

Thomas A. Duda¹, Joseph E. Casey¹, & Scott R. Millis²

¹Department of Psychology, University of Windsor

²Department of Physical Medicine & Rehabilitation, Wayne State University

Introduction

- Motor skill deficits, including poor graphomotor skills (i.e., handwriting) have been consistently observed in those with ADHD and have been characterized as additional features of the disorder (Posner et al., 2011; Tucha & Lange, 2011).
- Some research suggests that graphomotor fluency problems persist into adulthood in those with ADHD, but no studies have investigated the sensitivity or specificity of graphomotor fluency measures in identifying adult ADHD.
- Noting that graphomotor fluency problems have been found in adults with ADHD (Duda et al., 2013), it was expected that attenuated improvement in fluency despite identical practice would differentiate those with ADHD vs. unaffected controls

Methods

- Data were analyzed from 14 adult participants with ADHD and 24 controls
- All participants wrote a novel symbol on a digitizing tablet 30 times with ADHD participants off stimulant medication for a duration of 24 to 48 hours prior to testing.
- Graphomotor fluency was operationalized as Normalized Jerk (NJ). NJ is a measure of writing fluency, with higher scores indicating dysfluent movement and lower scores indicating fluent movement (Teulings et al., 1997).
- With practice, fluency increases and NJ decreases (Portier & Van Galen, 1992).
- The proportion of change in mean graphomotor fluency between the first 10 and last 10 trials was used to indicate change and/or improvement in graphomotor fluency.

Methods (Continued)

- An existing diagnosis plus self-report measures identifying significant ADHD symptomatology were used as the “gold standard” to indicate a positive ADHD diagnosis, whereas interview and self-report measures were used to indicate the absence of ADHD.

