Confidence is Key: Unlocking Relations between ADHD Symptoms & Math Performance

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Introduction

Many of the behaviours that are challenges for people with ADHD diagnoses, such as avoiding difficult tasks, difficulty with organization, and difficulty sustaining attention on boring or repetitive tasks, may also interfere with success in university. Accordingly, the prevalence of ADHD symptoms may be related to academic difficulties for university students, regardless of diagnosis (Canu et al., 2017; Hartung et al., 2016; Kooij et al., 2010; Wood et al., 2019)

Goal: Examine the relations among ADHD symptoms, anxiety, academic confidence, and academic performance, specifically mathematics, in university students. Canu et al. (2017) conducted a similar study and concluded that ADHD diagnosis and ADHD symptoms were linked specifically to anxiety about mathematics. In the present research, we used a wider range of academic self-assessments to more clearly specify the links among ADHD symptoms and affect towards academic subjects.

Method

Participants: 425 undergraduates (64% female, M_{Age} = 20.0)

Math Background & Interest Questionnaire (MBIQ)
- Designed to measure demographics and math attitudes
- Two composite scores, Math Confidence & Literacy Confidence were created through Principal Component Analyses

Adult ADHD Self-Report Scale (ASRS)
- Self-report measure of ADHD symptomology

State Anxiety Rating
- Please rate your current level of anxiety with 0 being 'not at all anxious' and 10 being 'extremely anxious'
- Completed twice

Basic Calculation Fluency
- Single-digit addition & multiplication; one-minute time limit
- Completed twice

Brief Math Assessment 3
- Math questions (e.g., arithmetic, fractions, algebra) that increase in difficulty

Word Problems
- Math word problems designed for this study

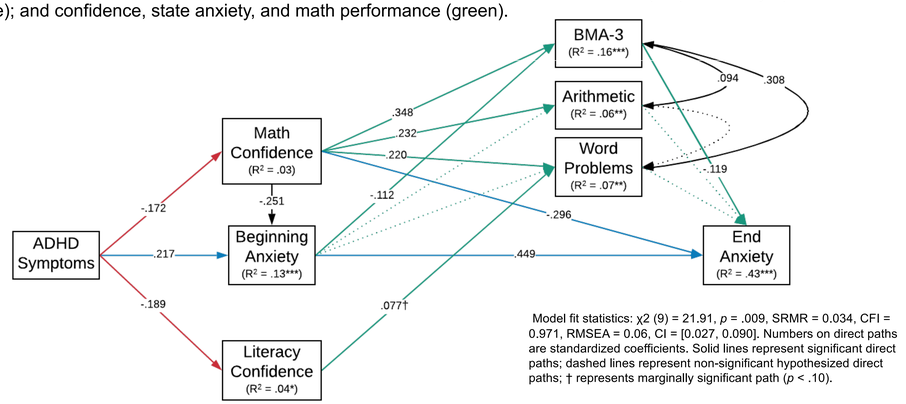
Results

Table 1. *Correlations among measures*

	1	2	3	4	5	6	7	8
1. ADHD symptoms (ASRS)	.81	-.17**	-.20**	.25**	.20**	-.11*	-.03	.04
2. Math confidence (MBIQ)		.86	-.18**	-.29**	-.48**	.24**	.39**	.23**
3. Literacy confidence (MBIQ)			.90	-.04	.09	-.03	-.16**	.06
4. State Anxiety – beginning				--	.55*	-.08	-.21**	-.15**
5. State Anxiety – end					--	-.11*	-.33**	-.19**
6. Arithmetic fluency						.89	.17**	.13**
7. BMA-3							.83	.36**
8. Word Problems								.81
N per measure	*425*	*419*	*424*	*386*	*384*	*425*	*425*	*425*
Mean (SD)	*30.4 (9.1)*	*3.1 (0.9)*	*4.2 (0.7)*	*4.2 (2.6)*	*5.5 (2.8)*	*21.4 (7.9)*	*7.2 (1.5)*	*7.7 (1.6)*
Participant Min/Max	*8-59*	*1-5*	*1.5-5*	*0-10*	*0-10*	*5.5-46*	*4-10*	*4-10*
Measure Min/Max	*0-72*	*1-5*	*1-5*	*0-10*	*0-10*	*0-54*	*0-10*	*0-10*

Note: Reliability of the measure is shown on diagonal (where available). * $p < .05$; ** $p \leq .001$.

Figure 1. Path model predicting relations among ADHD symptoms, confidence, and math performance. The coloured pathways represent three sections of the model: ADHD symptoms and confidence in academics (red); ADHD symptoms and state anxiety (blue); and confidence, state anxiety, and math performance (green).



Model fit statistics: $\chi 2$ (9) = 21.91, p = .009, SRMR = 0.034, CFI = 0.971, RMSEA = 0.06, CI = [0.027, 0.090]. Numbers on direct paths are standardized coefficients. Solid lines represent significant direct paths; dashed lines represent non-significant hypothesized direct paths; † represents marginally significant path ($p < .10$).

Discussion

- How are ADHD symptoms, academic confidence, state anxiety, and math performance related?
  - Canu et al. concluded that mathematics was a special area of concern for people with ADHD, but there was no evidence of a direct link between ADHD and math performance, nor did they consider the overall prevalence of academic confidence or state anxiety among people with ADHD symptoms.
- The results supported an alternative model of the relation between ADHD symptoms and academic confidence.
  - Direct links were found between ADHD symptoms and three affective measures: math confidence, literacy confidence, and state anxiety.
  - Contrary to the findings of Canu et al. (2017), we did not find support for a privileged connection between ADHD symptoms and mathematics affect.
- Our findings are consistent with research showing that students with ADHD are generally anxious about academic activities (Barkley et al., 2006; Daley & Birchwood, 2010; Voigt et al., 2017), presumably because their struggles with academic subjects occur in multiple domains (Frazier et al., 2007).
- After completing math tasks, negative affect increased for people with lower math confidence but did not change for people who reported higher levels of ADHD symptomology
  - Contrary to Canu et al. (2017) who found that negative affect increased for individuals with ADHD/ADHD symptoms after completing a mathematics task

Conclusion

The present study is among the first to closely examine how ADHD symptoms and confidence in academics are related to math performance in adults (cf. Canu et al., 2017). The findings suggest that the link between ADHD symptoms and math performance is related to confidence in academics in general, not just in mathematics: People with higher levels of ADHD symptoms were less confident in their academic skills than people with lower levels of ADHD symptoms. Addressing this lack of confidence could help support people with ADHD symptoms in academic settings.

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