



The Impact of Pre-Injury Attention Deficit/Hyperactivity Disorder (ADHD) Diagnosis on Post-Concussion Dual Task Performance in Adolescent Athletes

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Background

Attention Deficit/Hyperactivity Disorder (ADHD) may confound post-concussion evaluations, particularly during tasks where attention is divided. (i.e. dual-task).

Athletes with ADHD perform worse on pre-season neurocognitive testing and exhibit more severe symptoms, independent of concussion, than those without ADHD.

The relationship between pre-concussion ADHD diagnosis and dual-task performance after concussion is unknown

Purpose: To investigate whether adolescents with a recent concussion performed differently on single- and dual-task postural control evaluations based on pre-concussion ADHD diagnosis.

Results

We enrolled and tested 107 participants within 18 days of concussion

There were no significant between-group differences in single- or dual-task tandem gait completion time (Figures 1A and 1B), or mBESS errors (Figure 1D).

Participants with ADHD had worse cognitive accuracy during dual-task tandem gait testing than participants without ADHD (Figure 1C).

After adjusting for potentially confounding covariates (sex, ethnicity, and LOC at time of injury), dual-task cognitive accuracy was significantly associated with pre-concussion ADHD diagnosis ($\beta = -0.12$; 95% CI = -0.21 to -0.03; $p = 0.01$).

On average, participants with ADHD had 12% (95% CI = 3% to 21%) worse cognitive accuracy during dual task tandem gait compared to those without ADHD.

Conclusions

Participants with ADHD demonstrated worse cognitive, but not postural control, performance during dual-task timed tandem gait compared to patients without ADHD.

Participants with ADHD may prioritize the motor task over cognitive task accuracy during tests that require divided attention after concussion.

Incorporating dual-task assessments into concussion evaluation may help identify deficits not detected with single-task postural control measures, particularly among those with ADHD.

Methods

Participants:

- Adolescents aged 13-18 years with recent concussion (testing within 18 days of concussion diagnosis)

Grouping Variable: Prior ADHD diagnosis

Outcome Measures:

- Single-task tandem gait time
- Dual-task tandem gait time
- Dual-task cognitive accuracy
- Modified Balance Error Scoring System (mBESS)

Other Measures: Demographic/Medical Screen Questionnaire

Table 1. Participant characteristics for those with a pre-concussion ADHD diagnosis and without. Data are presented as mean (SD) for continuous variables and number within group (corresponding %) for categorical variables.

Variable	ADHD (N=18)	No ADHD (N=89)	P value	
Sex (female)*	5 (28%)	51 (57%)	0.02	
Age (years)	15.2 (2.0)	15.4 (1.7)	0.62	
Days post-concussion	9.9 (4.1)	8.7 (3.6)	0.22	
Race	American Indian or Alaska Native	0 (0%)	2 (2%)	>0.99
	Asian	1 (6%)	3 (3%)	0.66
	Black or African-American	0 (0%)	6 (7%)	0.59
	Native Hawaiian or Other Pacific Islander	1 (6%)	3 (3%)	0.53
	White	14 (78%)	68 (76%)	0.90
	More than one race	2 (11%)	7 (8%)	0.46
Ethnicity: Hispanic or Latine*	7 (39%)	15 (17%)	0.04	
History of concussion	9 (50%)	39 (44%)	0.63	
History of anxiety	3 (17%)	12 (13%)	0.72	
History of depression	4 (22%)	12 (13%)	0.34	
History of MSK injury	12 (67%)	59 (67%)	0.98	
LOC at time of injury*	7 (39%)	15 (17%)	0.04	
Amnesia at time of injury	3 (17%)	23 (26%)	0.55	
Sport-related injury	12 (67%)	74 (83%)	0.11	
Initial sx severity (PCSI)	40.3 (17.2)	42.7 (27.1)	0.72	

Statistical Analysis

Independent samples t-tests were used to compare mean single-task tandem gait time, dual-task tandem gait time, dual-task cognitive accuracy, and mBESS errors between those with and without prior ADHD diagnosis.

