Attention, Awareness and Ability: A Retrospective Analysis of ADHD's Impact on NeuroTracker Performance and Concussion Related Assessment Tools

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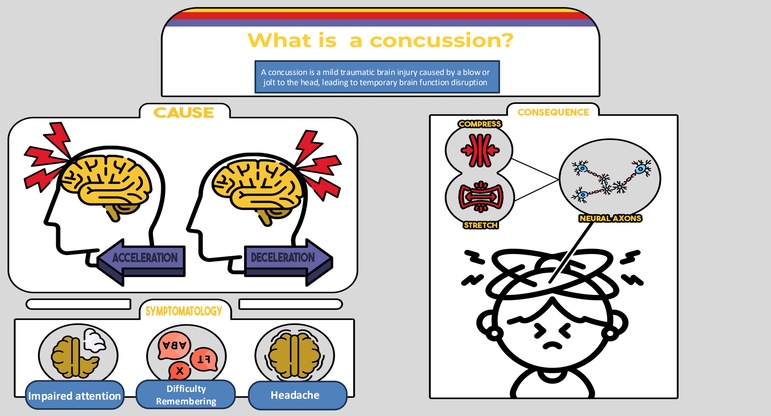
Introduction

Attention deficit hyperactivity disorder (ADHD) and concussion (mild traumatic brain injury) are related:

- Individuals with ADHD have a greater lifetime history of concussion[1]
- Those who experience concussion are more likely to have ADHD[2]
- Many of the symptoms that occur from post-concussion syndrome are like those caused by ADHD[3]

Attention deficit hyperactivity disorder (ADHD) is a common neurodevelopmental disorder, characterised by inattentiveness, hyperactivity and impulsivity[4].
Concussion is a type of mild traumatic brain injury (mTBI) caused by an impact to the head or neck, that transmits an impulsive force to the brain and disrupts regular function[5]. Symptoms such as difficulty concentrating, difficulty remembering, impacted sleep and headaches occur in both ADHD and concussion[6].
Due to the overlap between ADHD and mTBI symptomology, assessing the effectiveness of standardized concussion assessment tools in ADHD populations will assist in accurate diagnosis and management of mTBI in this group. Currently, there is limited research investigating the impact of ADHD on concussion-related assessment tools such as NeuroTracker, Vestibular Ocular Motor Screening (VOMS), SCAT (Sport Concussion Assessment Tool), and the King-Devick sideline assessment tool. Previous studies have examined each of these concussion related assessments individually in individuals with ADHD, but there is no literature that looks at all four tests using the same sample of participants[7].



Objectives

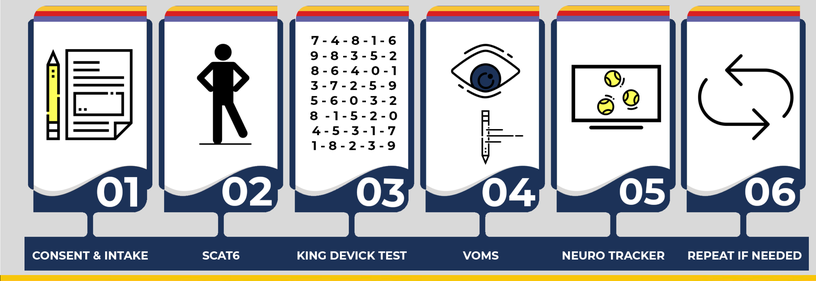
1. **To determine if a diagnosis of ADHD affects performance on NeuroTracker and other concussion-related assessment tools, during both baseline and post-injury concussion assessments.**
2. **To determine if there is an effect of age on concussion related assessment outcomes in individuals with ADHD.**

Methods

Demographic data from the University of Victoria Concussion Lab collected between 2009 and 2024 was categorized based on age, sex, concussion status and ADHD diagnosis to match ADHD participants and controls.

