Subclinical Vestibular Deficits Illustrated in Patients with Exercise Intolerance After mTBI Using Force Plate Protocols

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Objective:

Investigate the changes in sway velocity vestibular markers in mTBI patients with exercise intolerance (EI) during exertional testing as part of a 5-Step Exertional Rehab Protocol (ERP).

Background:

Exertional testing can be used to determine one's therapeutic exercise threshold. A number of systems have been shown to be related to Exercise Intolerance (EI) including autonomic, cervical, and vestibular, and visual. Vestibular function can be measured before and after exercise and may shed light into its impact on EI.

Design/Methods:
Retrospective review of 342 trials of exertional testing in mTBI patients, ages 10-60, in 2020. Exertional testing was completed with pre/post force plate sway velocity calculated. Protocol A involved single leg stances, while protocol B involved two feet stances. A concussion specialist determined exercise tolerance (ET) by evaluating for the onset of signs/symptoms or cardiovagal dysautonomia.

Results:

Of 342 exertional test trials, 34.8% exhibited EI due to symptom exacerbation and/or signs of autonomic dysfunction. Vestibular Force Plate sway velocities in both protocol A and B were significantly worsened in the EI group by an average change of 0.32 deg/sec, compared to those in the ET group who exhibited only an average change of 0.03 deg/sec sway velocity ($p=0.0004$).

The EI group using protocol A, showed an average change of 0.86 deg/sec compared to those in the ET group using protocol A, who exhibited only an average change of 0.03 deg/sec sway velocity ($p=0.0041$). EI group using protocol B, showed an average change of 0.12 deg/sec sway velocity compared to those in the ET group using protocol B, who also exhibited an average change of 0.03 deg/sec ($p=0.0013$).

Conclusions:
Subclinical vestibular markers such as sway velocity measures may be used to identify etiologies for EI in mTBI. Furthermore, these vestibular testing may be a subclinical measure that can aid exercise and sport clearance decisions.