edu

**Abstract.** This paper describes the virtual *MSU SL Prototyping Center for Psychotherapy Technologies* in development at Missouri State University and explores the value of using Second Life (SL) as a prototyping tool for HCI research. The power of SL is illustrated in our use of it to envision applications and usage scenarios for an integrative system for psychotherapy technologies called *MyPsySpace*, a highly flexible and customizable system that can be used by independent therapists trained in a wide range of theoretical orientations.

**Keywords:** futures studies, second life prototyping, psychotherapy, virtual reality, drama therapy, expressive arts therapy, scenarios.

## 1 Introduction

Around the turn of the century, many researchers attempted to predict the future of psychotherapy in the 21<sup>st</sup> century [1-3], discussing such topics as the impact of technological advances [4], ethical and legal issues in the coming age of distance psychotherapy [5], increasing pluralism [6], the future of the mental hospital [7], and the relevance of psychoanalysis [8]. Rarely mentioned in these forecasts were the cutting edge technologies already in development at that time. In the late 1990s, for instance, virtual reality exposure therapy (VRET) was demonstrating its effectiveness in treating people suffering from posttraumatic stress (PTS) and phobias [9, 10]. Serious computer games, alternative realities, and virtual environments (VE) were also beginning to show promise in treating people with body image disorders [11] and in providing people with special needs new expressive therapies, such as sound therapy [12] and audio-visual interactive spaces [13]. Today growth in these areas is exploding, with virtual reality (VR) successfully treating a wide range of psychological disorders [9] and with related technologies supporting the psychological health and well-being of people from all walks of life [14, 15].

A decade into the 21st century, Anthony et al. [16] asked clinical psychologists at the cutting edge to describe their use of technology. The technologies covered in their book included the telephone, SMS, VR, immersive reality, videoconferencing, and such internet tools as websites, wikis, blogging, email, message boards, and Skype.

One concern expressed by Anthony et al. is their worry that technology in psychotherapy will remain a niche field. Many therapists are reluctant to accept the new technologies. One reason is that those who use technology as the primary means of conducting psychotherapy typically offer focused, short-term interventions outside the traditional office setting, whether via telephone or some internet service, such as Skype [16] (with distance psychoanalysis being a notable, yet controversial, exception [17]), or through specialized VR systems associated with hospitals and large clinics that have their own IT departments. Most practicing therapists work independently and still believe in the value of seeing clients in private offices, one-on-one and face-to-face. Moreover, most therapists lack training and have insufficient resources for employing technology in the clinical setting. Yet another reason therapists are reluctant to adopt the new technologies is that a majority of them, especially those involving VR, are lopsidedly linked to one theoretical perspective: cognitive behavioral therapy (CBT) [9, 18], with few applications stemming from equally valuable evidence-based humanistic approaches [18], making technology less relevant to a large number of psychotherapists.

In the conclusion to their book, Anthony et al. [16] challenge the reader to imagine future technological innovations in psychotherapy. The project described in this paper envisions how cutting-edge mental health technologies can be integrated and used by independent therapists trained in a wide range of theoretical orientations: humanistic psychology, CBT, depth (Jungian) psychology, drama therapy, and expressive arts therapy (EAT). How best to imagine this integration and expansion into other theoretic modalities is a challenge. As Mankoff et al. [19] recently observed, the literature in HCI offers little guidance in envisioning the future. They suggest that methodologies developed in the field of Futures Studies be tried when attempting to map out future research agendas in HCI, acknowledging that some of these methods mesh well with established practices in HCI, such as prototyping and modeling interactions using gaming engines [20], film [21], science fiction, and scenarios [22]. Mankoff et al. also point out that because prototyping and exploring how future technologies can be used by people is such an important yet difficult task, creating innovative modeling and prototyping approaches has long been a focus in HCI research [19].

The goal of this paper is to explore Second Life (SL) as a fairly rapid and inexpensive prototyping tool for HCI. The power of SL is illustrated in our use of it at the virtual *MSU SL Prototyping Center for Psychotherapy Technologies* developed by the author at Missouri State University. In section 2, I briefly discuss some SL research related to psychotherapy and collaborative design. In section 3, I provide a quick overview of our use of SL for prototyping a system we envision, called *MyPsySpace*, which can be customized to serve both the individual needs of clients and the different theoretical orientations of therapists. In section 4, we summarize some of the advantages SL offers HCI research as a prototyping approach for envisioning future uses of technology and present some ideas for future research.

