

Abstract:

## -Virtual Reality Maze Navigation as a Cognitive Training Tool for Gait and Balance Rehabilitation

Emerging research suggests that virtual reality (VR) maze navigation holds the potential for enhancing navigation patterns and balance. However, a comprehensive understanding of its impact requires further investigations. This study delved into the effects of VR navigation on the gait and balance of healthy adults under two distinct conditions: with and without cognitive demands during navigation in the maze. Participants were randomly assigned to different groups, utilizing the HTC VIVE Eye Pro VR headset, foot trackers, and pelvis tracker ( VIVE HTC PRO, Valve Corporation, Bellevue, WA, USA) to navigate a digital maze developed in Unity 3D environment. Stride length, stride width, movement positions, foot placements, and turning points were among the parameters measured during the navigation process. The experiment findings are still in process of analyzing and classifying which important factors to consider when redoing the experiment again to be able to obtain more valuable results from our target group of subjects. The goal is to improve it so we can actually get meaningful results that really matter. The maze design, characterized by an increased number of decision points and larger maze size compared to previous studies, suggests that design elements can influence VR's impact on gait and balance. The study findings imply that VR mazes may enhance adults' walking patterns and symmetry. However, more research is necessary, particularly in developing mazes customized to individuals' balance abilities, especially for those facing challenges. The proper tailoring of mazes and tasks could maximize the benefits, with navigation requiring footing maintenance within a VR environment, thereby replicating real-world balance demands. VR navigation technology shows potential for addressing balance-related problems. Further research focusing on balance-impaired individuals could provide valuable insights for the development of successful VR-based balance therapies and practical applications, such as designing homes, athletes, and possibly fully immersive gaming.