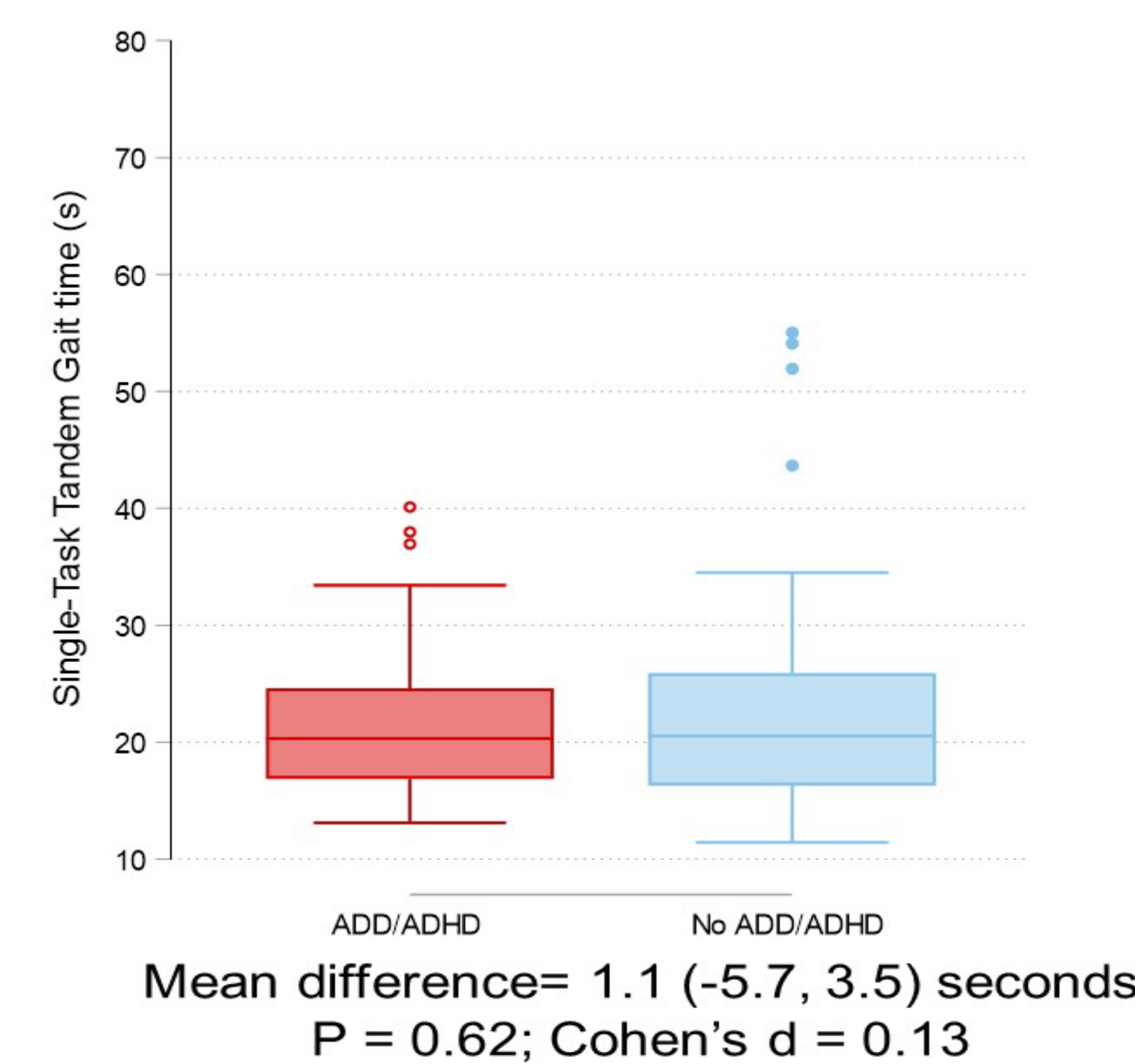
Effect sizes were estimated using Cohen's d.

Multivariate linear regression was used to predict the relationship between dual-task cognitive accuracy and pre-concussion ADHD diagnosis.

