084 Numerical Cognition #6

The gender gap in math anxiety (and in a link between math anxiety and math performance too) is not so salient when other anxieties are controlled for

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BACKGROUND

- Math anxiety (MA) affects math performance and choosing math-related education paths, contributing to a gender gap in STEM careers (Eidlin-Levy et al., 2023).
- MA tends to be more closely related to mathematical performance in ♀ than in ♂ (Yu et al., 2023), but the opposite pattern has also been reported (Szczygieł, 2020).
- Spatial anxiety in the areas of manipulation and navigation, but not by imagery, mediates gender differences in MA (Delage et al., 2022; Sokolowski et al., 2019).
- Math performance is considered a mediator of the relationship between gender and MA, but findings are inconsistent (Delage et al., 2022 vs. Sokolowski et al., 2019).
- The mechanisms driving associations between MA, gender, and math performance still remain largely unknown, mainly because different kinds of anxiety are rarely controlled for.

Research questions:

- Does the relationship between MA and mathematical performance differ significantly in women and men when various types of anxiety are controlled for?
- Do various types of anxiety and math performance mediate the relationship between gender and MA?
- What percentage of the variance in MA can be explained by gender, anxieties, and mathematical performance?

METHOD & RESULTS

Participants: online study, *n* = 269 (157 ♀, 112 ♂, *M* = 41.1, *SD* = 12.9, range = 20-75yo

Variables & materials:

- Math anxiety (MA): The composite score of MA (McDonald's ω for 2nd order latent factor = .94) based on scores in *Abbreviated Math Anxiety Scale* (AMAS-T, α = .88, AMAS-L, α = .90), *Math Anxiety Questionnaire for Adults* (α = .95), *Single-Item Math Anxiety Scale*.
- Spatial anxiety (SAQ): *Spatial Anxiety Questionnaire* (Imagery, α = .88; Navigation, α = .92; Mental Manipulation α = .96).
- Emotional stability (EMO): *Ten-Item Personality Inventory* (EMO's α = .72)
- State anxiety (STAI): *State-Trait Anxiety Inventory* (State Scale's α = .96).
- Test anxiety (CTAS): *Cognitive Test Anxiety Scale* (α = .97).
- Math performance (MATH): a set of 20 math problems (average difficulty = .55; α = .77)

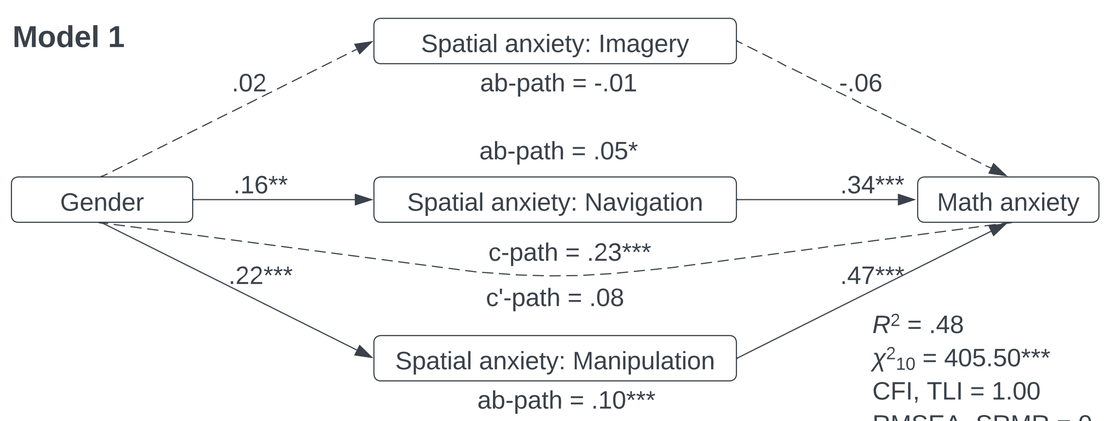
Results:

- Pearson's correlation between MA and MATH for women is r = -.52, p < .001, partial r = -.43, p < .001; and for men: r = -.62, p < .001, partial r = -.52, p < .001.
- Without control (Z = -1.19, p = .12) and controlling for anxieties (Z = -.93, p = .18), gender differences in the strength of the relationship between MA and MA were insignificant.
- Without mediators, women had a higher MA than men (β = .23, p < .001).
- For multimediation models (*lavaan*; gender as IV and MA as DV) see the diagrams.

