

Concussion-Like Symptom Reporting in High School Athletes with ADHD

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Introduction

Attention-deficit hyperactivity disorder (ADHD) occurs in approximately 11% of children and adolescents.

Consensus groups in sport-related concussion as well as pediatrics have identified youth with ADHD as a unique and important population to study in regards to risk for concussion and outcome from injury.

Youth with ADHD have been found to report more concussion-like symptoms on baseline testing. This presents a challenge in interpreting symptom reporting in student athletes with ADHD who are slow to recover from sport-related concussion in that it can be difficult to differentiate pre-existing symptoms from concussion-related symptoms.

This study documents preseason symptom reporting in athletes with and without ADHD and examines the effect of medication use for treatment of ADHD on concussion-like symptom reporting.

Study Design and Participants

- Cross-sectional, case-control, cohort survey study
- 37,510 high school athletes in Maine who completed baseline pre-season health survey and symptom questionnaire between 2000 and 2014
- None reported suffering a concussion without the past 6 months
- 2,409 (6.4%) self-reported having ADHD, 786 (32.6%) reported taking medications to treat ADHD
- Three groups: controls, ADHD with medication use (Medication), and ADHD but no medication use (No Medication)

Outcome Measures

- Post-Concussion Symptom Scale - included in ImPACT®
- 22 symptoms including headache, dizziness, concentration problems, and forgetfulness

- Students rate severity of each symptom from 0 to 6
- Total symptom score computed as the sum of these 22 severity ratings

Results

- Groups differed significantly on the Post-Concussion Scale [girls: $F(3, 17,885) = 139.16, p < .001$; boys: $F(3, 21,354) = 106.76, p < .001$]
- Pairwise comparisons revealed similar results for both sexes
- Medication group (boys: $Md=4$; girls: $Md=9$) and No Medication group (boys: $Md=3.5$; girls: $Md=7$) did not differ from one another
- No Medication group (girls: $d=.56$; boys: $d=.33$) and Medication group (girls: $d=.63$; boys: $d=.42$) both differed significantly from Control subjects, with small to medium effect sizes
- Regardless of medication status, girls with ADHD had greater total symptom scores compared to boys with ADHD

Conclusions

Youth with ADHD report greater levels of concussion-like symptoms during pre-season assessment.

Medication to treat ADHD does not appear to influence symptom reporting.

Better understanding of symptom reporting in uninjured student athletes with ADHD can facilitate the clinical interpretation of symptoms in those who are slow to recover following a concussion.

Table 1. Symptom Reporting by Groups and Sex

	Boys			Girls		
	No Medication	Medication	Controls	No Medication	Medication	Controls
	<i>n</i> =1,132	<i>n</i> =558	<i>n</i> =18,411	<i>n</i> =491	<i>n</i> =228	<i>n</i> =16,690
Total Symptom Score	Md=3.5	Md=4	Md=1	Md=7	Md=9	Md=2
	M=7.2	M=7.7	M=4.1	M=12.9	M=13.9	M=6.1
	SD=10.6	SD=10.8	SD=7.4	SD=15.3	SD=14.9	SD=9.5
	%	%	%	%	%	%
Headache	20.1	16.5	15.5	30.3	33.3	23.9
Nausea	5.1	2.7	2.9	4.9	5.3	3.0
Vomiting	4.5	4.1	3.2	10.8	9.6	4.5
Balance Problems	7.0	5.2	3.9	14.7	14.9	6.0
Dizziness	8.7	9.1	6.5	16.7	22.4	10.0
Fatigue	27.4	29.6	19.8	37.5	44.3	25.8
Trouble Falling Asleep	19.7	27.2	17.5	31.6	39.5	21.6
Sleeping More Than Usual	11.7	9.3	6.5	11.2	11.4	7.1
Sleeping Less Than Usual	24.4	29.6	19.4	34.8	39.0	24.4
Drowsiness	14.0	12.5	10.6	20.4	22.4	13.3
Sensitivity to Light	18.2	20.8	12.6	25.9	28.5	15.0
Sensitivity to Noise	7.7	9.0	4.6	15.7	16.7	6.3
Irritability	16.1	20.8	9.9	29.5	33.8	16.7
Sadness	18.5	19.0	14.1	38.9	35.5	23.2
Nervousness	15.9	15.4	9.5	30.3	37.7	17.0
Feeling More Emotional	13.5	13.6	7.8	34.8	34.2	21.3
Numbness or Tingling	5.7	3.8	3.5	7.5	5.3	3.6
Feeling Slowed Down	10.8	11.5	6.6	16.3	17.1	7.1
Feeling Mentally “Foggy”	10.6	13.3	6.9	16.7	17.5	8.0
Difficulty Concentrating	36.0	44.6	15.2	49.7	56.6	19.1
Difficulty Remembering	16.8	16.3	9.2	21.2	22.4	9.3
Visual Problems	9.1	7.7	5.7	16.7	13.2	7.7
“High” Symptom Reporting*	17.8	22.0	9.5	24.0	24.1	7.4

Note: Values represent the percentage of students who endorsed the symptom as present (i.e., score of 1 or greater). *High symptom reporting for males: Total symptom score of 13 or greater. High symptom reporting for females: Total symptom score of 21 or greater (Lovell et al., 2006)