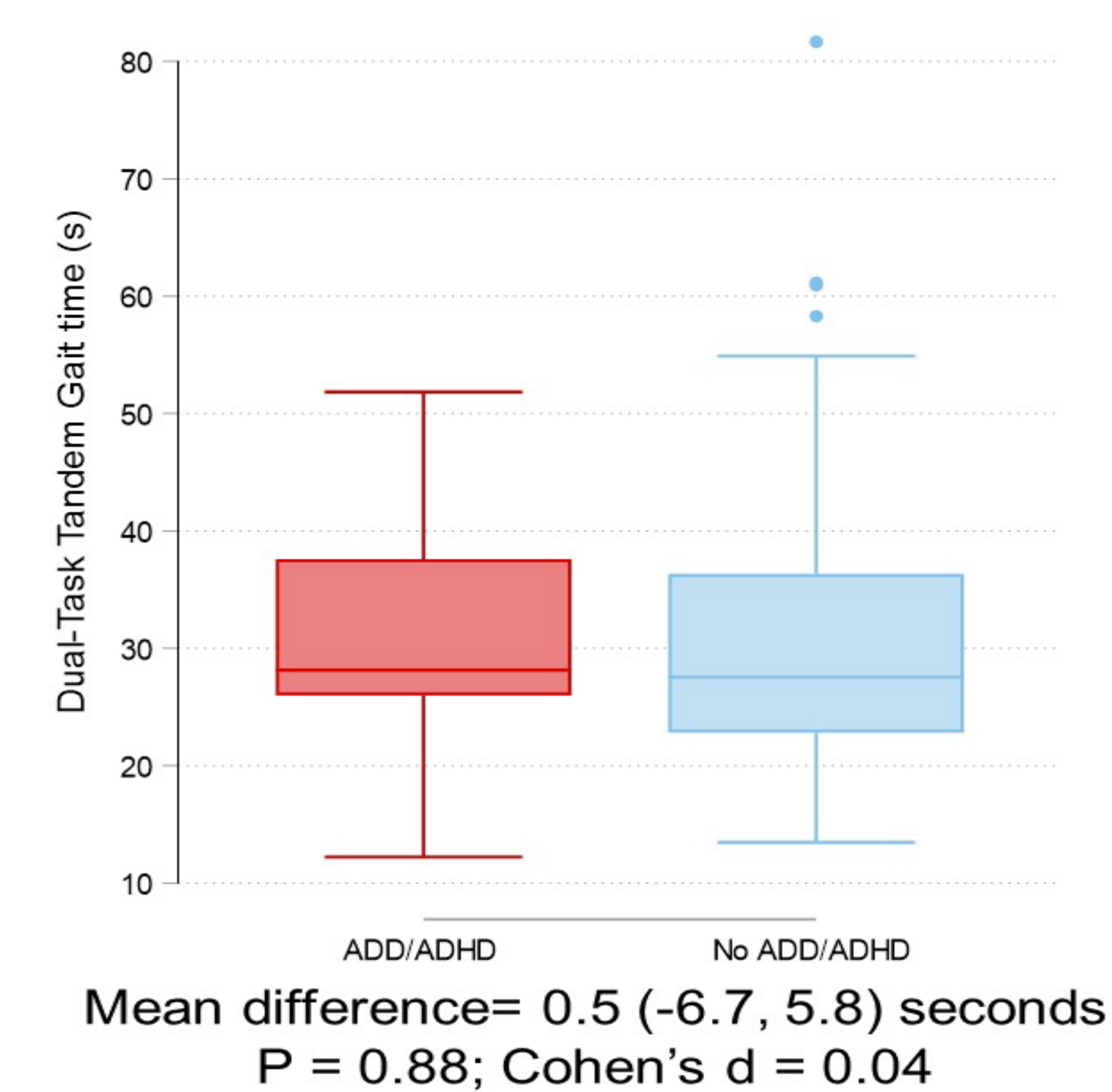
References

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