## 2 SL for Mental Health Services and Collaborative Design

Developed by Linden Labs and launched in 2003, SL is a free massively multiplayer online environment where residents construct identities, engage in role play, and design, build, and buy their own virtual content (buildings, furniture, clothing, vehicles, etc.). Identities and appearance are easily replaced and modified, with the Second Life Marketplace offering a wide variety of embodiments (free and for sale<sup>1</sup>) that range from hyper-feminine/hyper-masculine physiques to fat suits and a host of child and animal avatars. Communication between SL avatars can take multiple forms: instant messaging, notecard delivery, and voice (via VoIP), the sound of which can be altered to match the chosen identity. SL provides a sophisticated graphics engine for creating custom-made environments and objects, along with the Linden Scripting Language (LSL) to provide avatars and objects with behaviors and animations. Methods for bringing in-world outside content (such as YouTube videos and other media) and for taking snapshots and for filming SL events are also available.

Aside from the creative satisfaction people derive from making things in SL, most people go there primarily to socialize. Popular activities include dancing at nightclubs, attending parties, shopping, and playing sports and games. Many residents of SL form groups to find others who share their interests. Many of these groups involve role playing, with some SL residents living out virtual lives in themed cities and environments (such as Kingdom of Sand) while others take on family roles in SL households. A number of real-life (RL) organizations (such as IEEE) and universities (such as Texas A&M) have also formed SL groups and have built centers on SL to disseminate informational materials to potential recruits and to host distance education and specialized training programs (e.g., mental health nursing [23]). SL is thought to offer many educational benefits, including experiential learning, role playing, theater production, simulations, real-life skills development, and collaborative learning [24].

Other SL groups are formed to provide social support groups (such as Alcoholics Anonymous) and communities (such as the virtual veteran center Coming Home [25]) for people coping with long-term disabilities, chronic diseases, addictions, and mental health issues [26]. Mental health groups are very popular and are said to account for the largest number of participants, approximately 32% of all SL residents [27]. According to the SL community directory (<http://secondlife.com/community>), over 30 groups offer professional mental health services.<sup>2</sup> The Counseling Center on Wellness Island<sup>3</sup> is one example. A number of independent licensed therapists and counselors also have offices in SL, with some building their offices on land they rent (paying \$20-\$30 per month for 512 m<sup>2</sup>) while others negotiate rentals in SL commercial buildings.

---

<sup>1</sup> Purchased with Linden dollars (L\$): 250 L\$ is approximately equal to 1USD.

<sup>2</sup> According to SL community directory searches conducted in February 2014.

<sup>3</sup> See [www.slwellness.com](http://www.slwellness.com)

In addition, more than 500 research groups are represented on SL, with over 75 groups devoted to psychological research. One relevant SL project recently reported in the literature assessed the feasibility, acceptability, and effectiveness of treating adults with generalized social anxiety disorder (SAD) with VRET administered in SL [28]. Results of this study showed that the majority of SAD patients found their SL exposure treatments both acceptable and feasible.

Since 2007 SL has been used by many RL companies, universities, and research groups as a rich resource for collaborative design as well as for collaborative learning. The value of building architectural models in SL, for instance, is illustrated in [29], which provides four case studies, with one demonstrating a two way link between a physical dollhouse model and its SL counterpart. In [30] the authors describe how businesses are using SL to try out new ways of delivering business services in order to improve real-world implementations; Starwood Hotels, for example, developed a SL version of its concept hotels, which they improved by eliciting feedback from SL visitors. In [31] the authors describe their SL simulation of a positioning system composed of virtual sensors and emitters (in the form of virtual PDAs worn by avatars), and in [32], the authors report prototyping an automobile heads up display (A-HUD) that projects navigation and traffic information on the windshield of a SL vehicle.