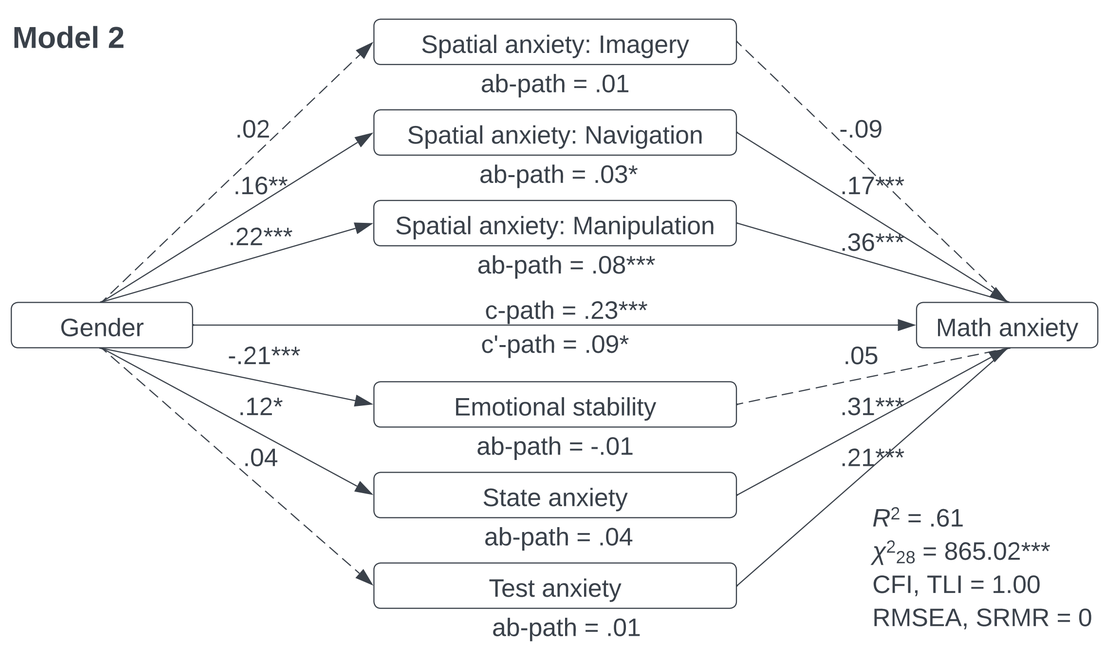
	M	*SD*	Range	Gender	MA	SAQ-I	SAQ-N	SAQ-M	EMO	STAI	CTAS
MA	77.20	23.82	29-127	.23***							
SAQ-I	19.46	7.02	8-38	.01	.37***						
SAQ-N	22.26	7.75	8-40	.15*	.56***	.48***					
SAQ-M	23.38	9.26	8-40	.22***	.62***	.58***	.51***				
EMO	8.83	3.16	2-14	-.21***	-.37***	-.17**	-.43***	-.23***			
STAI	43.29	13.98	20-80	.12*	.64***	.33***	.45***	.44***	-.48***		
CTAS	51.49	18.07	24-93	.04	.59***	.36***	.54***	.40***	-.49***	.63***	
MATH	11.08	4.02	1-20	-.14*	-.57***	-.16**	-.27***	-.37***	.18**	-.30***	-.24***

Notes: * p < .05, ** p < .01, *** p < .001; women are coded as 1 and men as 0

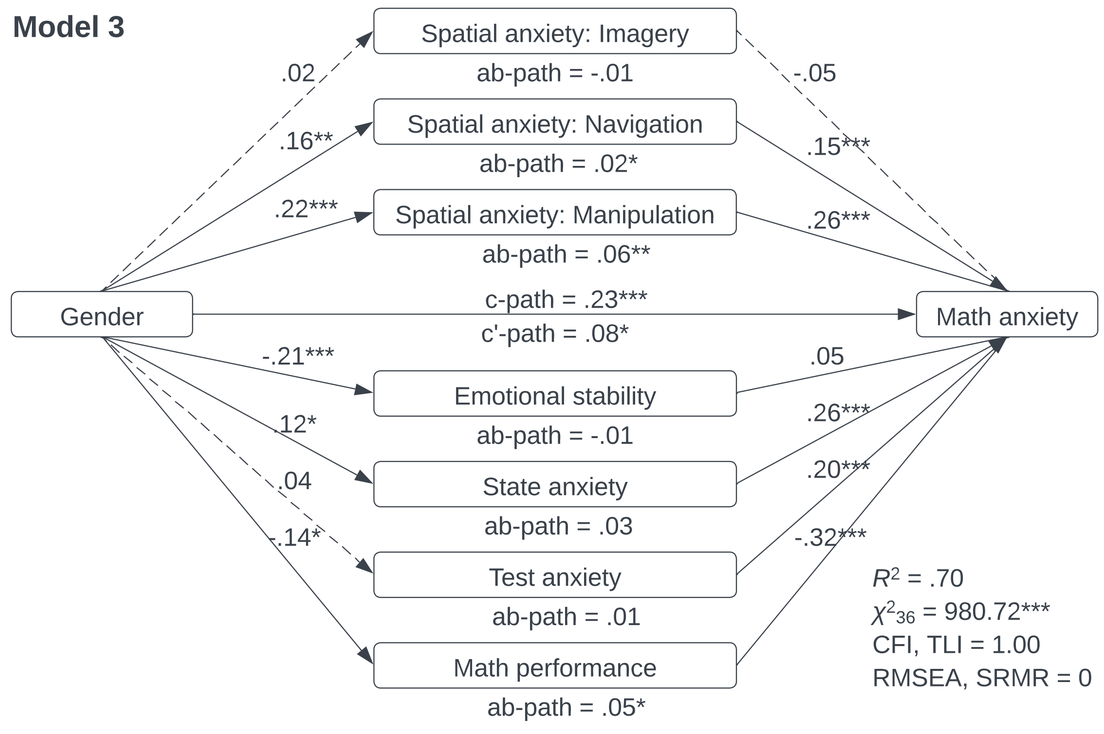
Model 1



Model 2



Model 3



TAKE HOME MESSAGES

- A negative correlation between MA and math performance is stronger in men, but the difference is ns regardless of controlling for anxieties: Women and men lose in math performance due to MA similarly, but they lose less than frequently thought (when anxieties are controlled)
- Manipulation and navigation spatial anxiety, but not imagery, robustly mediate adults' gender differences in MA, possibly contributing to the gender gap in STEM.
- Math performance significantly mediates the relationship between gender and MA.
- Gender, spatial anxiety, emotional stability, state anxiety, test anxiety, and math performance explain 70% of the variance in MA in adults.

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