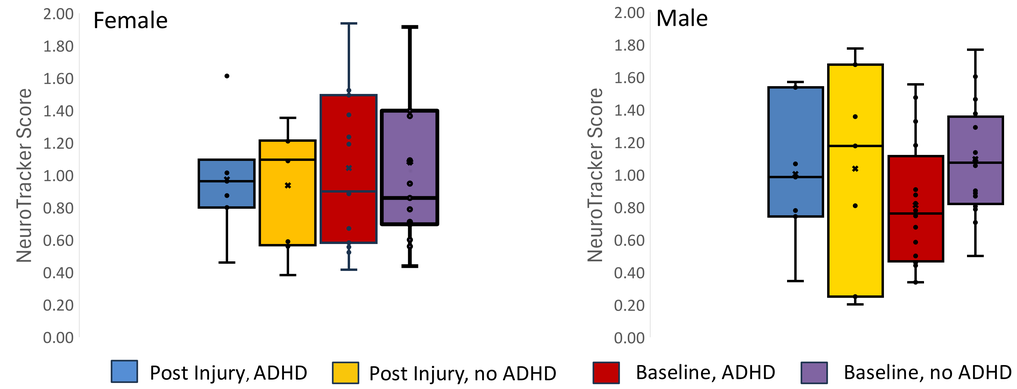
Demographic	Male	Female
Participants	46	45
Post-Injury*	14	15
Baseline*	32	30
ADHD Diagnosis	23	22
Control (No ADHD)	23	23
Age Range (years)	12-60	14-59
Mean Age (years)	26.91	28.07
Median Age (years)	20	24

**Based on whether participants completed a baseline or post injury concussion assessment*



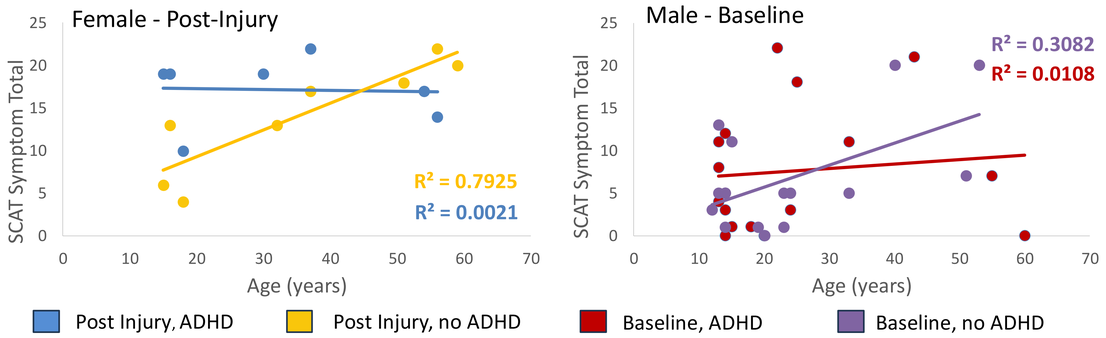
Results

NeuroTracker performance is not impacted by ADHD or concussion status



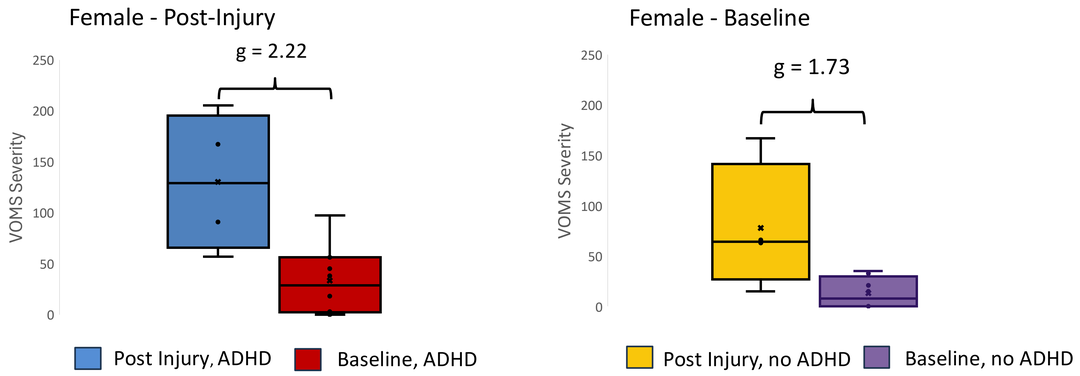
NeuroTracker threshold training speed did not differ significantly between participants with and without ADHD at baseline or post injury (ANOVA: p=0.90, p=0.31 respectively).