Within the last couple of years, Koutsabasis and Vosinakis [33, 34] not only have explored the benefits of collaborative design in SL for HCI education but have also recently developed a virtual world HCI studio course that takes advantage of problem-based learning in a virtual design studio equipped with tools (such as media players, projectors, bulletin boards, chat recorders, post-it boards, and floating text) that facilitate collaborative design, presentation, critique, and reflection [33]. Unlike traditional design studios, where the typical tools for practicing design are pen and pencil or CAD (Computer-Aided Design) programs, virtual design studios offer a realistic virtual world that can be set up to represent any number of design problems [34]. Moreover, multiple avatar scenarios can be created to explore interaction problems and possibilities. Artifacts, large and small, can be created in-world that exhibit complex behaviors when scripted, and interaction scenarios can be recorded cinematically using machinima techniques [35]. Solutions can also be scaled for better examination and evaluation.

### **3 MSU SL Prototyping Center for Psychotherapy Technologies**

The MSU SL Prototyping Center for Psychotherapy Technologies was recently set up to envision the integration and the further development of state-of-the-art psychotherapy technologies, especially VR, in the typical clinical setting, where clients and therapists meet face-to-face to discuss issues. The first system in development at the center is called *MyPsySpace*, which is intended to be a highly customizable and flexible system enabling activities that accommodate the needs of therapists trained in a range of theoretical orientations. In this section I briefly describe the use of SL as a prototyping tool for the MyPsySpace project. The

discussion that follows focuses on three aspects of the project: 1) the physical and conceptual design of the SL prototyping center, 2) the MyPsySpace interface, and 3) the methods used to model VR and distance integration. Figures 1-3 show photographs taken in SL that illustrate these three aspects.

### 3.1 Conceptual and Physical Design of the MSU SL Prototyping Center

The MSU SL Prototyping Center is currently a one story building that lies on a parcel of land in SL that is 1634m<sup>2</sup>. The center is both a design studio and an exhibition/information center that allows visitors to explore interface designs for MyPsySpace and replay usage scenarios when the center is not being employed by the design teams. At present, the design teams are being formed from CIS faculty and graduate psychology and undergraduate drama students at Missouri State University, as well as professional SL builders. Future teams will include licensed psychotherapists.

People teleporting to the center arrive on a brick landing porch in front of the prototyping center. Two doors lead inside to the main reception area, which contains a bot greeter behind a desk. The reception area and all hallways are always open to the public and provide links to research papers and YouTube videos describing projects and telling users more about the center.<sup>4</sup> The rest of the building is available to the public as well when not in private use by the design teams.



**Fig. 1.** View of the center's interior as seen from the reception room. The left hand side of the center provides models of two therapy rooms, associated observation areas, and a conference room; the right hand side provides two spaces to model the virtual worlds created and used in therapy session scenarios.

<sup>4</sup> The current SLurl for the center's SL location will be available at [www.mypspspace.com](http://www.mypspspace.com)

The interior of the building behind the main reception area is conceptually divided into two parts, with one half representing the real world (RW) and the other half representing the virtual world and distance connections (see figure 1). In effect, SL (a virtual world) is being used to model both the real world and other virtual worlds. The RW half of the building is composed of two therapy rooms containing the MyPsySpace interface and two corresponding observations areas. In the back is a conference room, equipped with presentation boards and media players, that can be used for public lectures, team meetings, presentations, displays, critiques, and brainstorming activities. The VR half of the building is composed of two large rooms encased in glass that provide actual models of the therapeutic virtual worlds and VR applications that were created for some of the MyPsySpace usage scenarios explored in the therapy rooms. The center's facilities are discussed in more detail below.

### 3.2 MyPsySpace Interface

As illustrated in Figure 2, the primary MyPsySpace interface is a large screen that is viewable either on a flat-panel TV or wall projection. MyPsySpace can be controlled using laptop computers, iPads, and smart phones, and requires therapists to create secure user accounts for each client. What appears on the screen varies depending on the client, the applications in use, and the materials in review that have been uploaded to the system by either the therapist or the client. Clients are able to upload photographs, music, journal entries, poems, and other materials any time they want, whether in session or not. Clients also have the ability to access the Internet during sessions using the MyPsySpace screen to project content for discussion. When a client enters the therapy room for his or her session, pictures and materials previously uploaded and produced by the client can appear on the MyPsySpace screen, thereby personalizing the therapy room. Moreover, new and old materials and recorded VR sessions can be accessed when required.