Results

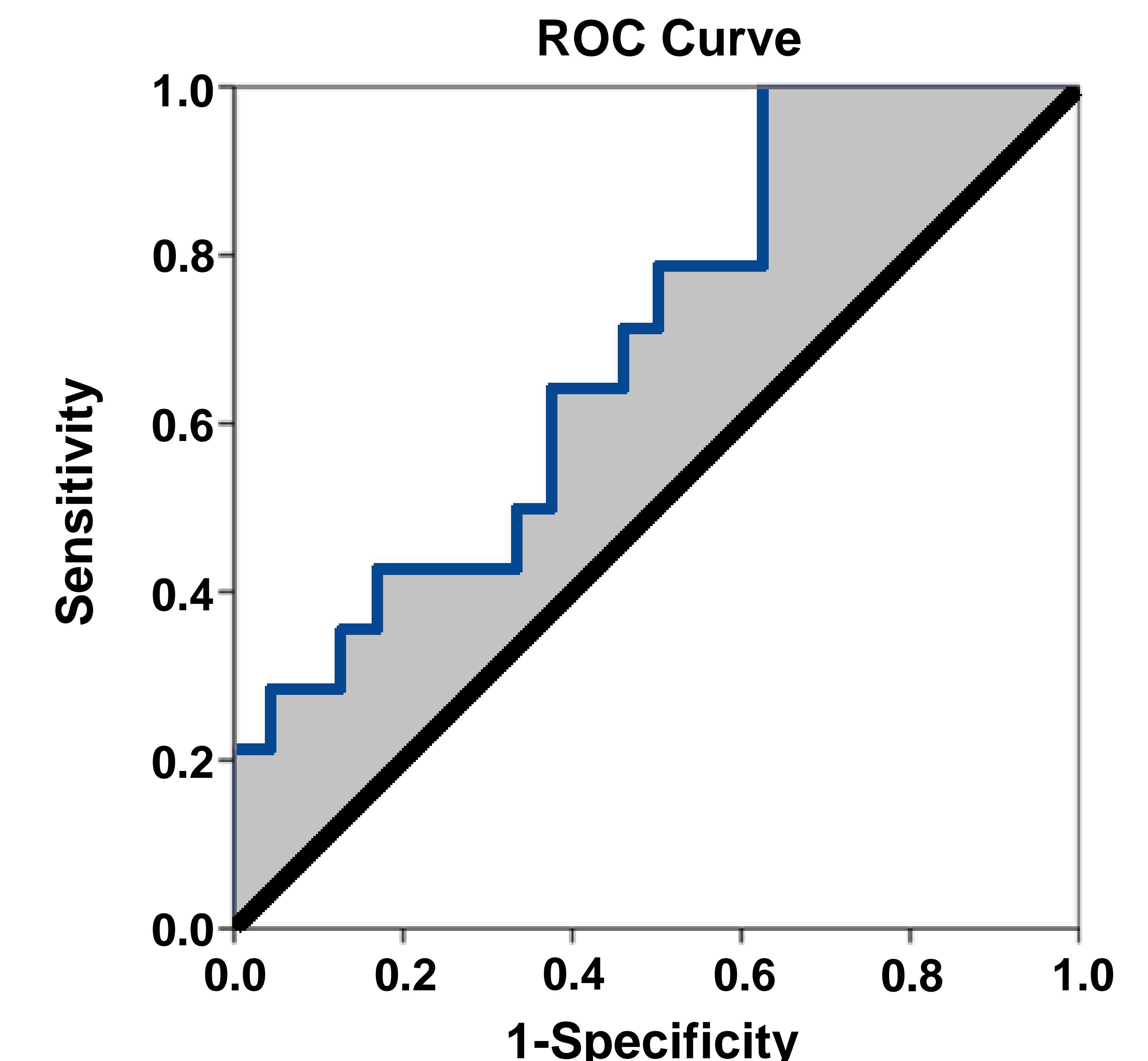
- Receiver Operating Characteristic Curve analysis was conducted to determine the classification accuracy of change in NJ
- Classification accuracy was fair: Area under Curve = .696, $p = .046$, $SE \pm .086$.
- Sensitivity and specificity were 1.00 and 0.38, respectively, at optimal positive test threshold based on the Youden Index.
- Sensitivity and specificity were 0.71 and 0.54, respectively, at optimal positive test threshold based on practical considerations (i.e., considering false positives and false negatives)

Discussion & Conclusions

- Overall, results suggest that change in NJ may have utility as a biomarker in identifying adult ADHD
- However, specificity was low and sample size was small
- Additional research is needed to further determine the utility of graphomotor program automatization in identifying adult ADHD

Acknowledgments: We would like to express our gratitude to Tahira Ahmed, M.D., and the University of Windsor's Student Disability Services for their help recruiting participants, Vilija Petrauskas for researching and acquiring the software and hardware necessary for this study, and Dennis Jackson, Ph.D. for consultation and insight.

Classification Accuracy of Change in Kinematic Graphomotor Fluency in Adults with ADHD and Controls



Positive if \leq	SN	SP	Positive if \leq	SN	SP
-51.86%	0.21	1.00	19.20%	0.57	0.63
-35.56%	0.21	0.96	25.84%	0.64	0.63
-22.49%	0.29	0.96	27.94%	0.64	0.58
-13.57%	0.29	0.92	29.97%	0.64	0.54
-9.42%	0.29	0.88	33.06%	0.71	0.54
-3.80%	0.36	0.88	35.28%	0.71	0.50
-0.81%	0.36	0.83	36.56%	0.79	0.50
0.31%	0.43	0.83	38.08%	0.79	0.46
1.53%	0.43	0.79	39.42%	0.79	0.42
2.29%	0.43	0.75	40.29%	0.79	0.38
3.49%	0.43	0.71	41.03%	0.86	0.38
5.57%	0.43	0.67	48.91%	0.93	0.38
7.51%	0.50	0.67	57.03%	1.00	0.38
11.24%	0.50	0.63			