



# Multi-Year Test-Retest Reliability of Baseline Neurocognitive Scores in Canadian University Athletes

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## Abstract

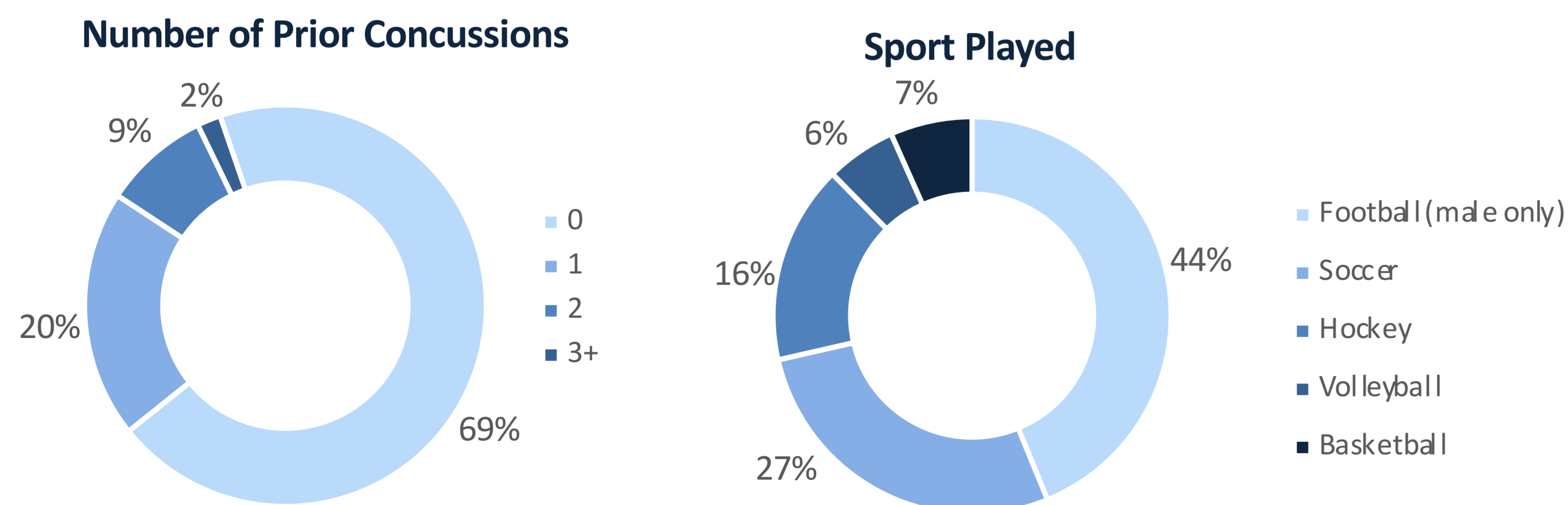
Effective decision-making about return-to-activity following concussions is dependent on accurate baseline assessments. There are currently no specific guidelines as to how often baseline assessments should be repeated. The purpose of this study was to examine the multi-year test-retest reliability of baseline assessment scores among varsity athletes at a Canadian university. 105 university athletes (25% female) were administered the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT®) battery on two occasions 2 to 3 years apart (M=2.30; 30% retested at 3 years) as part of their pre-season evaluation. Athletes who sustained a concussion between assessments were not included. Intraclass correlations demonstrated strong agreement for Visual Motor (R=0.83) and Verbal Memory (R=0.72) composites, and moderate agreement for Visual Memory (R=0.67) and Reaction Time (R=0.51) composites. Self-reported symptoms also demonstrated moderate agreement (R=0.61) across the multi-year retest interval. Results demonstrated moderate and strong test-retest reliability coefficients across composite scores after a multi-year retest interval in the absence of a concussion. In line with previous reliability research, the Visual Motor composite was shown to be the most reliable ImPACT® score across test administrations. Given the stability of reliability coefficients after a retest interval of 2 to 3 years, it may not be necessary for athletes to be retested yearly. Instead, it may be acceptable to use baseline data from assessments conducted within the previous 3 years in the absence of a concussion.

## Introduction

- Baseline testing is used in concussion management to facilitate tracking of symptoms and neurocognitive functioning following an injury.<sup>1</sup>
- It is assumed that baseline assessments are accurate when used in decision-making for return-to-activity.
- Yet, there are currently no specific guidelines as to how often baseline assessments should be repeated at the collegiate level.
- The current study examines multi-year reliability (e.g., 2 to 3 years) of baseline assessment scores among varsity student athletes at a Canadian university.

## Method

- 105 university athletes (25% female) aged 19 to 24 years (M = 21.4, SD = 1.27) completed both the Immediate Post-concussion Assessment and Cognitive Testing (ImPACT®)<sup>2</sup> and Post-Concussion Symptom Scale (PCSS).<sup>3</sup>
- Athletes completed the ImPACT and PCSS as part of their pre-season baseline assessment two to three years apart (M=2.30; 30% retested at 3 years).
- Athletes who sustained a concussion within the retest interval were not included.



## Results

- Based on the the intraclass correlations, ImPACT® composite scores demonstrated moderate to strong agreement across multi-year retest period.
- Visual Motor Speed was the most stable composite with strong agreement and high precision for individual athletes across the retest interval, in spite of significantly different overall mean scores in the sample.

ImPACT® composites	M(SD)		Pearson's r	Intra-class Correlation		Paired t-test	
	Time 1	Time 2		R	SEM	t	d
Verbal Memory	85.2 (10.8)	88.9 (9.3)	<b>0.61*</b>	<b>0.72</b>	3.66	-4.26*	0.37
Visual Memory	75.1 (12.2)	76.6 (12.9)	<b>0.50*</b>	<b>0.67</b>	5.14	-1.26	0.12
Visual Motor Speed	41.5 (6.6)	43.5 (6.7)	<b>0.75*</b>	<b>0.83</b>	1.50	-4.31*	0.30
Reaction Time	0.58 (0.07)	0.59 (0.8)	<b>0.35*</b>	<b>0.51</b>	0.04	-0.69	0.02
Symptoms	4.6 (8.0)	4.7 (7.8)	<b>0.44*</b>	<b>0.61</b>	3.69	-0.70	0.01

\* p < 0.001

## Conclusions

- The ImPACT® neurocognitive and PCSS symptom scores demonstrated moderate to strong agreement between test-retest reliability coefficients<sup>4</sup>.
- Given the stability of reliability coefficients, it may not be necessary for university athletes to be retested yearly.
- In the absence of a concussion, it may be acceptable to use baseline data for university athletes from within the past three years.
- In line with previous reliability research<sup>5,6,7,8</sup>, the Visual Motor Speed composite was shown to be the most reliable ImPACT® test score across test administrations.

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