



Associations among General Anxiety, Test Anxiety, Math Anxiety, and Math Achievement in Children



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Introduction

General anxiety interferes with social, emotional, and educational functioning and is common among children (Keeton et al., 2009).

Test anxiety is experienced by 10-40% of students as early as age seven, with women and minorities more likely to face it (Embse et al., 2013).

Math anxiety is prevalent and relates to math achievement even among children in early elementary school (Barroso et al., 2021; Ramirez et al., 2013).

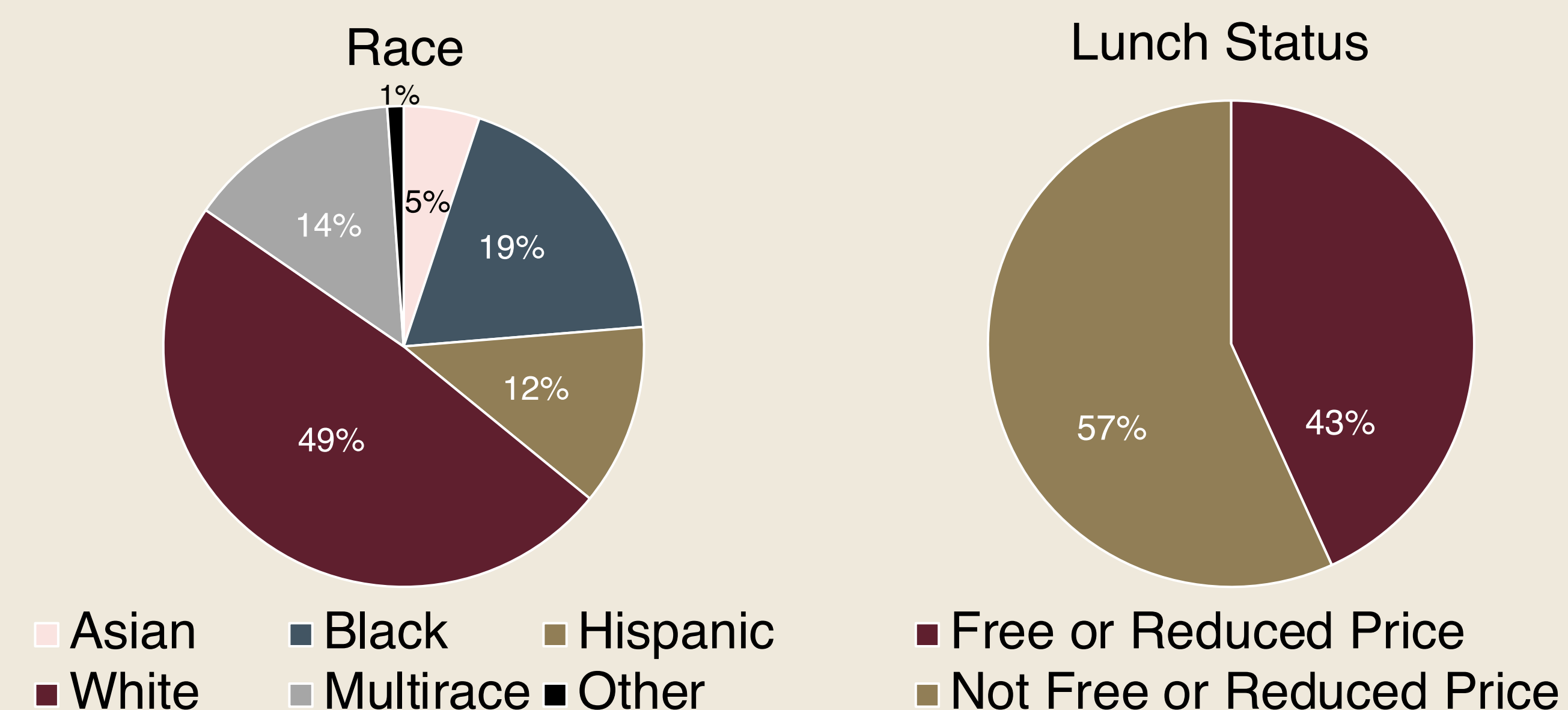
Research Questions

Does general anxiety relate to math achievement in elementary school aged children? Does math anxiety mediate this relationship?

How does test anxiety relate to math achievement in elementary school aged children? Does math anxiety mediate this relationship?

Figure 1. Participants

494 second-grade students; 50.5% were girls



Methods

Measures

General Anxiety: NIH Toolbox self-report Fear scale (8 questions, scale: 1-5).

Test Anxiety: Test Anxiety Scale for Children (30 questions, scale: 1-4; Wren & Benson, 2004).

Math Anxiety: Adapted by Ganley & McGraw (2016) from the Math Anxiety Scale for Young Children (13 questions, scale: 1-4; Harari et al., 2013).

Math Achievement: Researcher-developed Assessment (25 questions, mixed multiple choice and short answer; Schoen, et al., 2021).

