

**Abstract:** To date, there are major gaps in our knowledge about how to best manage the physical and cognitive demands associated with returning adolescents to activity following concussion/mild traumatic brain injury (mTBI). Returning to activities prior to the brain healing from its injury may result in delayed recovery or the increased risk for more serious brain injury. One approach to further inform when the brain and body are ready to reengage in activity may be monitoring neurophysiological parameters, or how the brain and related nervous tissues have recovered after a concussion/mTBI. Heart rate variability (HRV) is a non-invasive measurement of neurophysiological function that when used with adolescents with mTBI may provide insight into when the brain and body are ready to return to activity. The initial objective of this research is to develop the NeuroCare approach which involves combining HRV with other clinical measures typically used to assess recovery from mTBI in children and youth. In the second phase of research, smart phone technology required to deliver NeuroCare will be developed in collaboration with end users. The usefulness of this technology to help with clinical decision making will be determined in Phase 3.

Ultimately this project aims to create a wearable device (NeuroCare) that can let children and youth, their parents and treating clinicians know when it is safe for them to take part in activities and when it is better to continue to rest their brain and body. The techniques proposed in this research are feasible, accessible and have high potential to be used in clinical practice. The ultimate goal is that this innovative approach will optimize clinical decision making, educate health care professionals and improve the health outcomes for adolescents recovering from concussion/mTBI across Canada.