

Make Reading Fun: Implications of Virtual Reality on Standing Balance and Control

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Category: Masters

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ABSTRACT

The recent rapid expansion of virtual reality (VR) technology is driving a widespread number of new applications, including providing immersive environments for users to learn and read through commercially-available applications. However, recent research has shown that VR causes symptoms of dizziness and motion sickness, which could disrupt users gait and balance. Thus, it is important to understand how to best mitigate these effects before VR use becomes more widespread across the lay public. **PURPOSE:** The purpose of this study was to determine the acute effect of VR use on gait and balance control following use, and whether aspects of virtual environment design can mitigate negative effects.. **METHODS:** 60 young, healthy participants read a short story for 45 minutes while immersed in VR. They were randomly assigned to read in one of three environments: 1) a cluttered library, 2) a bright snowy landscape and 3) a dark outer space scene. These environments were selected due to their differences in visual clutter and lighting—VR design considerations which have been shown in previous work to influence visual fatigue and motion sickness. Prior to and following VR use, participants completed three standing balance tasks (standing balance, eyes open; standing balance, eyes closed and single leg stance) and two gait tasks (tandem walking and regular gait). While completing these tasks, kinematic and ground reaction force data were collected from an 8-camera 3D motion capture system and two force plates in order to assess changes in gait and balance kinematics and kinetics. **RESULTS:** Preliminary results ($n = 12$) indicate that those who read in the dark outer space environment demonstrated diminished balance control, as evidenced in an increase in center of pressure velocity during single leg balance. **CONCLUSION:** This finding indicates that the type of virtual environment a person is immersed in can affect their sense of balance following use. Specific to the dark outer space environment, it is possible the lack of visual anchors (i.e., nothing for them to focus on) lead to visual fatigue and downstream balance effects. Additional data analysis will help to elucidate these findings, which could lend insight to the role of virtual environment design on the user experience.