Post-Concussion Symptoms – Can We Rehabilitate Smarter with Heart Rate Variability?

Friday, February 14, 2020

3:00 PM - 5:00 PM

Abstract

Purpose/Hypothesis: Sport-related concussions are complex pathophysiologic disturbances to the brain caused by biomechanical forces [1]. Persistent symptoms can complicate recovery and result in postconcussive syndrome [2]. Rehabilitation is challenging due to variable symptoms and athletes' individualized responses to interventions (e.g. graded exercise) [3]. Autonomic nervous system (ANS) dysfunction has been linked with concussion pathophysiology [4]. Heart rate variability (HRV) is a non-invasive index of the ANS outflow at the heart and is used to monitor the body's physiological response to stressors [5,6]. The aim of this study is to systematically review literature that investigates the relationship between ANS function indexed by HRV in subjects with a history of concussion.

Number of Subjects: Primary research studies that measured HRV as a primary outcome measure in adults (>18 y.o.) with a history of concussion or mild traumatic brain injury (TBI).

Materials and Methods: A comprehensive search strategy was developed and a systematic search was performed in the following databases from 1996 to June 26, 2019: CINAHL, SportDISCUS, PubMed(MEDLINE), SCOPUS, PeDRO, and Cochrane. The inclusion criteria were: 1) studies that monitored HRV in subjects with post-concussive symptoms; 2) studies on human subjects; 3) studies in the English language. Studies on unconscious subjects or those with moderate to severe TBI were excluded. Two independent reviewers (ASG, FP) screened the titles and abstracts of

the records for inclusion eligibility. Full texts were pulled for all records assigned as 'included' and data were extracted.

Results: Final search yielded 1293 references and following duplicate removal, screening was performed on 955 references. 36 full-texts were retrieved, 2 were excluded from synthesis leaving 34 included studies. Preliminary analysis demonstrated patterns of ANS dysfunction indexed by reduction of parasympathetic HRV indices at rest and during exercise in subjects with a history of concussion or mild TBI. Measured HRV anomalies were present after acute concussion and in subjects with PCS.

Conclusions: Preliminary results appear to indicate that subjects with concussion demonstrate impaired ANS function indexed by reductions in HRV compared with healthy controls. Alterations in HRV are present at the onset of concussion but seem to also persist alongside prolonged symptoms due to concussion. Decrements in HRV parameters may signify a reduction in parasympathetic control and the body's inflexible, slowed recovery from concussion.

Clinical Relevance: Subjective reports of post-concussion symptoms can be insufficient for monitoring an athlete's tolerance to progression of rehabilitation and return to sport protocols [2-4]. The ANS holds an integral and adaptive role in directing the body's response to stressors like concussion injury. Results from this study suggest that monitoring changes in HRV may provide important information to help guide concussion rehabilitation.

Authors

Forum Patel

Steve Tumilty

Keerava Kovanur Sampath

Angela Rose Sportelli Gisselman

View Related

SP-2308 - Science Meets Practice 6: How Lower Extremity Injury Rates and Movement Patterns Change Post Concussion ›

Educational Sessions ›

Sports ›

Similar

Screening Individuals with History of Concussion: Single Vs. Cluster Testing- Preliminary Data

***Daniel Miner, PT, DPT**, Brent Alfred Harper, PT, DPT, DSc, Carrie Case, Brooklynne McDermott, SPT, Ashley Gail Humphries, SPT, Ashley Dudding, SPT and Sam Lawrence*

Prolonged Post Concussion Syndrome in an Adolescent- a Multimodal Approach Toward Recovery

***Robert M. Hofschulte, PT, DPT, ATC** and Purvi Shaan Vora, PT, DPT*

Effect of Cervical and Vestibular Exercises on a Post-Concussion Disorder Patient: A Case Study

Maureen M. Clancy, PT, DPT

What Is the Impact of Utilizing Voms for Patients Sustaining a Concussion? a Systematic Review

***Steven Lesh, PT, PhD**, Derek Straus, Erick Tunnell and Nathan Rogers*

A Retrospective Investigation of Symptoms Triggered during Sustained Neck Rotation Post-Concussion in Military Service Members

***Miriam Helen Hammerle, PT, DPT**, Carrie W. Hoppes, PT, PhD, Jeremy Nelson, PhD, Alicia Swan, PhD, Lisa Lu, PhD, Lucy Thomas, PhD,BPhty and Julia Treleaven, PhD, BPhty*