

The Effect of Pre-Test Exercise on Baseline Computerized Neurocognitive Test Scores

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Introduction

- 1.6 to 3.8 million sports related concussions (SRC) occur in the United States annually (1). SRC occurrence has increased at an annual rate of ~7.0% in collegiate athletes from 1988 to 2004 (2).
- Premature return to play (RTP) following SRC is associated with an increased risk of subsequent injury.
- Concussion in Sport Group recommends a multidimensional approach to concussion management including neurocognitive recovery and symptom resolution (3).
- Baseline neurocognitive tests can aid in determination of recovery and RTP decisions.
- Factors such as age, gender, education level, amount of sleep, prior concussions, and learning disabilities/ADHD may affect neurocognitive test scores (4-10).
- Minimal research has gone into the effect of pre-test exercise on baseline test scores and the results have been conflicting (11-12).

Methods

- 7273 student-athletes included from a database of 18,245 patients utilizing various inclusion and exclusion criteria.
- 664 (9.13%) had undergone strenuous exercise prior to baseline testing and 6609 had not.
- A random, 2:1 matching process was used to control for the potential confounders of age, sex, education level, prior concussions, and hours of sleep prior to testing.
- Mann-Whitney U-tests were used in the place of 2-tailed t-tests in the analysis of continuous matching variables and ImPACT composite scores.



Results

- No significant differences between the variables used to match the groups, indicating a successful match process (Table 1).
- The strenuous exercise group had significantly decreased scores on verbal memory, and visual memory, significantly slower reaction, a greater impulse control score, and greater total reported symptom score (Table 2).
- The strenuous exercise group also had a significantly higher frequency of invalid baseline testing occurrence (4.46% vs. 2.44%, p=0.013) compared to the control group.

	Exercise	Control		p-value ^a
Group Size	664	1328		-
Age	15.90±1.907	15.90±1.798		0.501
Gender (% Male)	69.1	69.1		1.000
Education Level Number of	9.73±1.788	9.73±1.679)	0.573
Concussions	0.33±0.690	0.31±0.616	6	0.581
Hours of Sleep	7.352±1.4956	7.415±1.378	34	0.155
categorical variable Table 2: ImPACT Com	posite scores of	exercise vs. co	ntrol gro	oups
ImPACT Composite Score	Exercise	Control	p-value ^a	Hedge's g
Verbal Memory	84.06±10.532	85.52±9.548	0.009	-0.148
	74.15±13.398	75.92±12.863	0.005	-0.136
Visual Memory		37 6815+6 773	0.051	-
Visual Memory Visual Motor	36.944±6.675			0.177
,	36.944±6.675 0.630±0.108	0.6137±0.0851	0.001	0.177
Visual Motor		0.6137±0.0851 5.85±4.243	0.001	0.170

Learning Objectives

- Understand the role of modifying factors on concussion baseline testing.
- Describe the role of pre-test exercise on ImPACT baseline testing scores.
- Describe the rationale for standardizing/eliminating pre-test exercise.

Conclusions

- The group that had undergone strenuous exercise prior to baseline testing obtained lower neurocognitive scores, greater total symptom scores, and increased frequency of invalid results
- As a result, we recommend the standardization of conditions so that no strenuous exercise takes place prior to testing.

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