IMPROVING GAIT AND ACTIVITIES OF DAILY LIVING IN SEVERE TBI: VESTIBULAR REHABILITATION

By Chris Macdonald, PT Student

KEY POINTS

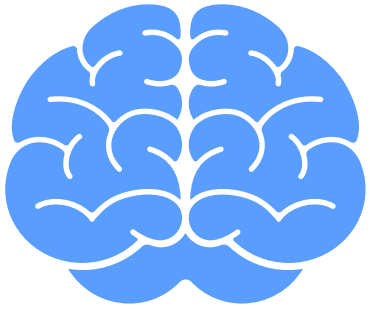
1. Vestibular rehabilitation significantly improved gait smoothness and postural control in individuals with severe Traumatic Brain Injury (sTBI).

2. Vestibular rehabilitation was the only group that had a significant increase in the ability to perform activities of daily living (ADLs) after a period of 8 weeks.

Background and objective

- Severe TBI often leads to impaired **balance and difficulty in walking**, reducing quality of life.
- Previous studies have not looked at the effect of vestibular rehabilitation on patients **without** a vestibular diagnosis.
- Many studies include outcome measures evaluating linear walking, such as the 6-minute walk test (6MWT) and 10-metre walk test (10MWT), that may poorly represent the demands of daily life.
- This study looks to improve community-based walking by including a curvilinear (figure-8) walk test.
- This study aimed to evaluate whether vestibular rehabilitation could improve gait quality, balance, and activities of daily living (ADLs) in sTBI patients without vestibular syndrome, as compared to conventional neurorehabilitation during the post-acute phase of recovery.

> *"Significant improvements in gait quality [...] in tasks requiring dynamic balance like curvilinear walking which mimics real-world demands"*



Methods

Design: randomized control trial

Participants: individuals with sTBI, currently hospitalized, aged 15-65 years old, Level of Cognitive Functioning Scale scores ≥ 7. Participants with previous TBI or other neurological disorders were excluded.

Participants were randomly assigned to groups:

- Vestibular rehabilitation (n = 12); Including gaze stabilization and dynamic postural stability exercises.
- Conventional balance rehabilitation (n = 11); Including trunk stabilization exercises such as sitting on Swiss ball and standing on a balance board.

Each session was 20 mins long, 3 days per week for 4 weeks.

Outcomes measures:

Gait quality: various walking tasks using a sensor-based gait analysis during the 10MWT and a figure-8 walk test.

ADLs: Activities-Specific Balance Confidence Scale (ABC) and Community Integration Questionnaire (CIQ).

Others: Berg Balance Scale (BBS), Community Balance and Mobility Scale (CB&M), Dynamic Gait Index (DGI), Dizziness Handicap Inventory (DHI).

Results

- Data were collected at: baseline, after 4 weeks of training, 4 weeks post-training, and 8 weeks post-training.
- Both groups showed significant improvements in BBS, DGI, CB&M, and DHI scores over time.
- Only the vestibular rehabilitation group showed significant increases in their ABC and CIQ scores.
- Participants in the vestibular rehabilitation group showed significant improvements in gait quality, particularly in tasks requiring dynamic balance like curvilinear walking which better mimics real-world demands than linear walking.
- Gait quality was measured with sensor based synchronized inertial measurement units (IMUs) placed throughout the body and showed a significant increase in spatiotemporal ability, stability, and smoothness.

Limitations

- The small sample size may limit the generalizability of the findings.
- Dropouts caused the groups to be slightly below the a priori sample size estimation of 13 people
- Additionally, the study did not assess long-term outcomes, so it is unknown if the benefits of vestibular rehabilitation diminish over time.

Clinical Implications

- Vestibular rehabilitation may better mimic the demands of daily life leading to enhanced postural stability and dynamic balance even among individuals with severe TBI without vestibular syndrome.
- These participants also demonstrated increased confidence in their balance and increased integration into the community compared to the control group.
- Clinically, including vestibular rehabilitation without the need of a vestibular diagnosis has the potential to help improve outcomes and allow people with severe TBI to function more independently in their everyday life.
- Vestibular rehabilitation appears to be a promising tool to be used in patients with TBI who wish to improve their quality of gait, dynamic stability and balance, ability to perform ADLs, and reintegrate into the community

MEET THE REVIEWER

Chris is a student physiotherapist at Dalhousie University currently on placement focusing on neurological rehabilitation, particularly working with patients living with an Acquired Brain Injury (ABI) such as traumatic brain injuries (TBI) and stroke.

STUDY REFERENCE

Tramontano, M., Belluscio, V., Bergamini, E., Allevi, G., De Angelis, S., Verdecchia, G., ... & Buzzi, M. G. (2022). Vestibular rehabilitation improves gait quality and activities of daily living in people with severe traumatic brain injury: a randomized clinical trial. Sensors, 22(21), 8553.

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