MyPsySpace also allows therapists to select and create any number of interventions for their clients. Interventions accessible on MyPsySpace are loosely divided into seven categories:

1. **Virtual Safe Spaces and Objects:** created in session with the possible assistance of a distance virtual world builder and accessible in and out of session for those suffering from trauma;
2. **Virtual Play Spaces:** painting and music applications, the virtual equivalent of sandplay boxes, virtual dollhouses, and other EAT applications, some of which are in development at the MSU SL prototyping center [18];
3. **Virtual Memorials and Commemoration Spaces:** for trauma and grief work and accessible by clients both in and out of session (figure 3 shows an example of such a space);
4. **Virtual Enactments:** the virtual equivalent of role rehearsal, role expansion, role reversal, narradrama, fixed-role therapy, and the empty chair dialogue intervention [36] (figure 2 shows an example of the virtual empty chair dialogue);
5. **VRET:** VRET applications and virtual worlds for exposure therapy interventions;

6. **Distance Connections:** with specialists, virtual world builders, and playback theatre troupes [36] (discussed below);
7. **Tracking and Assessment:** providing charts and graphs that track depression levels, anxiety attacks, alcohol and drug consumption, etc., over the long and short term. Using smart phone apps, clients can report events to the system as they occur between sessions. Episodes can then be discussed in the next session. These assessments can also be reviewed periodically to evaluate progress.



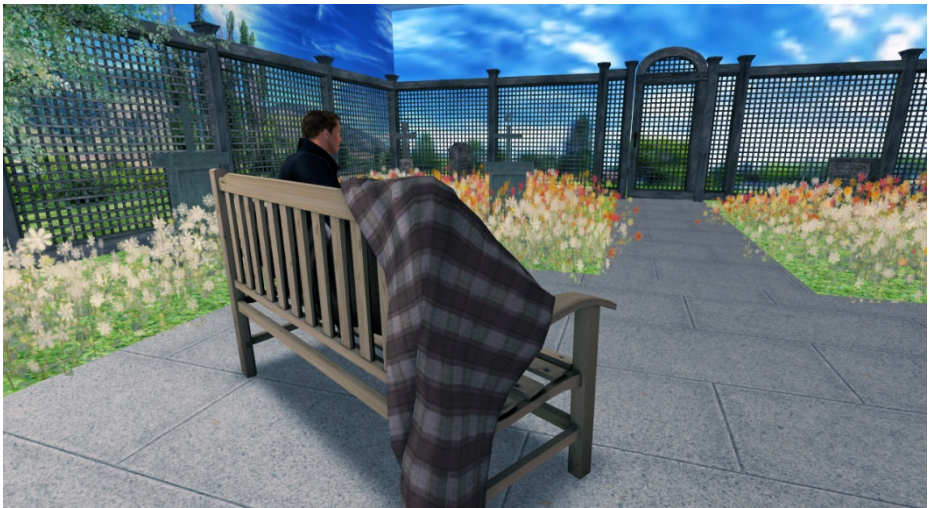
**Fig. 2.** View of a therapy room with observation area

The SL therapy and observation rooms are used by the design teams to investigate client and therapist interactions using MyPsySpace as well as to develop novel applications and virtual translations of some of the more traditional techniques listed in the seven intervention categories above. The current focus is on creating multiple usage scenarios in each category for both private and public discussion and evaluation. Students in the MSU drama department and other actors are enlisted to improvise a particular intervention between therapist and client within the parameters of a scene defined by graduate psychology students, CIS faculty, and therapist advisors. The actors are watched and directed in realtime by team members and advisors in the observations areas. The improvisations can be filmed using machinima techniques for later evaluation and iterative development of the scenarios. Movies of scenarios are available for playback in the conference room and as YouTube videos. An advantage using SL for prototyping purposes is the ability to record actor dialogues and avatar movements as they happen in SL and then play them back within the same virtual space at a later time, much like actors repeatedly performing a play on a stage. In this way, interactions can be viewed any number of times from multiple perspectives, unlike film, which can only present the perspective of the camera. Menus in the observation rooms allow team members and visitors to playback and observe the scenarios that are captured live in the therapist rooms.



Figure 2 shows an example of a virtual translation of the empty chair dialogue. Here a man who is grieving the loss of his wife has the opportunity of expressing his feelings and regrets to a projected photograph of his wife who is sitting in a chair in their home. In the iteration of the empty chair scenario portrayed in figure 2, it was observed that the image of the wife was very large and might be overwhelming for the client. It was then realized that tools and gestures for easily resizing images must be readily available in the MyPsySpace interface.

