

CNS Vital Signs (CVS) Performance and Sports-Related Concussion (SRC) Recovery in High School Athletes

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65% of high school athletes were delayed in being cleared to play, based on a test with limited validity for adolescent concussions. Some athletes may be more at-risk for this delay than others.

FIGURE 1. CONCUSSION GUIDELINES FOR RETURN-TO-PLAY (RTP) COMPLETION WITH CNS VITAL SIGNS (CVS) TESTING.



- 65% of athletes sustained a delay on RTP. ~ 1/6 were delayed by at least 10 days.
- 37% of athletes incurred a prolonged RTP due to a single failed CVS test category.
- Visual Memory, Simple Reaction Time, and Verbal Memory most commonly resulted in abnormal CVS testing (52%).
- Age was not significantly associated with a delay on RTP.
- No categorical demographic factors were significantly associated with a delay on RTP.

RESULTS

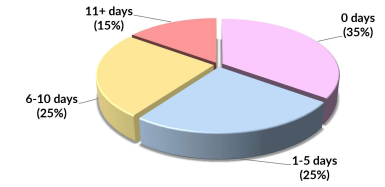


FIGURE 2. DELAY ON RTP COMPLETION DUE TO CVS TESTING (# DAYS)

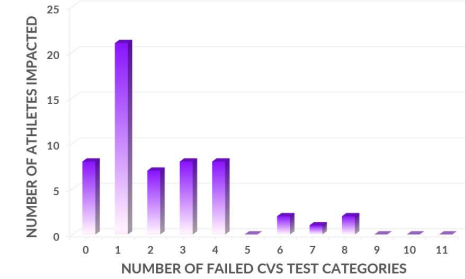


FIGURE 3. NUMBER OF FAILED CATEGORIES ON FINAL CVS PRIOR TO RTP

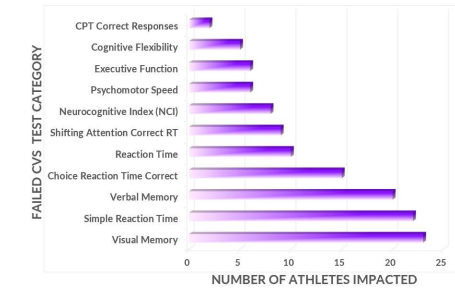


FIGURE 4. FREQUENCY OF FAILED CATEGORIES ON FINAL CVS PRIOR TO RTP

Table 1: Demographic Associations with the Delay of Return-To-Play (RTP) Completion from CNS Vital Signs (CVS) Testing

Demographic Factor	N = 62	%	μ^2	(d.p.) ^{1,2}	SD ^{1,2}	p-value	t	DF ¹	95% CI ¹	Upper	Lower
Gender	61	98.4									
Male	49	80.3	4.57	(0.68)	4.82	0.667	-0.43	59	-3.81	2.46	
Female	12	19.6	5.25		5.07						
Grades	54	87.0									
A, A-, B+, B-	39	72.2	4.56	(0.09)	4.28	0.945	0.07	52	-2.71	2.90	
C+, C-, D+, D-, F+	15	27.8	4.47		5.36						
Sport Played	61	98.4									
Football	37	60.7	4.65	(0.14)	5.07	0.911	-0.11	59	-2.70	2.41	
Other	24	39.3	4.79		4.55						
Learning Disability	61	98.4									
Yes	12	19.7	6.50	(2.23)	4.83	0.153	1.45	59	-0.85	5.32	
No	49	80.3	4.27		4.78						

TABLE 1. DEMOGRAPHIC ASSOCIATIONS WITH RTP DELAY FROM CVS TESTING

SIGNIFICANCE & FUTURE DIRECTION

- CVS testing commonly prolongs the completion of the RTP progression beyond the time of clinical improvement.
- Certain CVS categories are more commonly failed and there is no association between demographics and CVS performance.
- These results may serve to better inform clinicians evaluating adolescent SRC and interpreting CVS test results.
- Future - validation of findings by an external study; consideration of additional CVS performance indicators (SES, # CVS attempts, etc.)

CONTEXT

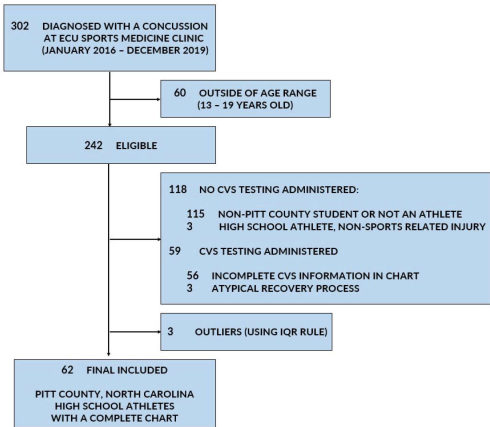
- 1/3 of athletes may sustain an undiagnosed sports-related concussion (SRC).
- Organizations such as the American Medical Society for Sports Medicine (AMSSM) have recommended guidelines to effectively diagnose and treat concussions, which also include completion of a return-to-play (RTP) progression.
- CVS is a neurocognitive test used to evaluate concussed high school athletes for symptoms overlooked during Return-To-Play (RTP).

OBJECTIVE

- Since there is limited evidence on the role of CVS to determine recovery from SRC in high school student-athletes, the purpose of this study is to explore the clinical impact on return-to-play (RTP) and evaluate associations with demographic factors and CVS results.

METHODS

- Study Design: IRB-approved (UMC-IRB 18-002973), retrospective cohort study with the following patient criteria (N = 62):



- Outcome: patient charts of Pitt County High School athletes were reviewed to identify and associate the CVS testing delay on RTP (†, Figure 1) with:
 - Testing performance and categories on final CVS prior to RTP. See Figure 3 and Figure 4.
 - Categorical demographic factors - using the independent samples t-test (see Table 1).
 - Age - using bivariate correlation.

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