An efficacy study of virtual reality game–based therapy for restoring postural and coordination abnormalities secondary to TBI

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**Introduction:** A therapy program consisting of virtual reality (VR) game-based activities was developed to address multiple postural and coordination abnormalities seen in individuals with traumatic brain injury (TBI). The program uses interactive customized VR games and scenarios, supported by a commercial portable motion capture sensor (Xbox Kinect). Led by a virtual Personal Instructor Avatar, the therapy replicates the content, sequence, and dosage of conventional exercise programs that are recommended for management of the specified impairments in this patient population. The study was designed as a phase II clinical trial to test efficacy of the VR therapy when delivered in a supervised clinical setting.

**Methods:** A sample of convenience of fifteen participants with mild to moderate TBI-related balance and movement impairments were recruited for the study. The VR practice included 15 sessions, each approximately 50-55 minutes in duration, scheduled 3 times a week over 5 consecutive weeks, with games adjusted to the needs of the individuals. Each participant was evaluated at baseline, immediately after the final session, and in a one month follow-up. Evaluations included a battery of clinical tests (measuring postural stability, gait, and coordination), and movement performance parameters. Movement parameters included arm-leg coordination, dynamic stability, and arm precision, calculated from kinematic data recorded with Xbox Kinect sensor at 30Hz.

**Results:** Following therapy the majority of participants improved their static and dynamic postural stability, gait, and upper extremity movements. These effects persisted fully or partially over the retention interval. Researchers also developed safety criteria which may be used to allow in-home practice.

**Conclusion:** Results will be used to design larger scale clinical trials to compare effectiveness of the VR therapy over conventional techniques, with the goal of producing a cost-effective, accessible, and easy to individualize therapeutic approach, which has the potential to be delivered via tele rehabilitation.

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