Procedure

In the fall, students were assessed for general anxiety, test anxiety, and math anxiety. Math achievement was then measured the following spring.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age	494	6.92	10.0	8.30	0.43
Test Anxiety Factor	494	-1.44	1.94	-0.0004	0.58
General Anxiety Factor	494	-0.80	1.56	0.01	0.54
Math Anxiety Mean	494	1.00	4.00	1.97	0.75
Spring Math Score	494	-2.31	2.66	0.66	0.93

Results

Preliminary Analyses

Descriptive statistics are in Table 1. Correlations in Table 2 show that test, general, and math anxiety all have a weak to moderate relation to math achievement. Test, general, and math anxiety all demonstrate a strong correlation to one another.

Mediation Analyses

We used percentile bootstrapping (Preacher & Hayes, 2004) to estimate confidence intervals for the indirect relation between general anxiety and math performance through math anxiety. This indirect relation was statistically significant ($ab = 0.78 \times -0.36 = -0.28$, 95% CI [-0.39, -0.19]; See Figure 2).

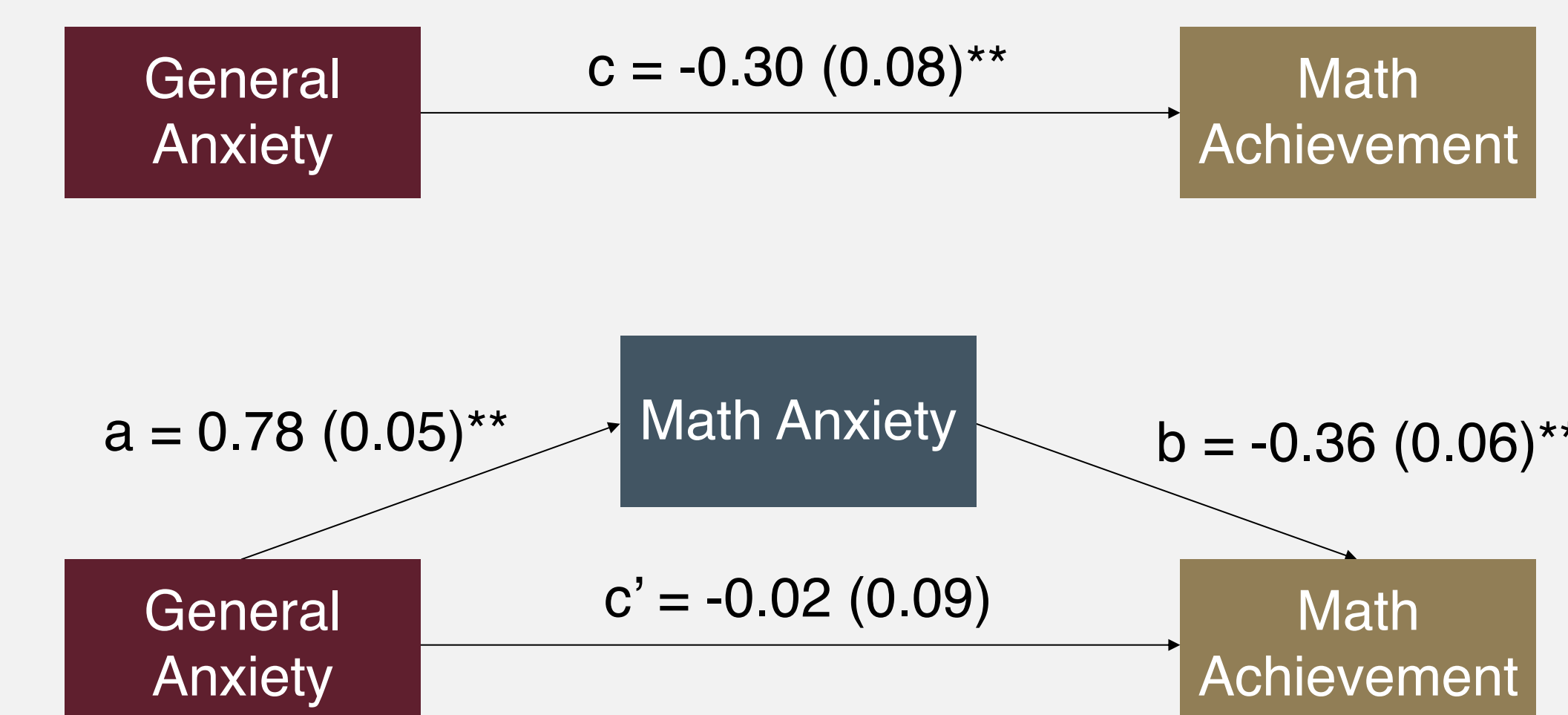
Results also showed that the indirect relation between test anxiety and math performance through math anxiety was statistically significant ($ab = 0.90 \times -0.26 = -0.24$, 95% CI [-0.37, -0.11]; See Figure 3).

