Characteristics of Vision Deficits In Pediatric Concussion Patients

Children's MINNESOTA

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BACKGROUND

Little is known about vision deficits in pediatric concussion patients.

The vast majority of research and clinical knowledge on vision deficits and TBI involves adult samples with moderate to severe injuries.

This study characterizes the nature and frequency of visual impairments that are associated with pediatric concussion, as well as their effects on recovery.

METHODS

Sample was patients seen in the Concussion Clinic at the Children's Hospitals and Clinics of Minnesota, 09/15 - 02/16.

All subjects were evaluated/treated in the Concussion Clinic following mild head trauma.

In consecutive sampling, we identified two groups based upon the severity of vision deficits detected via clinical exam at presentation to the clinic: moderate-severe (VisD, n = 25) or none (NoVisD, n = 25). VisD was defined as abnormal findings on two or more vision tests and NoVisD as 0-1 abnormal tests.

Examinations were performed by neuroscience nurse clinicians and the conditions/functions tested for included convergence, accommodation, smooth pursuits, saccades, various strabismus, and exophoria/esophoria.

Clinical variables included age at injury, prior concussion history, loss of consciousness (LOC) with presenting injury, mechanism of injury, first clinic visit ImPACT computerized cognitive testing raw scores [Verbal Memory Composite (VeMC), Visual Memory Composite (VisMC), Visual Motor Speed Composite (VisMoC), Reaction Time Composite (RTMC), Post-Concussive Symptom (PCS)], Post-Concussion Symptom Inventory for Parents (PCSI-P), and history of depression/anxiety, migraine, learning disability (LD), ADHD, and vision problems.

Date of recovery was defined as the final visit date in the Concussion Clinic. Recovery interval was defined as the time in days between the date of injury and date of recovery.

Parametric (Independent Samples T-Tests) and non-parametric (Chi-square) statistical analyses were conducted using SPSS.

IRB approval was obtained for this project.

Group Characteristics

	VisD	NoVisD
n	25	25
Age at Injury	13.5 (2.5)	14.2 (2.2)
Race (% Caucasian)	75%	52%
Gender (% Male)	80%	68%
Hx of Concussion	20%	44%
LOC w/ Presenting Injury	16%	12%
Sports-related Injury	68%	64%
Days from injury to 1st Clinic Visit	9.9 (5.7)	15.9 (16.6)
Hx of Dep/Anx	8%	4%
Hx of Migraine	12%	20%
Hx ADHD	8%	12%
Hx LD	12%	16%
Hx Vision Problems	8%	24%
Day to Recovery	56.1 (42.3)	29.5 (22.8) p < .01
# of Clinic Visits	2.8 (1.3)	1.8 (0.9)
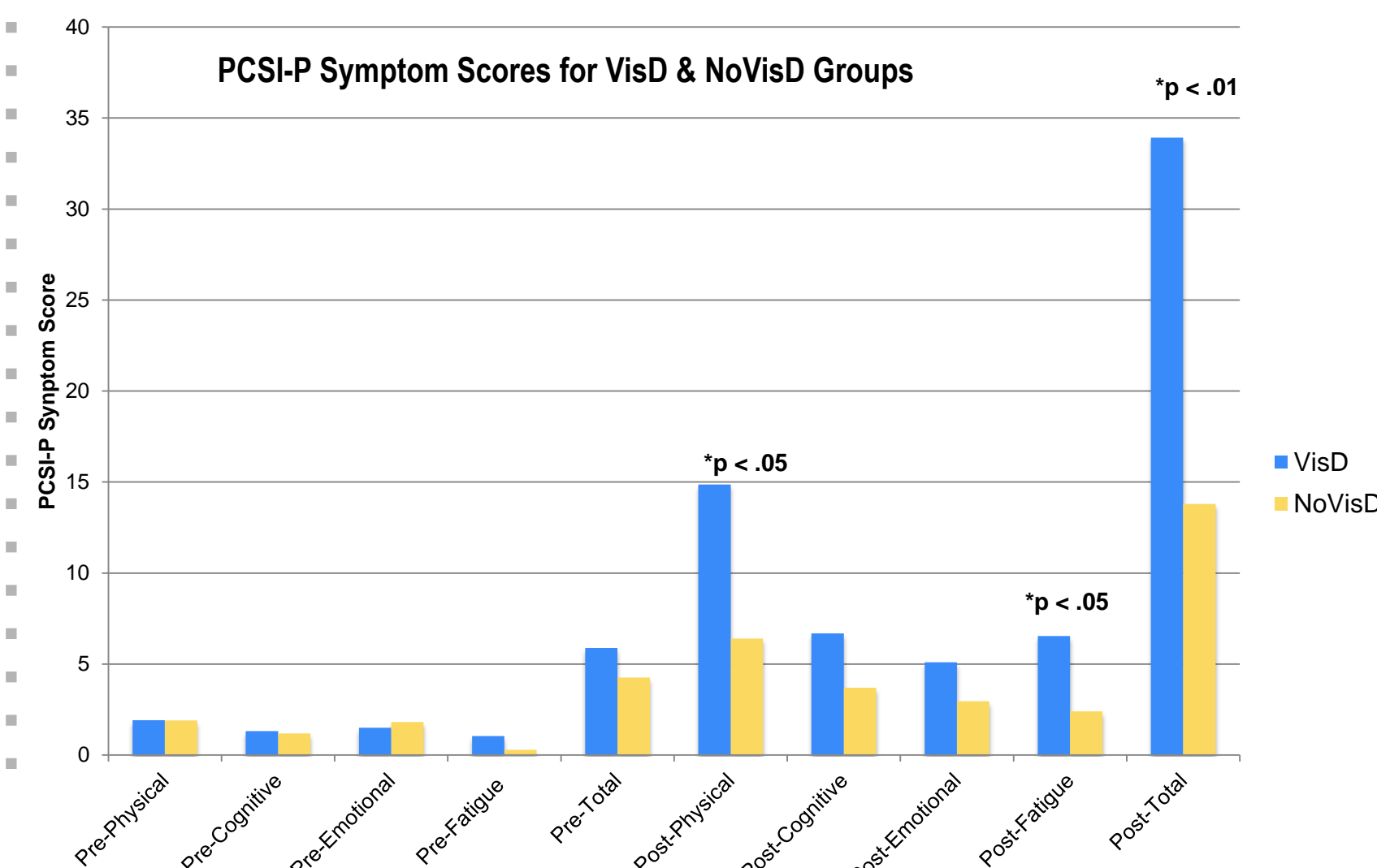
1st Clinic Visit ImPACT Raw Scores