Images for the empty chair dialogue can come from photographs in the possession of the client, or they can be created in SL by builders who construct environments in consultation with client and therapist (as discussed below). In the latter case, an image of someone's face can be mapped to the face of an avatar, which can then be positioned in the environment. A photograph of this SL scene can then be taken. Thus it is possible for any number of empty chair interventions to be created and called up when necessary. These same methods can be extended to create other VR interventions, such as drama therapy and role rehearsing.



**Fig. 3.** A commemoration space for grief work rendered in one of the VR spaces at the center

### 3.3 Methods for Modeling VR and Distance Integration

Some of the interventions listed in categories 1-6 may involve VR and necessitate the building of customized virtual spaces. The VR half of the center provides a space to render virtual worlds that are constructed by SL builders for and under the direction of clients and their therapists. As is the case with the therapy rooms, scenarios involving client-therapist interactions and client solo actions in the virtual worlds can be worked out and recorded. The walls in the center containing the VR models, as mentioned above, are constructed of glass thereby enabling people to observe these worlds and what goes on in them from the vantage point of the hallway. When the VR rooms are not in use by a design team, menus are available on the hallway walls that



activate what is called a *multi-scene rezzer*, a container that stores virtual environments and renders them within an associated VR space when an environment is selected. Once a virtual environment is rendered, observers can walk inside the space to experience the virtual environment for themselves. Visitors also have the option of playing back scenarios within the virtual environments, much like visitors in the observation rooms can playback and observe prerecorded sessions in the therapy rooms.

Figure 3 shows an example of a virtual commemoration space that was developed as a second intervention for the client depicted in Figure 2 who lost his wife. Explored in a separate therapy session scenario is how a SL builder might come into the therapy room via a remote connection to construct a commemoration space for a client.<sup>5</sup> Once such a space is created, it might be possible to give a client access to it between sessions. It is envisioned that the client sitting on the bench depicted in Figure 3 would have unlimited access to his commemoration space and would be able to write poems, letters, and journal entries on notecards while in the space that he could deposit on one of the grave stones before leaving. These notecards would automatically be uploaded to MyPsySpace where they could be discussed later with the therapist, if so desired. In one rendition of this scenario, it was thought that the client might want to mark some notecards private for personal use; these private thoughts could be emailed to the client instead.

VR spaces can also model distance connections with other specialists while in session. An example would be an encounter with a Playback theatre (PT) troupe, who might be invited into a session, remotely via the MyPsySpace interface, for the purpose of re-enacting traumatic events. PT is a form of improvisational theater where a person called “the teller” tells his or her story to a troupe of actors who then go about dramatizing it [36]. A special member of the troupe called “the conductor” then asks the teller to pick out actors to represent the characters in his or her story. The actors, along with a group of musicians, then improvise the story, with the conductor checking in with the teller to make sure that the actors have depicted the story accurately. If not, the actors are asked to replay these scenes. For more information about the possibilities of virtual drama therapy, see [18].

## 4 Conclusion

Prototyping and exploring how future technologies can be used by people is an important yet difficult task. For this reason, developing new modeling and prototyping techniques has long been a focus of HCI research. In this paper I describe the virtual MSU SL Prototyping Center for Psychotherapy Technologies at Missouri State University. This center is exploring the value of using SL as both a prototyping tool and exhibition space for HCI research. Reported in this paper are some unique

---

<sup>5</sup> Collaboration would be done in session for ethical reasons and because thinking about memorials for traumatic events could be disturbing for some clients. It should also be noted that we are imagining virtual world builders who would be specialist at building virtual worlds for therapeutic purposes. This certainly will be a profession seen in the future.

benefits offered by SL, which are illustrate by our use of it to envision applications and usage scenarios for an integrative system for psychotherapy technologies called MyPsySpace, a highly flexible and customizable system designed for independent therapists who work in private offices and whose theoretical orientation may or may not be CBT.

My description of the center focused on three aspects of the project: the physical and conceptual design of the prototyping center, the MyPsySpace interface, and the methods used to model VR and distance integration. Described in this paper are some of the techniques used to develop scenarios of therapeutic interventions (some of which are original to the project) within SL models of RW therapy offices and virtual environments.

