

Reaching The Summit without Leaving Your Armchair (Short Paper)

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Abstract

This study focuses on people with lower limb disabilities that have been acquired during their lifetime. Research in the field of virtual reality technology has shown that a virtual reality environment can provide enjoyment and motivation for the disabled. Their activities in the virtual world can feel like a real experience as they enjoy the movements, which they are unable to perform in the real world. The concept of self-efficacy in a virtual reality game among a population with a motor disability has not been yet investigated. The aim of the current study is to improve the participants' ability in self-efficacy and mental well-being in virtual reality environments which would in turn lead to improvements in their daily life in the real world. The study includes ten participants with a lower limb disabilities. The study clearly demonstrates a process of improvements in the self-efficacy and mental well-being of the participants. It was found that the virtual reality experience was beneficial to the participant in six different ways: two in the aspect of mental well-being: independence and sport activities and four in self-efficacy factors: emotional aspects, discovery of mental flexibility, improved cognitive functions, and self-recovery after failures. These research results could have important implications for the next stage of the research and for its implementation. This study adds to the theoretical knowledge about using virtual reality for rehabilitation purposes, by placing the emphasis on cognitive functions and developing the full potential of people with some sort of motor disability. The implications of this research are unlimited.

Keywords: Virtual reality, physical disabilities, self-efficacy, well-being.

Introduction

Virtual reality (VR) technology is a computer simulated, which consists of environment that can be in the real word or an imaginary world (Sherman & Craig, 2003). This technology can include a head mounted display that includes a 3D monitor, position and sometimes headphones (Javaid

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& Haleem, 2020). VR technology may break the deep everyday connection with our senses, which tell us that we are where we seemingly are (Sanchez-Vives & Slater (2005). VR technology offers novel ways to practice and maintain a variety of skills for different needs as memory reinforcement for knowledge (Richmond, 2017). VR technology also used for medical planning, architecture, driving training, flight simulator, military training, and rehabilitation (Javaid & Haleem, 2020). All this is due to the advances that have taken place in recent years in VR technology, which has supported among other things, the creation and evaluation of learning and rehabilitation tasks (Lange et al., 2012).

VR technology has evolved in the field of rehabilitation and offers new opportunities for the development of tools and rehabilitation options (Kang & Kang, 2018). Research in the field of VR technology in rehabilitation has shown that a VR environment can provide enjoyment and motivation for people with physical disabilities (Yalon-Chamovitz & Weiss 2008). Their experience in the virtual world can feel real as they enjoy the activities, they cannot perform due to their disability in the real world (Tariq, Rana, & Nawaz, 2018). Integrating VR in rehabilitation processes improves rehabilitation methods (Lange et al., 2012). The ability to change the imagery, rating the level of difficulty in the task, and adapting it according to the participants' abilities are important advantages in VR, since these characteristics are essential for physical and cognitive rehabilitation (Rizzo, Schultheis, Kerns & Mateer, 2001). Therefore, VR has clinical significance for improving participant performance when dealing with the challenges of daily life (Lange et al., 2012). The concept of self-efficacy in a VR game among a population with a physical disability has not been yet investigated.

Methods

The study includes ten adult participants ($M = 34.20$, $SD = 8.53$), five women and five men, ages varied from 18-50. All participants were injured throughout their life, their main injuries were in their lower limbs without other disabilities. The participants volunteered to the current research, through rehabilitation centers and social media.

We used the Oculus Quest with seven VR games: Nature Treks VR, The Climb, Real VR Fishing, fitXR, Dance Central, Beat Saber and Tripp. During the study we used four data collection tools: background questionnaire, mental wellbeing questionnaire based on Perceived Wellness Survey (PWS) (Harari, Waehker & Rogers, 2005), self-efficacy questionnaire based on General Self-Efficacy Scale (Chen, Gully, & Eden, 2001), and interview. The research method chosen for the current study is a mixed method: quantitative and qualitative methods. The study was built in two stages: design and development of research tools and the experiment. The experiment included nine individual sessions with each participant (30-40 minutes). During the experiment, the capacity for self-efficacy and the sense of mental wellbeing were measured at three time points – pre, during the experiments, and at the end of the intervention. The sessions which included VR activities performed in four stages: first, the researcher defines boundaries in order to maintain the participants safety. In stage two, the participant chose the environment that he or she was interested to operate in. Stage three included casting the glasses to the phone, in order to guide the participant. In the final stage the participant was seated in a wheelchair and operated in the chosen environment.

