Defense Health Agency (DHA) Clinical Communities Speaker Series

Resource List-August 2019

Innovations in Health Care from Select Centers of Excellence and Communities of Practice Groups

Understanding Cardiovascular Autonomic Function in the Context of Concussion Injuries

A mild traumatic brain injury (mTBI) is a complex pathophysiologic process that has a systemic effect on the body aside from solely an impairment in cognitive function. Dysfunction of the autonomic nervous system (ANS) has been found to induce abnormalities in organ systems throughout the body, and may contribute to cardiovascular dysregulation and increased mortality. Autonomic dysfunction, also known as dysautonomia, has been studied in moderate and severe TBI, and has emerged as a major contributing factor in the symptomatology in mTBI as well. The article, Autonomic Dysfunction after Mild Traumatic Brain Injury explains the analysis of the ANS that has been studied through changes in heart rate variability (HRV), pupillary dynamics, eye pressure, and arterial pulse wave in those with mild TBI.

Concussion is defined as a complex pathophysiological process affecting the brain that is induced by the application or transmission of traumatic biomechanical forces to the head. The result of the impact is the onset of transient symptoms that may be experienced for approximately 2 weeks in most individuals. However, in some individuals, symptoms may not resolve and persist for a protracted period and a chronic injury ensues. Concussion symptoms are generally characterized by their emergence through changes in affect, cognition, or multi-sensory processes including the visual and vestibular systems. An emerging consequence of concussion is the presence of cardiovascular autonomic nervous system dysfunction that is most apparent through hemodynamic perturbations and provocations. The medical journal, An Anatomical and Physiological Basis for the Cardiovascular Autonomic Nervous System Consequences of Sport-Related Brain Injury investigates data that are derived from continuous digital electrocardiograms and/or beat-to-beat blood pressure monitoring often reveal an imbalance of parasympathetic or sympathetic nervous system activity during a provocation after an injury.

Heart rate variability (HRV), thought to reflect autonomic nervous system function, and is lowered in conditions such as posttraumatic stress disorder (PTSD). The potential confounding effects of traumatic brain injury (TBI) and depression in the relationship between HRV and PTSD have not been elucidated in a large cohort of military service members. Here we describe HRV associations with stress disorder symptoms in a large study of Marines, while accounting for well-known covariates of HRV and PTSD including TBI and depression. The article, Heart Rate Variability Characteristics in a Large Group of Active-Duty Marines and Relationship to Posttraumatic Stress further explains the relationship.

The study, A Review of Post-Concussion Syndrome and Psychological Factors Associated with Concussion reviews several topics related to post-concussion syndrome and psychological factors associated with concussion. Topics include neurobiological perspectives, psychological predictors of post-concussion syndrome including pre-morbid anxiety, anxiety sensitivity and cognitive biases and misattribution. In addition, the iatrogenic effects of excessive rest are reviewed and treatment options are discussed briefly.

References

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