It is expected that when design teams work out scenarios for MyPsySpace, many ideas for future HCI research will arise. These will be recorded by design team members and collected in a virtual idea box located in the center's conference room. Possible ideas worthy of future investigation include evaluating the acceptance, feasibility, and effectiveness of virtual safe spaces for people suffering from PTS and exploring whether therapists reluctant to accept psychotherapy technologies, but who nonetheless are persuaded to become consultants for a design team at the center, become more accepting of the idea of technology in the clinic when they are given the opportunity of exploring technological implementations based on their own practices of therapy. Another possible area of exploration would be the development of a framework for creating customizable VR applications for psychotherapy. Not discussed in this paper are the practicalities of implementing MyPsySpace. Future studies would also need to address this concern.

**Acknowledgments.** Special thanks to SL builders Dan Fenwick and Odette Armour for their assistance in building and photographing the MSU SL Prototyping Center for Psychotherapy Technologies.

## References

1. Gutkin, T.B.: School psychology and health care: Moving service delivery into the twenty-first century. *School Psychology Quarterly* 10(3), 236–246 (1995)
2. Worell, J., Robinson, D.: Feminist counseling/therapy for the 21st century. *Counseling Psychologist* 21(1), 92–96 (1993)
3. Snyder, C.R., Ingram, R.E. (eds.): *Handbook of psychological change: Psychotherapy processes & practices for the 21st century*. John Wiley & Sons Inc., Hoboken (2000)
4. DeLeon, P.H., Brown, K.S., Kupchella, D.L.: Editorial: What will the 21st century bring? An emphasis on quality care. *International Journal of Stress Management* 10(1), 5–15 (2003)
5. Koocher, G.P.: Twenty-first century ethical challenges for psychology. *American Psychologist* 62(5), 375–384 (2007)
6. Norcross, J.C., Freedheim, D.K.: Into the future: Retrospect and prospect in psychotherapy. In: Freedheim, D.K., et al. (eds.) *History of Psychotherapy: A Century of Change*, pp. 881–900. American Psychological Association, Washington, DC (1992)

7. Persad, E., Kazarian, S.S., Joseph, L.W. (eds.): *Mental Hospital in the 21st Century*. Wall & Emerson (1992)
8. Wallerstein, R.S.: The relevance of Freud's psychoanalysis in the 21st century: Its science and its research. *Psychoanalytic Psychology* 23(2), 302–326 (2006)
9. Scozzari, S., Gamberini, L.: Virtual reality as a tool for cognitive behavioral therapy: A review. In: Brahnam, S., Jain, L.C. (eds.) *Advanced Computational Intelligence Paradigms in Healthcare 6*. SCI, vol. 337, pp. 63–108. Springer, Heidelberg (2011)
10. Safir, M.P., Wallach, H.S.: Current trends and future directions for virtual reality enhanced psychotherapy. In: Brahnam, S., Jain, L.C. (eds.) *Advanced Computational Intelligence Paradigms in Healthcare 6*. SCI, vol. 337, pp. 31–45. Springer, Heidelberg (2011)
11. Riva, G.: Virtual reality in psychological assessment: The Body Image Virtual Reality Scale. *CyberPsychology and Behavior* 1(1), 37–44 (1998)
12. Swinger, T.: The invisible keyboard in the air: An overview of the educational, therapeutic and creative applications of the EMS Soundbeam. In: 2nd European Conference on Disability, Virtual Reality and Associated Technologies, pp. 253–259 (1998)
13. Brooks, A.: Virtual interactive space. In: *World Confederation for Physical Therapy*, Yokohama, Japan (1999)
14. Argenton, L., Triberti, S., Serino, S., Muzio, M., Riva, G.: Serious games as positive technologies for individual and group flourishing. In: Brooks, A.L., Brahnam, S., Jain, L.C. (eds.) *Technologies of Inclusive Well-Being*. SCI, vol. 536, pp. 221–244. Springer, Heidelberg (2014)
15. Stetz, M.M.C., Ries, R.I., Folen, R.A.: Virtual reality supporting psychological health. In: Brahnam, S., Jain, L.C. (eds.) *Advanced Computational Intelligence Paradigms in Healthcare 6*. SCI, vol. 337, pp. 13–29. Springer, Heidelberg (2011)
16. Anthony, K., Nagel, D.M., Goss, S. (eds.): *The use of technology in mental health: Applications, ethics, and practice*. Charles C Thomas Publisher, Ltd., Springfield (2010)
17. Scharff, J.S. (ed.): *Psychoanalysis Online: Mental Health, Teletherapy, and Training*. Karnac Books Ltd., London (2013)
18. Brahnam, S.: Theory-guided virtual reality psychotherapies: Going beyond CBT-based approaches. In: Shumaker, R. (ed.) *VAMR 2013, Part II*. LNCS, vol. 8022, pp. 12–21. Springer, Heidelberg (2013)
19. Mankoff, J., Rode, J.A., Faste, H.: Looking past yesterday's tomorrow: using futures studies methods to extend the research horizon. In: *CHI 2013*, pp. 1629–1638. ACM, New York (2013)
20. O'Neill, E., Lewis, D., Conlan, O.: A simulation-based approach to highly iterative prototyping of ubiquitous computing systems. In: *Simutools 2009* Article No. 56 (2009)
21. Bardram, J., et al.: Virtual video prototyping of pervasive healthcare systems. In: *DIS 2002*, London, pp. 167–177 (2002)
22. Blythe, M., Wright, P.: Pastiche scenarios: Fiction as a resource for user centred design. *Interacting with Computers* 18(5), 1139–1164 (2006)
23. Kidd, L.I., Knisley, S.J., Morgan, K.I.: Effectiveness of a Second Life® simulation as a teaching strategy for undergraduate mental health nursing students. *Journal of Psychosocial Nursing and Mental Health Services* 50(7), 28–37 (2012)
24. Sidorko, P.E.: Virtually there, almost: Educational and informational possibilities in virtual worlds. *Library Management* 30(6/7), 404–418 (2009)
25. Morie, J.F.: The healing potential of online virtual worlds. In: Brahnam, S., Jain, L.C. (eds.) *Advanced Computational Intelligence Paradigms in Healthcare 6*. SCI, vol. 337, pp. 149–166. Springer, Heidelberg (2011)