Table 2. Correlations

	Age	Test Anxiety Factor	General Anxiety Factor	Math Anxiety Mean	Spring EMSA Score
Age	--				
Test Anxiety Factor	.07	--			
General Anxiety Factor	.08	.69**	--		
Math Anxiety Mean	-.04	.70**	.55**	--	
Spring Math Score	-.03	-.27**	-.18**	-.30**	--

Note. ** $p < .01$

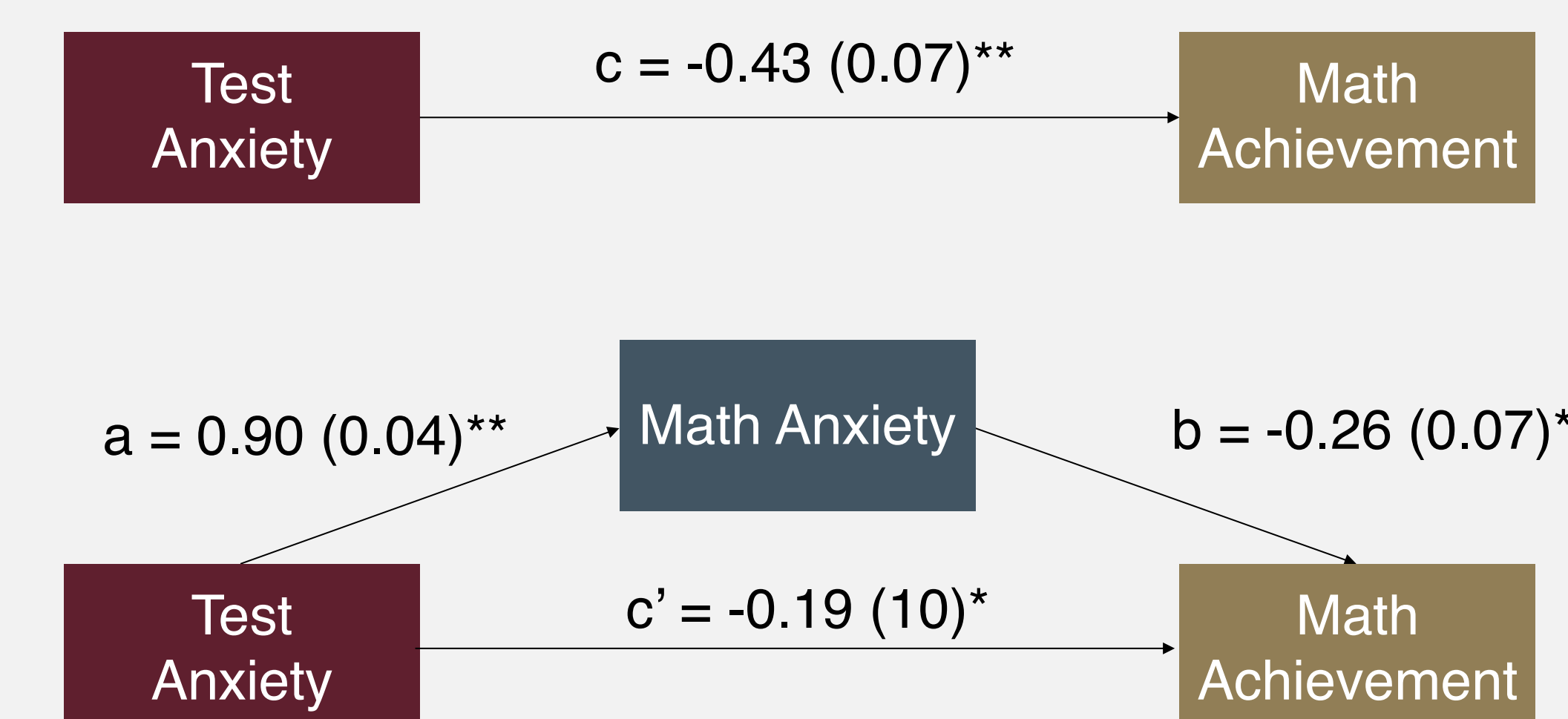
Figure 2. General Anxiety Mediation Model



Note. * $p < 0.05$, ** $p < 0.01$

There is a significant relation between general anxiety and math achievement. When accounting for math anxiety, the relation between general anxiety and math achievement is not significant, suggesting mediation.

Figure 3. Test Anxiety Mediation Model



Note. * $p < 0.05$, ** $p < 0.01$

There is a significant overall relation between test anxiety and math achievement. There is also a significant relation between test anxiety and math achievement when accounting for math anxiety.

Discussion

The relation between general anxiety and math achievement is explained by math anxiety.

Math anxiety explains some of the relation between test anxiety and math achievement, but test anxiety also has a direct relation with math achievement

Our results highlight the impact of anxiety on young children and could inform effective intervention strategies to mitigate general, test, and math anxiety in children.

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