

Mediation analysis of the relation between math anxiety, worry, test anxiety, and cognitive control

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BACKGROUND

- Mathematics anxiety (MA) is a debilitating negative reaction to arithmetic that affects between 17-61% of students.
- MA: general feelings of tension that affect the handling of numbers and the solving of mathematical problems.
- Processes shown to lead to anxious symptoms and impair problem solving strategies:
 - Worry: uncontrollable thinking about potential negative consequences
 - Test anxiety (TA): concerns about possible negative consequences of failure during an evaluative situation
- On the other hand, cognitive flexibility may protect against anxiety by serving as a coping mechanism that allows to successfully challenge and replace maladaptive thoughts.

STUDY AIM

Explore the interaction between cognitive flexibility, worry, and TA to understand the manifestation of MA. For this we

- translated from English to Spanish and validated several questionnaires,
- studied correlations among measures, and
- explored the predictive role of cognitive flexibility, worry, and TA in MA levels.

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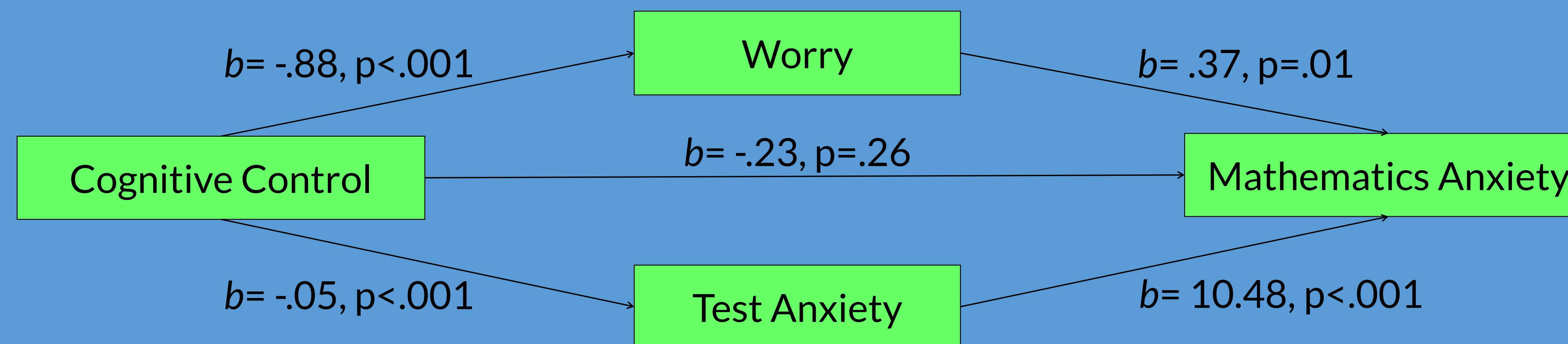
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ANALYSES AND RESULTS

Correlations among measures	Interpretation
CFIC-C + PSWQ	$r = -.59, p < .001$ strong negative
CFI-C + WTAS	$r = -.49, p < .001$ moderate negative
CFI-C + SMARS	$r = -.44, p < .001$ moderate negative
PSWQ + WTAS	$r = .43, p < .001$ moderate positive
PSWQ + SMARS	$r = .48, p < .001$ moderate positive
WTAS + SMARS	$r = .58, p < .001$ strong positive

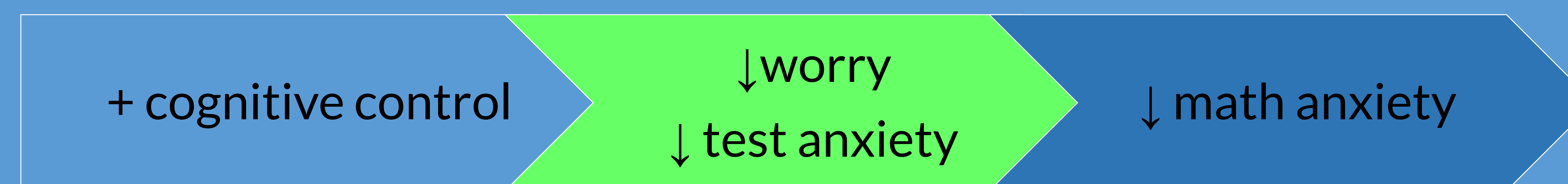
Mediation analysis

- Indirect effect of cognitive control on math anxiety, through worry
 $b = -.32$, percentile bootstrap 95% CI [-.54 - -.09]
- Indirect effect of cognitive control on math anxiety, through test anxiety
 $b = -.52$, percentile bootstrap 95% CI [-.80 - -.31]



CONCLUSIONS

- Spanish-speaking young adults with higher self-reported cognitive control tend to significantly reduce math anxiety by decreasing worrying thoughts and test-related anxiety.



- The development of interventions aimed to reduce math anxiety should focus on how cognitive control is mediated by thoughts of worry and anxiety towards test taking.

METHODS

Participants

- 152 Spanish-speaking young adults (18-29 y.o., 108 females) of the San Juan, Puerto Rico metropolitan area were recruited.

Self-report measures : Spanish versions of

- Control subscale of the Cognitive Flexibility Inventory¹ (CFI-C, $\alpha = .86$, 7 items)
- Penn State Worry Questionnaire² (PSWQ, $\alpha = .90$, 16 items)
- Westside Test Anxiety Scale³ (WTAS, $\alpha = .87$, 10 items)
- Shortened Mathematics Anxiety Rating Scale⁴ (sMARS; $\alpha = .95$, 25 items)

Procedure

- English-Spanish translation, back-translation, and panel of judges.
- Cultural adaptation of items' language.
- Orientation to participants and assent/consent.
- Administration of scales and demographic data form.

References

- ¹Dennis, J.P., Vander Wal, J.S. (2009). The Cognitive Flexibility Inventory: Instrument development and estimates of reliability and validity. *Cognitive Therapy and Research*, 34(3), 241-253. <https://doi.org/10.1007/s10608-009-9276-4>
- ²Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the Penn State Worry Questionnaire. *Behaviour Research and Therapy*, 28(6), 487-495. [https://doi.org/10.1016/0005-7967\(90\)90135-6](https://doi.org/10.1016/0005-7967(90)90135-6)
- ³Driscoll, R. (2007). Westside Test Anxiety Scale validation. *Education Resources Information Center*. <http://www.testanxietycontrol.com/research/sv.pdf>
- ⁴Núñez-Peña, M.I., Suárez-Pellicioni, M., Guílera, G., & Mercadé-Carranza, C. (2013). A Spanish version of the short Mathematics Anxiety Rating Scale (sMARS). *Learning and Individual Differences*, 24, 204-210. <https://doi.org/10.1016/j.lindif.2012.12.009>