Research Article

BIOMEDICAL Journal of Scientific & Technical Research

ISSN: 2574 -1241

DOI: 10.26717/BJSTR.2019.22.003740

Use of Virtual Reality Therapy (VRT) for Vestibular Rehabilitation

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ARTICLE INFO

Received: October 17, 2019

Published: October 30, 2019

ABSTRACT

Citation: Sierra Hunnicut, Lilian Felipe. Use of Virtual Reality Therapy (VRT) for Vestibular Rehabilitation. Biomed J Sci & Tech Res 22(3)-2019. BJSTR. MS.ID.003740.

Introduction

Corporal balance is composed by the vestibular, visual and proprioceptive systems [1]. The vestibular system acts as a gravity sensor controlling the dynamic posture. Vestibular dysfunctions may be peripheral and/or central, occurring by primary or secondary causes, having as main manifestations, body sway under visual or somatosensory conflict conditions, reduced stability and functional capacity, gait deviations and falls [2]. Dizziness is one of the most common complaints to physicians worldwide, and in United States it is responsible for over 8 million health appointments per year [3]. Around 40 to 50 percent of people over the 40's has experienced dizziness or imbalance [1]. Vestibular disorders are a range in disorders in which an individual is imbalanced [4]. Patients with vestibular disorders experience dizzy triggers, and due to this factor, an increasing of risk for falling and/or getting injured [5]. Vestibular disorders have several alternatives of treatment, and one of them is the vestibular rehabilitation. The vestibular rehabilitation combines physical movements with exposure to different sensory inputs to reduce symptoms and improve balance problems. The vestibular rehabilitation is a treatment that associate physical movements with exposure to diverse sensory inputs to decrease symptoms and enhance balance. Part of the intervention is to execute exercises that incorporate visual-vestibular and/or somatosensory-vestibular conflict [2,5,6]. Vestibular rehabilitation is founded on mechanisms associated to the neuronal plasticity of the central nervous system, known as adaptation, habituation and substitution, where nerve cells create new synaptic connections growing its neural arrangement [2]. Virtual Reality (VR) is computer technology aimed to replicate or modify a user's physical presence in an illusory, yet representative, setting. It has been used for didactic and amusement reasons, as well as immersive video games. It has now created its way into the dominion of healthcare and remains to make progresses in how experts and specialists can assistance develop their patients' outcomes [7].

Objective

To verify the application of virtual reality in the vestibular rehabilitation process.

Discussion

In Virtual Reality Therapy (VRT) it is possible to replicate, using an appropriate software, real spaces in a multisensory setting through resources that can intensify sensations such as special helmets, belts, headphones, platforms and use of environment displays. This allows the user to interact and emerge in a virtual world in real time through multi sensations, facing them and getting involved and motivated to perform the proposal activity [8]. This technology offers an extensive variety of specific stimuli and sensory conflicts of different degrees of complexity in a safe environment [9]. Studies has shown the use of VR in clinical management through diverse healthcare areas as efficient in treatments, including developing gait in physical therapy, treating post-traumatic stress disorder and phobia controlling [9-12]. For vestibular disorders treatment, the VR is considered a new instrument for treatment with favorable results. Virtual reality improves a patient's condition through balance training. This tool can improve motor skills and postural control abilities in order to prevent risk of falling [12-22]. The VRT has contributed to enhancement of postural balance, motor coordination mobility, flexibility, physical function, also improved of stability limit; decreasing dizziness levels and rates of falls, offering functional independence and quality of life for the patients [13-23].

This technology applied in vestibular rehabilitation can offer numerous positive aspects not just in successfully recover balance patient's abilities, providing superior results to assistance and improve postural control and supporting the improvement of motor learning. The significance of using VR as a therapeutic technique is interconnected to the capability to provide a range of stimuli if compared to conventional vestibular rehabilitation; allowing the patient sensory divergences at distinctive levels of difficulty and in a safe environment that will stimulate enhancement balance and posture, improve mobility, the functionality of upper and lower limbs, additionally encouraging and motivating the patient during therapy [10-22]. Another benefit is the ability to custom the VR system to for the vestibular rehabilitation in the comfort of the patient own home. They would be able to complete rehabilitation inside their house, with the assistance of the clinician or family member, creating motivation to continue the therapy [14]. Several studies have been published, which, however, requisite further investigations, requesting stricter protocols [6,10-23]. With improvements in technology, VR based companies are trying to minimize the cost of the devices and software used to make rehabilitation programs more affordable and accessible to the public [13].

Conclusion

The visual, vestibular, and proprioceptive divergences produced by virtual reality stimulation technology can offer an extensive array of sensory stimuli to generate conflicts of variable degrees of difficulty in a secure setting. Therapy in virtual reality proposes a relationship between the individual and the machine, suggesting that it is in another reality in which the perception of the environment is altered by sensory stimuli. Additional studies on the use of rehabilitation supported by virtual reality in vestibular disorders are necessary to corroborate how successfully the body balance functional tests can be used in the short and long terms.

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ISSN: 2574-1241

DOI: 10.26717/BJSTR.2019.22.003740

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Submission Link: https://biomedres.us/submit-manuscript.php