	VisD	NoVisD	
Verbal Memory	75.7 (19.1)	83.1 (11.1)	
Visual Memory	62.9 (15.9)	77.3 (10.7)	p < .01
Visual Motor Speed	28.0 (6.1)	33.8 (9.6)	p < .05
Reaction Time	0.76 (0.11)	0.70 (0.14)	
Post-Concussive Sx Score	24.8 (22.1)	11.6 (12.4)	p < .05

Days to Recovery by Group

*p < 0.01

PCSI-P Symptom Scores for VisD & NoVisD Groups

RESULTS

Mean age for the VisD and NoVisD groups was 13.5 and 14.2, respectively.

The average number of days from injury to the 1st clinic visit was 9.9 and 15.9 for the VisD and NoVisD groups, respectively (n.s.).
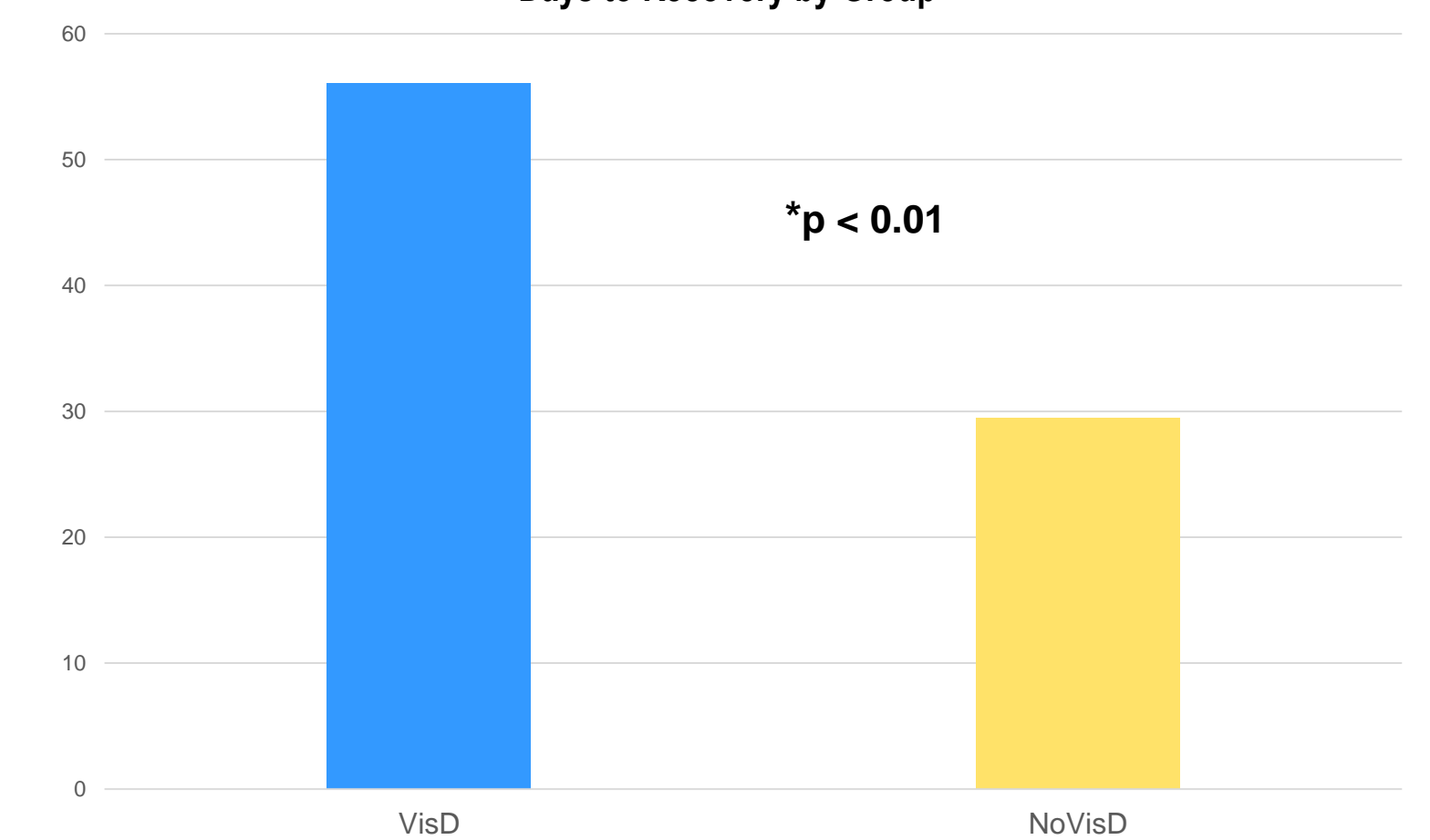
There were no statistically significant differences between the VisD and NoVisD groups with respect to prior concussion history (20% vs. 44%), LOC with presenting injury (16% vs. 12%), history of LD (12% vs. 16%), depression/anxiety (8% vs. 4%) ADHD (8% vs. 12%), migraine (12% vs. 20%), vision problems, or sports-related injury (68% vs. 64%).

Patients with VisD scored significantly higher on the PCSI-P post-injury total score (Mean = 33.9 vs 13.8, p < .01). Furthermore, the VisD group scored significantly lower on the ImPACT VisMC (Mean = 62.9 vs. 77.3, p < .01) and VisMoC (Mean = 28.0 vs. 33.8, p < .05) and reported significantly higher PCS symptoms (Mean = 24.8 vs. 11.6, p < .05) at their first clinic visit.

The VisD group took significantly longer to be considered recovered from their injury than the NoVisD group (Mean = 56.1 vs. 29.5 days, p < .01).

To that end, the VisD group required significantly more clinic visits compared to NoVisD group (Mean = 2.8 vs. 1.8, p < .01).

DISCUSSION

This study shows that vision deficits in pediatric concussion patients is relatively common (~50%) as an initial presenting symptom.

Patients with documented vision deficits demonstrate a greater number of post-concussive symptoms overall, worse visually-mediated cognitive function, and a longer recovery time (~3-4 weeks longer).

These findings were in the context of comparable demographics, pre-injury PCS ratings, medical/psychological histories, and injury characteristics between the two groups.

These findings provide important data on the nature and frequency of vision deficits in a pediatric concussion population that has heretofore been rather sparse.

These findings may have implications for concussion management (e.g., initial rest recommendations, classroom accommodations, & rehabilitative therapies).