Self-management intervention for amputees in a virtual world environment

S L Winkler[1], R Cooper[2], K Kraiger[3], A Ludwig[4], A Krueger[5], I Gaunaurd[6], A Fisher[7], J Kairalla[8], S Elliott[9], S Wilson[10], A Esquenazi[11]

[1, 10]Occupational Therapy Department, [2]Conflict Analysis and Resolution Department, Nova Southeastern University, Ft. Lauderdale, FL, USA

[1,6]Miami Department of Veterans Affairs Medical Center, Miami, FL, USA

[3]Psychology Department, Colorado State University, Fort Collins, CO, USA

[4,5]Virtual Ability, Inc., Aurora, CO, USA

[7]US Army Telemedicine & Advanced Technology Research Center (TATRC) Fort Detrick, MD, USA

[8]College of Public Health and Health Professions and College of Medicine, University of Florida Gainesville, FL, USA

[9]Scott Elliott e-learning Solutions, Chicago, IL, USA

[11]MossRehab Einstein Healthcare Network, Philadelphia, PA, USA

[1]swinkler1@nova.edu, [1]sandra.winkler@va.gov, [2]robicoop@nova.edu, [3]kurt.kraiger@colostate.edu, [4]emecapalini@gmail.com, [5]akrueger@virtualability.org, [6]ignacio.gaunaurd@va.gov, [7]ashley.g.fisher.civ@mail.mil, [8]johnkair@ufl.edu, [9]scott.t.elliott@gmail.com, [10]sw1269@nova.edu, [11]aesquena@einstein.edu

[1]www.virtualhealthadventures.org, [4,5]www.virtualability.org

ABSTRACT

An e-learning self-management intervention for amputees was created then beta-tested for usability using focus groups and qualitative analyses. The next phase of the study compares change in outcomes when the intervention is presented in e-learning and virtual world conditions. Focus group results identified the self-directed structure and video presentation aspects of the intervention as strengths and were less enthusiastic about use of text. Research team experiences, beta test results, and available technology suggest the need to rethink traditional learning theory in order to meet the needs of the modern learner and create more modern learning environments.

1. INTRODUCTION

1.1 The Problem

Amputation is a life-long condition. Although acquiring current and evolving prosthetic- and health-related information will be an on-going process throughout the lifespan of the amputee, amputees report a lack of information available on new prosthetic devices (Berke et al, 2010). We hypothesize that amputees who feel well-educated about their prosthesis care are more likely to adhere to treatment recommendations and have improved health outcomes.

1.2 The Approach

This project uses a self-management approach to build an intervention that provides evidence-based health information for amputees. The effectiveness of self-management programs is attributed to enhanced self-efficacy. The approach is based on Bandura's social cognitive and self-efficacy theories where evidence-based knowledge of risks and benefits creates a pre-condition for change, but must be coupled with a self-influence, e.g., self-efficacy or belief, before desired physical, social, and emotional outcomes can be achieved, or knowledge translated into action (Bandura, 2004).

Bandura's four sources of self-efficacy were used to guide the development of this intervention: performance accomplishment/mastery, modeling/vicarious experience, verbal persuasion/interpretation of symptoms, and

social persuasion (Bandura, 2004). The five core skills of self-efficacy identified by Lorig and Holman (2003) were also taken into consideration: problem solving, decision-making, resource utilization, forming a patient/health care provider partnership, and taking action. While Bandura's theories guided the nature of the content, Kraiger's Decision-Based Evaluation Model (Kraiger, 2002; Kraiger et al, 1993) guided the presentation of the content. Kraiger's model posits that learning in training consists of affective (self-efficacy), cognitive, and behavioral change. Using Kraiger's model, we provided declarative knowledge to facilitate cognitive change and procedural knowledge to facilitate the potential for behavioral change.

1.3 The Context

A limitation of the more traditional mass communication of health information is that it is not individualized; yet individualization, social support, and guidance impact the success of health programs (Bandura, 2004). Few studies have tested the effectiveness of using a virtual world environment to disseminate evidence-based information while at the same time building self-management skills. Virtual world environments such as Second Life® (SL) have been used to enhance patient experiences and increase engagement in their healthcare (Cantrel et al, 2010; Hoch et al, 2012; Johnson et al, 2014). Virtual worlds allow users to "explore, create, imagine, collaborate, role play, interact, socialize, learn, and experience events in a safe and vivid manner" (Ghanbarzadeh et al, 2014). A transfer of behavior from a virtual world to the real world has been documented (Bayraktar and Amca, 2012; Fox and Bailenson, 2009; Napolitano et al, 2013).

1.4 The Purpose

The purpose of our three-year project is test the effectiveness of delivering evidence-based health information to amputees in a virtual world environment. Specifically, delivery in the Second Life (SL) virtual world and e-learning environments will be compared on the following outcomes: use of prosthetic devices, self-efficacy, psychosocial status, pain interference, and function.

This presentation will describe the project and provide results of the beta testing of the self-management intervention that will be used to refine the intervention prior to the randomized clinical trial that will begin in June of 2014.