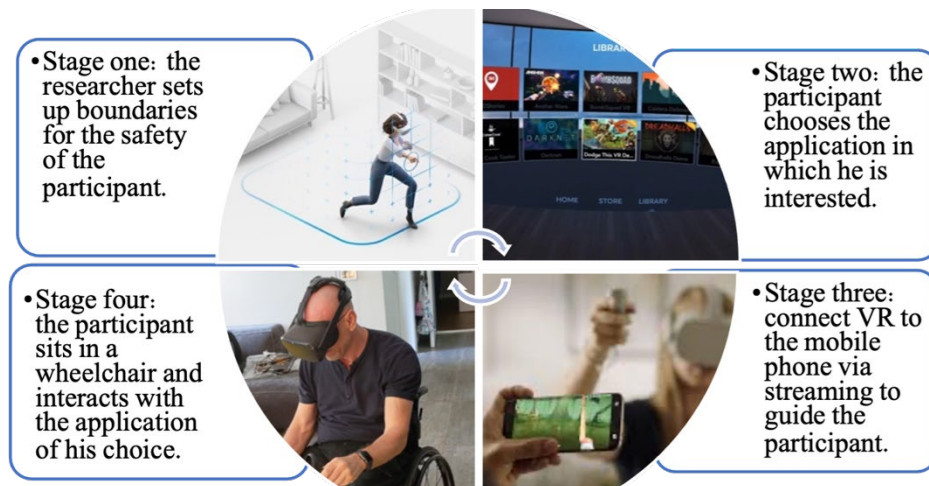


Figure 1. *Research setup Instruments Research Process*

Results

The study demonstrates a process of improvement in the self-efficacy and mental wellbeing of the participants. A statistically significant improvement in the participants' mental wellbeing was found between the beginning, the middle and the end of the intervention, $t(9) = 2.67, p = .026$, Cohen's $d = 0.84$. There was also a statistically significant difference in the degree of self-efficacy between the time point at the start of the intervention and the time point at the end of the intervention $t(9) = 2.39, p = .040$, Cohen's $d = 0.76$. There was a gradual increase in both mental wellbeing and the degree of self-efficacy of the participants following the use of VR. Mental wellbeing: before (3.04), during (3.32), and at the end of the intervention (3.53). The degree of self-efficacy: before (2.26), during (3.67), and at the end of the intervention (4.06).

Discussion and Conclusions

This study adds to the theoretical knowledge about the use of VR for rehabilitation purposes by people with physical disability. Yalon-Chamovitz & Weiss (2008) research demonstrated that a VR environment can provide enjoyment and motivation for people with physical disabilities. Trick et al. (2018), showed that people with physical disabilities who perform motoric activities through VR (activities that they cannot perform in the real world due to their disability), have improved mental performance. Our study showed that exploring and gaming through VR environments provided enjoyment and motivation for people with physical disability. Furthermore, this study highlights the effect of VR on the improvements in the self-efficacy in people with physical disabilities that was not explored in previous studies.

The results of this study may form the basis for further research, for example, focusing on examining the relationship between mental functioning to motoric or cognitive functioning; or the impact of the VR activities on self-efficacy and mental wellbeing and its influences on everyday life in the real world.

Research results could influence how we deal with the mental state of people with a physical disability in their lower limbs and could offer new mental rehabilitation hope to people with disabilities. The results of this study may be the basis for further research, for example, focusing on examining the relationship between mental functioning and physical functioning of a

participant with a physical disability following exposure and activity in imaginary environments. Another study may be a comparative study examining the examination of self-efficacy and / or the level of self-efficacy among people with physical disabilities compared to people without disabilities following virtual reality activity. Similarly, the effect of the participants' level of physical disability on self-efficacy and / or self-efficacy level following activity in virtual reality can be examined. Many years of research can examine the contribution of activity in virtual reality over time to their ability to deal with the challenges of daily life (recovery after failures, discovery of mental flexibility, independence, other).

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