NeurologySection

Online Journal Club-Article Review

Background/Overview	
Article Citation	Chen P. Y., Hsieh W. L., Wei S. H., Kao C. L. (2012). Interactive wiimote gaze stabilization exercise training system for patients with vestibular hypofunction. J. Neuroeng. Rehabil. 9 7710.1186/1743-0003-9-77
Study Objective/Purpose (hypothesis)	The purpose of the study was to assess the effectiveness of vestibular rehabilitation using the Nintendo Wii to measure speed of head movements and gaze stabilization in reducing dizziness, and increasing Dynamic Visual Acuity (DVA) and balance function parameters of patients with unilateral and/or bilateral vestibular hypofunction.
Methods	
Study Design	Case series
Target Population	4 individuals with unilateral (UVH) or bilateral vestibular hypofunction (BVH) based on the head thrust test, horizontal head shaking nystagmus test, and caloric testing
Interventions (if applicable):	Vestibular function training with use of Wii system adapted to assess head movements during virtual reality programs. The article provided pictures and descriptions of the adapted set up. The subjects received 30-40 minutes of training 2 days a week for 6 weeks. Two types of activities were used to train visual stability compensatory movements with a goal of producing head speeds between 120-180 degrees/sec. 1. The first type consisted of common street scenes or daily-life-related images. The subject focused on the center of the screen and quickly turned his or her head left and right. A target number was presented when the head-turning speed reached the required speed. The patient had to identify the number correctly. • If the patient could not identify the number, the speed was reduced by 10 degrees/sec. • After 3 consecutive correct answers the speed would increase by 10 degrees/sec. 2. The second type consisted of two games for head turning and gaze stability -In the first game, the eyes of the subject were fixed on the swinging square. When the square moved near the target area below and the subject's head-turning speed reached the training threshold, the square immediately dropped to the target area below and the squares would stack up • If the squares weren't stacked straight, they would fall. • The task was completed when the stack reached a certain height. • Head turning speed was gradually elevated to >120 degrees/s as performance improved. -In the second game, a pitcher threw a baseball toward a batter. The subjects initially focused on the

	baseball in the pitcher's hand. When the baseball flew near the front of the batter, the patient turned his head quickly. When the head-turning reached the target speed, the batter would swing the bat to hit the baseball. • pitch timing and ball velocity randomly changed to increase difficulty • game scored by number of successful hits out of 10 attempts **Pt also performed home program as follows**: VOR x1 and VORx2 viewing exercise for 1 minute in standing for 30 minutes every day
Outcome Measures	Dizziness Handicap Inventory (DHI), Activity specific Balance Confidence Scale (ABC) , Hospital anxiety and depression score (HADS), Visual Analog Scale (VAS), Tinetti fall risk performance scale (POMA), Dynamic Gait Index (DGI), Timed up and go (TUG), Sensory Organization Test (SOT), Dynamic Visual Acuity (DVA)
Results	
Summary of Primary and Secondary Outcomes: note results that were statistically significant	The article included pre, post and 1 month follow up measures for each case. No statistical analysis was performed. The primary outcomes discussed were the DGI and POMA assessments. All patients demonstrated improvements in DGI and POMA assessments as well as walking speed on the TUG post treatment and 1 month after treatment. During the treatment all patients improved in head turning velocity with reports of reduction in dizziness and discomfort. Additionally, all subjects had improvement in DVA, VAS, HADS, DHI, ABC scores.
Authors' Conclusions	
Authors' Conclusion	The authors concluded that 12 sessions of gaze stabilization exercise with use of interactive video games over the course of 6 weeks is effective to decrease dizziness, improve balance, and increase walking speed of patients with BVH or UBH leading to improvements in QOL. They discussed the effectiveness of task-oriented virtual reality training focusing on stability and gaze stabilization to provide a new treatment approach to reduce the severity of symptoms in patients with vestibular hypofunction.
Reviewer's Discussion and Conclusion	
Study Strengths	• Utilized several outcome measures to determine the effectiveness of the treatment • Compared results from other studies assessing treatments for vestibular hypofunction which demonstrated similar conclusions • Provided a description of each patient prior to treatment, during, and after treatment, showing how each participant responded to the virtual reality training
Study Limitations and Potential for Bias	• Included only 4 subjects (3 UVH and 1 BVH) • No control or comparison to Vestibular Rehab without gaming system • Did not record the patients eye movements; therefore, further investigation is required to determine whether compensatory saccades (related to gaze stability improvements) played a role in the study.
Applicability:	• Patients with vestibular hypofunction

• Types of patients (dx) that results apply to • Types of settings or patient acuity that the results apply to • Can interventions be reproduced? Can results be applied to other pt populations?	• Patients with chronic/persisting symptoms of dizziness from BVH or UVH • Interventions reproduced with use of visual reality rehab (use of Wii as more cost effective and readily available option) • All patients were given home program of VOR exercises to continue gaze stabilization exercises • Interventions are specific to individuals with vestibular hypofunction diagnoses, however virtual reality rehabilitation can be useful for populations with balance/visual deficits (stroke, TBI, CP…)
How will study results impact PT management of this patient population?; List suggestions for how to implement changes in your clinic/department to integrate study findings into patient care	Interventions used in the study can be applied in the clinic to incorporate technology and gaming systems into vestibular rehab for patients with VOR deficits. The Wii systems games provided a safe and controlled environment for the patient's to improve gaze stabilization. The Wii system was adapted to assess and control the speed of head movements. Without the head sensor technology, it is difficult to assess a patient's head speed during VOR exercises. The technology captured real time results of subjects' performance and adjusted the head turning speed requirements, allowing for a gradual progression of task difficulty. Therefore, the intervention was individualized for each patient at their own performance capacity. To apply technology in a clinic, modifications to sense head position and to some game programs in the Wii system would be required.