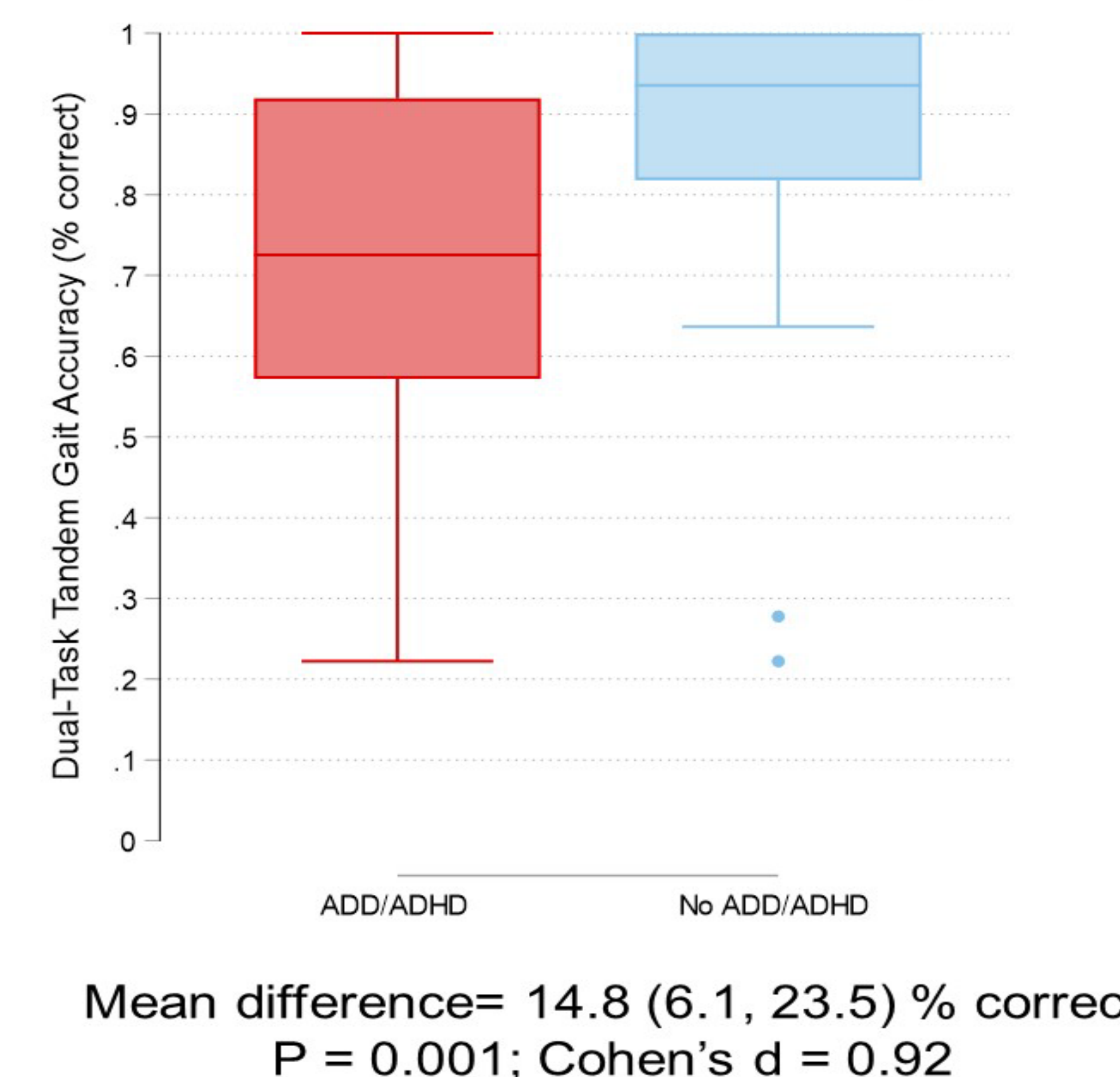
A. Single-Task Tandem Gait



