

VIRTUAL/AUGMENTED REALITY TRAINING AS AN INTERVENTION FOR BALANCE IN OLDER ADULTS: A SYSTEMATIC REVIEW

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ABSTRACT

Virtual/augmented reality training are new interventions used by the physical therapist in the treatment of balance disorders in older adults. Virtual/augmented reality is a computer-based technology that allows the use of a simulated environment that challenges the visual, auditory, and proprioceptive senses in order to improve balance reactions and reduce falls in the elderly. The purpose of this review was to evaluate the effectiveness of virtual reality (VR) or augmented reality (AR) on postural balance in older adults with no major medical issues as compared to traditional therapy.

PubMed and Embase were systematically searched for articles pertaining to the topic. Studies were eligible for inclusion if they met the following criteria: 1) Randomized-control or randomized-clinical trials, 2) written in English, 3) participants were 60 years of age or older, 4) participants had no major medical issue, and 5) used virtual reality or augmented reality as treatment.

Seven studies met all inclusion criteria. Six of the seven studies included demonstrated no significant differences between VR and conventional exercise groups. One of the seven studies showed a significant between group improvements in favor of the VR intervention. Five of the seven studies demonstrated significant within group improvements utilizing both VR and conventional physical therapy balance exercises.

Virtual reality and augmented reality training are effective interventions used to improve postural balance in elderly patients, but there is no compelling evidence to suggest that VR/AR is more effective than traditional therapy options when treating the older adult without major medical issues.

INTRODUCTION

One in four Americans over the age of 65 fall each year [1]. According to the Center of Disease Control (CDC), falls are the number one cause of fatal injuries in older adults [1]. Falls and fear of falling can significantly limit activity levels and, consequently, quality of life for these older adults. Balance impairments are significant contributors to the cause of these falls [2]. While conventional exercise with adequate challenge has been found to be effective in reducing and preventing falls [2], [3], the occurrence of falls continue to be a significant health concern for older adults. Virtual reality (VR) and augmented reality (AR) are emerging technologies that are currently being used in physical therapy departments to treat functional impairments such as balance and/or gait deficits in order to reduce falls. VR/AR are computer-based technologies that allow the use of a simulated or immersive environment that challenges the visual, auditory, and proprioceptive senses. The computer program simulates real-life environments such as sports activities, grocery shopping, and games, providing a challenge to balance within this environment [2], [3]. This challenge can lead to improved balance reactions and reduction of falls.

Several studies have been published that have focused on the use of VR/AR in elderly patients with pathologies such as Parkinson's Disease or patients with history of cerebrovascular accident. However, we are not aware of any systematic reviews that have focused on using VR/AR as an intervention to treat balance deficits in older adults with no other major medical issue. "Exergaming", such as Wii gaming console, is sometimes considered a VR intervention. However, for the purpose of this study, we do not consider exergaming an aspect of VR because it does not create an immersive environment. In addition, VR/AR systems can be costly to install and implement in the treatment of patients that present with balance deficits within the clinical setting. Therefore, the effectiveness of VR as an