

Effects of Auditory and Visual Cueing in Virtual Reality Environment for Parkinson's Disease Gait Training

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Background: A common symptom of Parkinson's disease is impaired gait, including increased gait variability and reduced stride length and time, which greatly increases the risk of fall and fall-related injuries. Rhythmic auditory stimulation (RAS) and visual cueing have been demonstrated as effective therapies for stabilizing gait. However, there have been very few comparative studies on the aspects of gait most impacted by each therapeutic method and the effects of using both types of cueing simultaneously. Furthermore, less is known about the relationship between patients' responses to auditory cueing and their musical experience/beat perception, which could affect the efficacy of the intervention. The present pilot study aims to evaluate the relationship between auditory and rhythmic cueing and the affected gait parameters. Understanding these effects could help identify the most effective rehabilitation approach tailored for individual patients. *Methods:* A virtual reality environment was developed which can provide either or both auditory and rhythmic cueing. Six healthy individuals (ages 19-28) were recruited for this study and completed a pre-survey assessing their musical background and beat perception ability. The participants' gait parameters were measured as they walked on an instrumented walkway in a virtual environment under seven conditions: no cues (baseline), with auditory cueing, with visual cueing, and with both auditory and visual cueing (all with both normal and offset conditions). *Results:* Results revealed that temporal gait parameters (stride time and cadence) were impacted most under auditory cueing conditions, while spatial parameters (stride and step length) were changed most by visual cues, confirming that the paradigm is effective in changing these parameters. *Conclusion:* Results suggest that auditory and visual cueing cannot be used interchangeably, and using both types simultaneously may have further positive benefits. Further studies should investigate how people with Parkinson's disease respond to a combination of both types of cueing.