B. Dual-Task Tandem Gait



C. Dual-Task Accuracy



D. Modified BESS

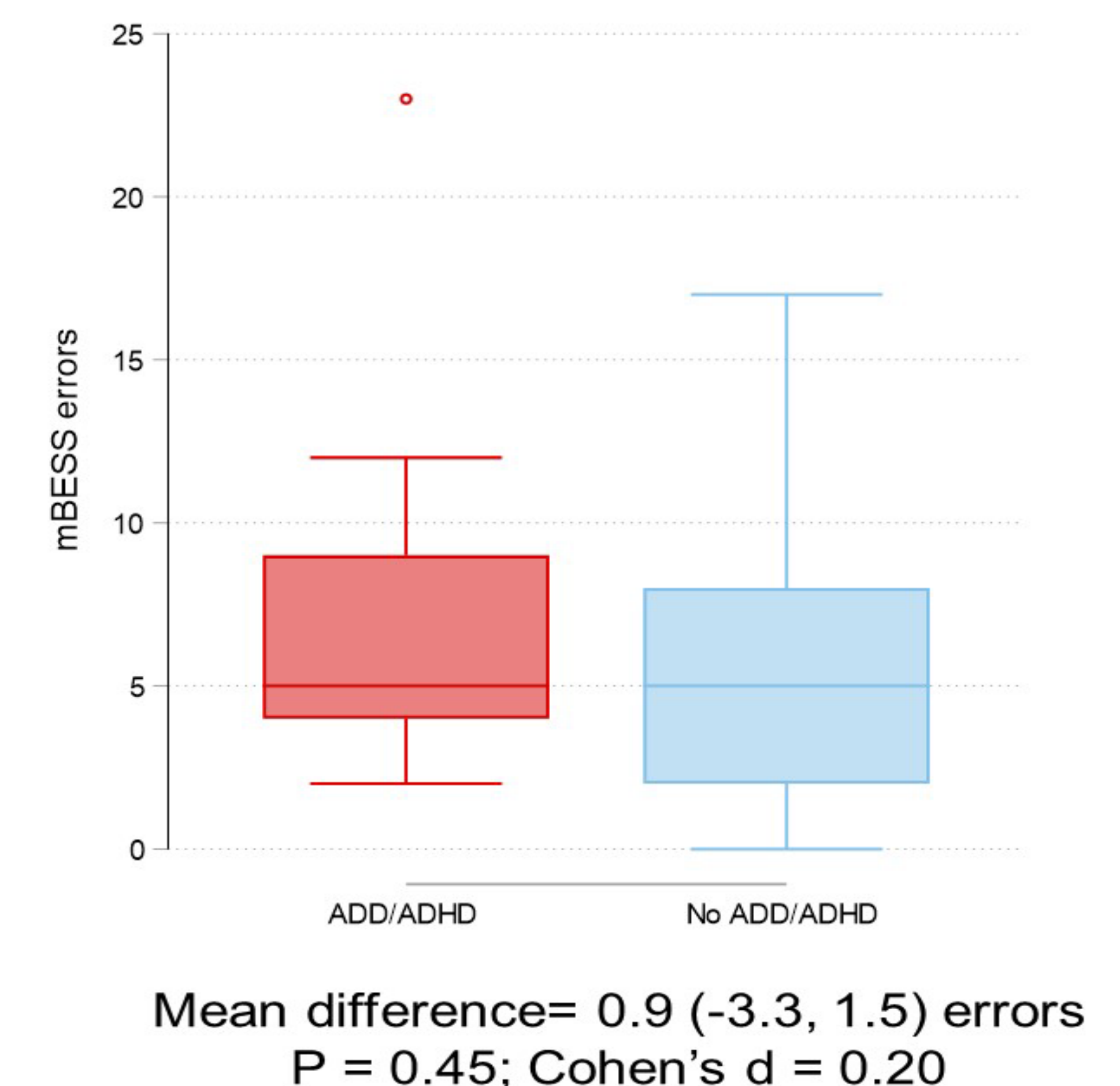


Figure 1. Comparison between "ADHD" and "No ADHD" groups on single- and dual-task measures and postural stability.