

Late Exercise Tolerance Testing Using a Dynamic High Intensity Interval Multidirectional (HIIT-MD) Movement Protocol

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Objective:

Analyze the utility of a 5-step exertional rehab protocol (ERP) that included High Intensity Interval Multi-Directional Movement (HIIT-MD) or Step 5. We assessed the incidence and etiologies of exercise intolerance (EI) during Step 5 in concussed patients who tolerated maximal linear exertion.

Background:

Exertional testing can be used to determine appropriate levels of exercise tolerance (ET) in concussed patients. Traditionally linear modalities have been used to determine max ET prior to clearance. HIIT-MD protocols can be the next appropriate step to bridge clearance for more dynamic activities.

Design/Methods:

Retrospective chart review included 130 Step 5 trials for EI; of those, 72 had pre/post exercise King Devick (KD) and force plate (FP) testing. Patients were 10-59 years old and clinic visits occurred 2019-2020. EI rate was recorded and failure reason was documented by our clinic's concussion specialist. The difference between pre/post exercise KD and FP was investigated.

Results:

Of 130 Step 5 trials, 21.54% failed due to EI. Reason for EI included the onset of symptoms (82.1%), followed by signs of dysautonomia (39.3%). Symptoms and dysautonomia combined were noted in 35.7% of those with EI. Symptoms appeared in combination with another marker 69.6% of the time. The average change in KD times pre/post exercise testing was +2.52 seconds longer in the EI group compared to -2.45 seconds shorter in the ET group ($p=0.62$). The EI group demonstrated an average change of 0.36 deg/sec sway velocity increase after exercise compared to 0.13 deg/sec in the ET group ($p=0.93$).

Conclusions:

There is evidence for the utility of a HIIT-MD protocol for dynamic exercise/sports clearance. Exercise testing progression and concussion clearance should include a dynamic HIIT-MD protocol to ascertain no late phase dynamic EI. Dysautonomia and/or vestibulocular aggravation may be contributors to late phase EI. If EI exists, identifying and targeting underlying causes can aid optimal recovery.