2. METHODS

2.1 Intervention

The self-management intervention was created by the research team over a one-year period using Microsoft PowerPoint. The intervention was organized into four sections: History of Prosthetics Epidemiology of Amputation, Phases of Rehabilitation (Esquenazi, 2004), and Current Technology. The history, epidemiology, and current technology sections were declarative knowledge based, that is, learners are expected to be able to recognize or recall propositional knowledge or new information presented during training. The phases of rehabilitation section included declarative and procedural knowledge. For the latter, learners are expected to apply rules or implement procedures covered in training. Once the research team had reviewed and edited each section as a group, the PowerPoint was converted to an e-learning course using Articulate software (www.articulate.com), which will serve as the control in the randomized clinical trial. Simultaneously, a virtual world version of the intervention was created in the SL virtual world by Virtual Ability, Inc. Figures 1, 2, and 3 compare constructs presented in real life (e-learning) with those in Second Life.

2.2 Participants and Data Collection

Beta-test subjects were recruited using convenience sampling. Four women and five men participated, including six occupational and physical therapy clinicians who were colleagues of members of the research team with expertise in treating amputees and three amputees who were also the three amputee actors in the training videos. Following signing of informed consent, the beta testers accessed the e-learning version* of the intervention via links on the project website (www.virtualhealthadventures.org). The focus groups were held online using Adobe Connect software and were conducted as audio interviews supported by synchronous chat. The interview questions were organized around three main topic areas: overall impressions, style and format of the intervention, and the content of the intervention. Questions were open-ended to elicit descriptive, detailed responses. Data was collected through in-depth notes taken during the focus group interviews, as well as via digital recording. Following the interviews, the recordings were played back and additional notes were taken to capture all relevant content of the interviews as well as direct quotes illustrative of the subjects' feedback.

**Due to the nature of the research questions and timeline and resource constraints, beta testing was done on a development server using only the e-learning format.*

Figure 1. *History of prosthetics in the e-learning and SL environments*.

Figure 2. *Stair training in the e-learning and SL environments*.

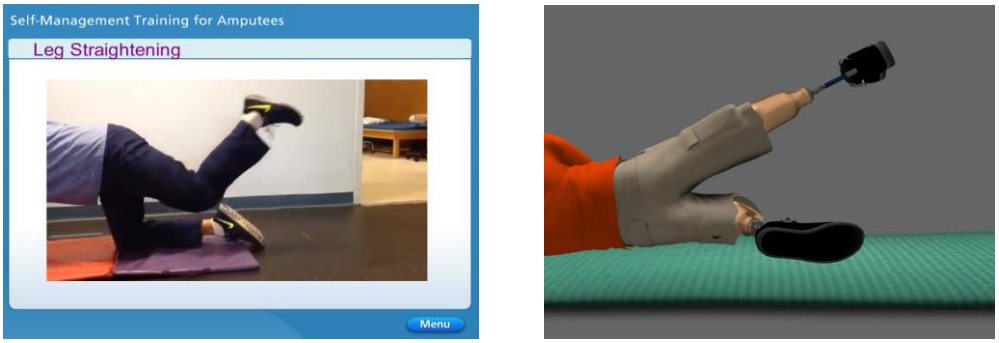

Figure 3. *Conditioning exercises in the e-learning and SL environments*.

2.3 Analysis

Qualitative content analysis was used to analyse the complete set of detailed interview notes. Descriptive coding was used to highlight the experiences and perceptions of the beta-test subjects, followed by pattern coding to identify key themes emerging across the focus group interviews. These findings were summarized in a report which included quotes as exemplars of the key points shared by the subjects.

3. RESULTS

Data were analysed by summarizing common points from all three focus groups. The common points from all three focus groups are presented here.

1. Overall Impression. The self-directed structure of the intervention was highly regarded. The navigation could be clarified. All web links should be active.
2. Style and Format. Subjects reported the sections were visually pleasing but some slides included too much textual information. The videos received universal acclaim.
3. Content. Subjects reported the information was accurate and would be useful to new amputees. Several subjects felt there was too much historical information while at least one subject valued the depth of the historical information. Subjects recommended a section that targeted family members.

4. DISCUSSION

This study evaluated the overall impression, style and format, and context of a self-management intervention in order to improve the intervention prior to its use in a randomized clinical trial. The purpose of the randomized clinical trial, which will begin during summer 2014, is to compare patient-level outcomes (dependent variable) when the intervention is delivered in either an e-learning or a virtual world environment (independent variable).

Beta-test subjects expressed high regard for the self-advocacy approach, which is characteristic of the self-management approach. The subjects praised the videos (procedural knowledge) with less appreciation of the text (declarative knowledge). Perhaps the declarative knowledge was not appreciated because the beta-test subjects were already either clinical experts or well-adjusted amputees; subjects did comment that this would be useful information for new amputees. Because our focus group members were already experts, beyond the need for facts, they were ready to experience the more novel procedural knowledge aspects of our project. Alternatively, it is possible that text has become boring to some learners. Because of these findings, we have added the following instructions to the randomized portion of the clinical trial: "Sections can be completed in any order. Not all sections need to be completed." We can then use Internet tracking mechanisms to examine the order in which users view sections, which sections were viewed most often, and how long each section was viewed.

In summary, subjects indicated a preference for a more modern learning environment. For example, less text and more videos were desired. Research team experiences and beta test results have prompted this research team to rethink how and when to mix declarative and procedural knowledge to meet the needs of the modern learner.

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