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Exploring Turning Lap Time in Mild Traumatic Brain Injury

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Keywords

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Abstract

Introduction

Approximately 2.8 million people sustain a mild traumatic brain injury (mTBI) annually and can result in dynamic balance deficits. Turning is not routinely tested after mTBI. The Custom Clinical Turns Course (CCTC) is a novel course that measures varying angles with wearable sensors that has demonstrated deficits after mTBI. The clinical application of the CCTC is unclear when sensors are not available. Our aim was to explore lap time (seconds) as an outcome measure.

Purpose

To 1) compare CCTC lap times after mTBI with healthy controls (HC) and 2) determine if people with mTBI improve after rehabilitation.

Methods

Eighty-six people with mTBI (66 F, mean±SD: age 35.0±12.3 y, 37.8±19.3 days since injury, 25.8 ±5.3 BMI) and 50 HC (38 F, 31.1±9.3 y, 24.5±4.1 BMI) were included. The CCTC was measured before and after rehabilitation. People completed 8 laps (comfortable pace) and average lap time was calculated from a sensor at the waist. Symptomology was measured using the Neurobehavioral Symptom Inventory (NSI) and a return to pre-mTBI levels of activity question. Rehabilitation included 8, 60 minute visits (cardio, cervical and static/dynamic balance).

Results

The mTBI group had significantly slower lap times compared to HC (15.2 ± 2.6 vs 11.3 ± 1.4 sec; $p < 0.05$). After rehabilitation, the mTBI group improved significantly (15.2 ± 2.6 vs 13.0 ± 1.9 sec; $p < 0.05$), although they were still slower than HC group ($p < 0.05$). Symptoms significantly improved after rehabilitation (NSI: pre 40.7 ± 12.7 vs post 22.15 ± 12.9 ; $p < 0.05$). 61% of people had not returned to normal activity after rehabilitation despite improvements in NSI and lap time.

Conclusions

CCTC lap times after mTBI were significantly slower than HC and improved after rehabilitation. Although lap times improved, mTBI participants were still slower than HC. CCTC appears to detect dynamic balance deficits in people with mTBI but further analysis should validate the use of hand-held stop watch measures for clinical implementation.