



# Executive Functioning in an ADHD/LD, Concussion, and Typical Sample

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## INTRODUCTION

- Attention-deficit/Hyperactivity Disorder (ADHD) and learning disorders (LD) are often comorbid and there is debate whether these conditions are associated with a specific pattern of neurocognitive symptoms (Ackerman & Dykman, 1990; Stanford & Hynd, 1994; Wu, Anderson, & Castiello, 2002).
- Previous research shows that individuals with ADHD are more likely to endorse a history of concussion (Alosco, Fedor, & Gunstad, 2014)
- This research is examining Delis Kaplan Executive Functioning System (DKEFS): Trail Making Test (TMT) and Color Word Interference (CWI), performance differences among undergraduate students with ADHD/LD, those with a history of concussion, and healthy controls.

## METHODS/PARTICIPANTS

- Undergraduate research participants were administered a full neuropsychological battery ( $N = 184$ ,  $M(SD)_{age} = 19.02 (1.16)$ ).
- 3 groups were identified: Self-reported ADHD/LD (ADHD/LD;  $n = 13$ ), a history of prior concussion (Concussion;  $n = 39$ ) and no diagnosis (No DX;  $n = 120$ )
- One-way ANOVAs investigated group differences across TMT and CWI trials.
- Tukey's post hoc analyses further clarified performance differences between groups.

## RESULTS

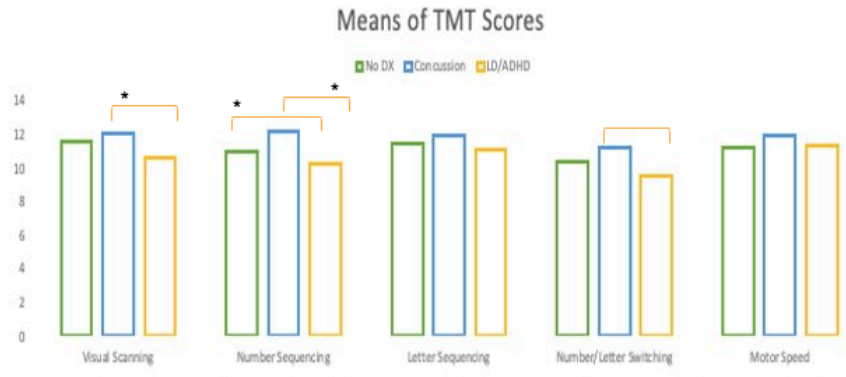


Figure 1. Trail Making Test means for No Dx, Concussion, and ADHD/LD groups across 5 trials

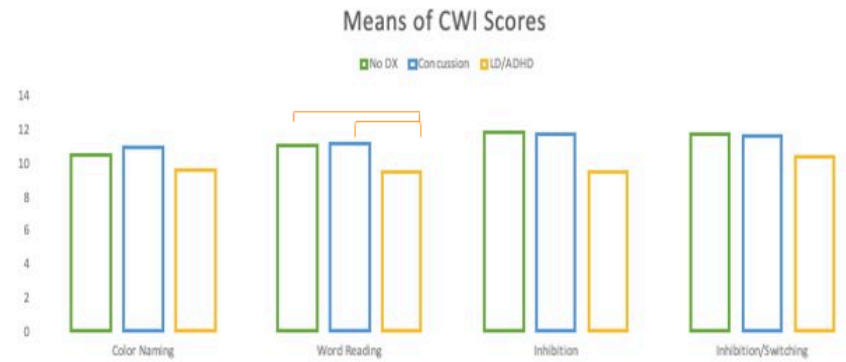


Figure 2. Color Word Interference means for No Dx, Concussion, and ADHD/LD groups across 4 trials

## DISCUSSION

This goal of this project was to see any differences among these groups in terms of their cognitive functioning.

### TMT

- Surprisingly, participants with a history of concussion demonstrated higher scores on the TMT visual scanning, number sequencing, and Number letter switching task than LD/ADHD group.

### CWI

- No differences were reported between LD/ADHD, prior concussion and no dx groups on trials of CWI.
- This may indicate that the CWI used alone did not capture difference in executive function in these groups.

### Limitations/Future Directions

- These results cannot be generalized to the population because of the collegiate/highly educated sample group
- LD/ADHD group was significantly smaller compared to the other groups

## REFERENCES

Ackerman, P. T., & Dykman, R. A. (1990). Prevalence of additional diagnoses in ADD and learning-disabled children. In K. Gadow (Ed.), *Advances in learning and behavior disorders: Vol. 6* (pp. 1–25). Greenwich, CT: JAI Press.

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Table 1. Color Word Interference group differences across 4 trials

Color Word Interference Trials	Sum Of Squares	Mean Square	F	Significance
Color Naming	19.219	9.61	1.711	0.184
Word Reading	32.041	16.02	2.973	0.054
Inhibition	0.989	0.495	0.116	0.891
Inhibition/Switching	21.942	10.971	2.06	0.131

Table 2. Trail Making Test group differences across 5 trials

Trail Making Tasks Trials	Sum Of Squares	Mean Square	F	Significance
Visual Scanning	20.218	10.109	3.801	0.024
Number Sequencing	51.691	25.845	5.892	0.003
Letter Sequencing	9.809	4.904	0.996	0.371
Number/Letter Switching	32.677	16.338	3.514	0.032
Motor Speed	15.603	7.802	2.393	0.095

### TMT

- Significant group differences were observed for TMT Trials 1 (Visual Scanning), 2 (Number Sequencing), and 4 (Number/Letter Switching; see Table 2)).
- Post-hoc analyses revealed that performance on TMT Visual Scanning was significantly lower for the LD/ADHD group ( $M(SD) = 10.67(1.50)$ ) when compared to the concussion group ( $M(SD) = 12.10(1.3)$ ,  $p = .023$ )
- Performance on TMT Number Sequencing was significantly lower in the LD/ADHD group ( $M(SD) = 10.25(3)$ ,  $p = .018$ ) relative the health control group ( $M(SD) = 11.00(2.1)$ ,  $p = .008$ ) and concussion group ( $M(SD) = 12.15(1.7)$ ).
- Performance on TMT Number/Letter Switching was trending significantly lower for in the LD/ADHD group ( $M(SD) = 9.58(2.27)$ ,  $p = 0.052$ ) compared to the concussion group.

### CWI

- Overall, no difference was found between groups on all trials of the CWI task (See Table 1).
- CWI Word Reading was trending significantly lower for LD/ADHD group ( $M(SD) = 9.462 (3.07)$ ,  $p = .053$ ) compared to the concussion and no diagnosis group.