26. Gorini, A., et al.: A second life for ehealth: Prospects for the use of 3-d virtual worlds in clinical psychology. *Journal of Medical Internet Research* 10(3), e21 (2008)
27. Norris, J.: The growth and direction of healthcare support groups in virtual worlds. *Journal of Virtual Worlds Research* 2(2), 4–20 (2009)
28. Yuen, E.K., et al.: Treatment of social anxiety disorder using online virtual environments in Second Life. *Behavior Therapy* 44(1), 51–61 (2013)
29. Ehsani, E., Chase, S.C.: Using virtual worlds as collaborative environments for innovation and design: Lessons learned and observations from case studies in architectural projects. In: 27th Conference on Education in Computer Aided Architectural Design in Europe, Istanbul, pp. 523–531 (2009)
30. Kim, H.M., Kelly, L., Cunningham, M.A.: Towards a framework for evaluating immersive business models: Evaluating service innovations in second life. In: 41st Annual Hawaii International Conference on System Sciences, Hawaii, p. 110 (2008)
31. Prendinger, H., Brandherm, B., Ullrich, S.: A simulation framework for sensor-based systems in second life. *Presence* 18(6), 468–477 (2009)
32. Chu, K.-H., Joseph, S.: Using second life to demonstrate a concept automobile heads up display (a-hud). In: *MobileHCI*, Amsterdam, The Netherlands, pp. 2–5 (2008)
33. Koutsabasis, P., Vosinakis, S.: Rethinking HCI education for design: problem-based learning and virtual worlds at an HCI design studio. *International Journal of Human Computer Interaction* 28(8), 485–499 (2012)
34. Koutsabasis, P., et al.: On the value of virtual worlds for collaborative design. *Design Studies* 33(4), 357–390 (2012)
35. Bardzell, J., Bardzell, S., Briggs, C., Makice, K., Ryan, W., Weldon, M.: Machinima prototyping: an approach to evaluation. In: 4th Nordic Conference on Human-computer Interaction: Changing Roles, pp. 433–436 (2006)
36. Landy, R.J.: *The couch and the stage: Integrating words and action in psychotherapy*. Jason Aronson, New York (2008)