

Virtual Reality: An Enabling Environment for Occupational Performance of Leisure Activities for the Older Stroke Survivor

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Abstract

This paper describes how the use of a virtual reality leisure based program can provide an enabling environment for the engagement in leisure activities for older people who have survived a stroke. The virtual reality program contains many different leisure applications putting the person in different places during virtual experiences. A theoretical explanation for how virtual reality encourages competence, expression, and pleasure in leisure activities in older stroke survivors is proposed in this paper. Stroke survivors over 60 years of age are participating in a pilot investigation that explores their general perceived and the specific volitional benefits of having used virtual reality. The virtual reality system used is the Gesture Xtreme completely immersive system. We are presenting the results of qualitative interviews that are used to gauge the perceptions that stroke survivors hold about engaging in virtual experiences. Themes related to pleasure, creativity and flow are expressed in these interviews. These results are interpreted based on concepts from the field of aging and cultural anthropology. There are plans to conduct a larger study where more outcomes are examined.

Virtual reality (VR) has been described as having the potential to be a powerful tool for use in rehabilitation with people with disabilities.¹⁻² VR is defined as an immersive and interactive three-dimensional (3D) computer experience occurring in real time.³ VR applications use 3D computer graphics, which respond to the user's movements, thereby giving the user the sense of being immersed in the virtual environment.

Drawing from the field of aging, we view people as proactive, and people and environments as integrated and mutually defining^{4,5} or as mutually transacting.⁶ Further, this present work has been informed by recent attempts to explore the personal and experi-

ential aspects of aging in environments and the enduring and expressive relationship of persons and objects.⁷

Emerging from the field of cultural anthropology and discussed in an earlier paper⁸ are concepts that are particularly relevant here. The concept referred to as 'body-centeredness' refers to the relationship of the body to the environmental features that surround it.⁹ 'Environmental centralization' refers to the way in which the environment is manipulated over time to accommodate increasing limitations of the body through closing off of peripheral areas and the concentration of living space in central zones.⁹

Another concept is 'entexturing', or the fine tuning of the environment to sensory modalities in connection to daily routines. The term refers to the individual's awareness of the body with respect to a variety of media with different sensory "textures" such as space, light, color, visual imagery, activity, rhythm, content, pace, ambiance, and sound.⁹ Entexturing may be thought of as an individual's regulation of activity, of aural and visual stimuli, and color, and other sensory media that surround the body in order to produce, if possible, a finely articulated and satisfying whole. These concepts are relevant to the ways in which people with disabilities interact with virtual environments (VE).

Virtual reality has the potential to offer persons with disabilities greater control over events in their environment and therefore to contribute a sense of competence and satisfaction with life. Csikszentmihalyi¹⁰ uses people's play and leisure activities as examples of the optimal experience of flow. Flow is defined as the state of consciousness an individual achieves during the active engagement in an activity, which is intrinsically rewarding.¹⁰ In order to experience flow there must be a balance between the challenges and the skills as well as the environmental conditions. Recent advances in the area of VR technology have facilitated the active engagement of people with disabilities in leisure activities.

There have been problems reported with the use of different VR systems that have important implications for using VR success-

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fully with people with disabilities. Critics of the head-mounted display systems have reported they tend to restrict movement, are heavy to the user, cause motion sickness, have a limited field of view, and are not very comfortable.¹¹⁻¹³ The major limitation with the use of desktop VR (which is accomplished through projecting the virtual environment (VE) onto the computer monitor and the user interacts with the VE with the use of a joystick, mouse, or keyboard) is a diminished sense of immersion.¹²

Method

To overcome the problems reported above, we used the 1996 patented *Mandala® Gesture Xtreme* VR system,⁹ which offers unique opportunities for people with disabilities. This system uses a video camera as a capturing and tracking device to put the user inside VR experiences. The user sees him/herself on a TV screen and the VE responds to his/her movements. The user does not have to wear, touch or hold anything. Through the use of the system's "video gesture" capability, the movements (e.g., reaching, bending) trigger visible or invisible icons to score points, and manipulate animations (e.g. playing a virtual drum kit, catching and bursting flying balloons, playing volleyball). For this pilot work our sample was two stroke survivors over the age of 60 years. They were given three one hour sessions of virtual reality leisure intervention. Following each session, participants were interviewed concerning their experiences.

Results

Pseudonyms, Ben and Frank, will be used for describing participants.

The concept of environmental centralization was seen in several virtual environments because they provided closed off areas to Ben's physical world and allowed a "doing" space where Ben could perform an activity in a central zone. One such environment was soccer. Ben was sitting on a chair and positioned so he was projected in front of a soccer net as a goalkeeper. He didn't need to move at all except to move his arms or legs in a blocking action to stop the balls from getting past him into the net. The centralization aspect of this activity maintained his competence through the removal of physical barriers. He had the necessary space for performing an activity (Figure 1). In another environment, volleyball, the concept of centralization was seen by having Frank sitting on a chair projected onto a beach volleyball court. To play volleyball, Frank only had to lift his arms above his head to hit the ball back over the net to Mary, the research assistant who was his opponent. He was capable of these movements and was successful in playing the game. The ball always arrived in Frank's space so that Frank did not have to run for it but only reach upwards (Figure 2).

An example where entexturing was expressed was with painting and playing drums. Ben was able to play some drums that were



Figure 1.



Figure 2.



Figure 3.

placed around him. He had to reach out to the side and across his body to hit the various drums. A rhythm was created by hitting the drums. He expressed as "being into it". Ben was creative in his execution of the activity responding to auditory and visual stimuli (Figure 3). He also was able to reach and grasp a paint ball and drag it across the screen to create a rainbow.

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These are some examples how the use of virtual reality has created what we call occupational spaces. These are places where activities are possible. Our participants have expressed their perceptions of what it means to them to be able to engage in virtual reality. Here are some of their quotes:

“They give the participant a feeling of competition and participation. They keep you going. I liked the feedback. It was almost instant” [Frank].

“Promising. It makes me move. I concentrate more. I get back a little to normal. It makes me feel alive. Makes me feel useful” [Ben].

The use of virtual reality is a positive addition to the lives of people with stroke. We need to continue our work and explore how it impacts on the leisure aspects of the lives of these people at home. Is it possible that virtual reality may stimulate people to resume past activities or pick up new ones that have some similar features? We are focused on the social and psychological benefits of virtual reality but it is also important to look at the physical benefits such as improved balance, and range of motion from participating in virtual reality. We plan to do larger studies where these outcomes will be explored.

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