SCAT6 symptom scores are not associated with age in females with ADHD post-injury and males with ADHD at baseline



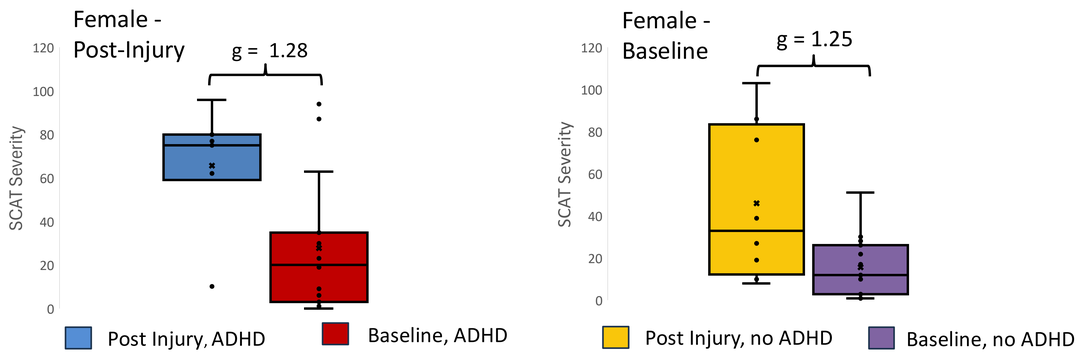
In females post injury, SCAT6 symptom count is very strongly correlated with age in participants without ADHD but weakly correlated in participants with ADHD. In males at baseline, SCAT6 symptom count is strongly correlated with age in participants without ADHD but weakly correlated with age in participants with ADHD.

VOMS severity scores are increased in symptomatic females regardless of ADHD status



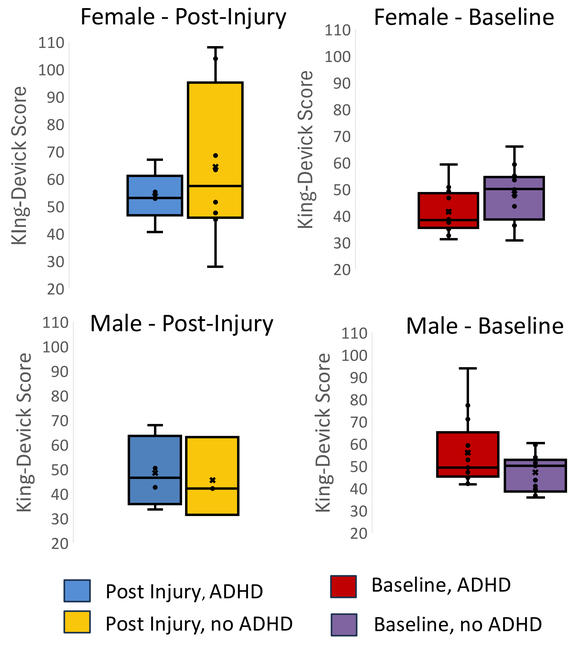
VOMS symptom severity was increased post-injury in both ADHD and no-ADHD groups, indicating VOMS symptom severity as a measure of concussion status is useful regardless of ADHD status.

SCAT6 severity scores are increased in symptomatic females regardless of ADHD status



SCAT6 symptom severity was increased post-injury in both ADHD and no-ADHD groups, indicating SCAT6 symptom severity as a measure of concussion status is useful regardless of ADHD status.

King Devick results are not impacted by ADHD status



King-Devick scores did not differ between participants with and without ADHD at baseline or post injury, indicating ADHD status does not affect King Devick assessment results (ANOVA: p=0.44, p=0.09, p=0.80, p=0.08 respectively)

Discussion and Future Directions

- There are no significant differences between participants at the post injury timepoint with ADHD and without ADHD or between participants at the baseline with ADHD and without ADHD on concussion related assessment tool outcomes. This indicates the current standardized concussion assessment tools are useful regardless of a diagnosis of ADHD.
- In females without ADHD, SCAT6 symptom severity increases with age. However, in females with ADHD, symptoms are not related at all to age. An ADHD diagnosis should be considered when evaluating concussion related symptoms in older females post-injury.
- Usage of ADHD medication was not recorded during data collection, therefore, the impact of ADHD medication usage on concussion assessment tool outcomes is unknown. It is suggested that future work investigates the impact of use of ADHD medication on concussion assessment outcomes.
- The mean age of the participant sample was approximately 27 years old, indicating research examining the impact of ADHD on concussion assessment outcomes in older populations and across the lifespan is warranted.

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