



Gender Differences in Math Attitudes: Reciprocal Relations Between Math Self Concept and Math Anxiety



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Introduction

Math anxiety—feelings of fear and worry related to math—is prevalent among children as early as elementary school and negatively impacts math achievement (Barroso et al., 2021; Ramirez et al., 2013).

Girls consistently report higher math anxiety than boys, despite demonstrating similar math skills (Hill et al., 2016; Lindberg et al., 2010).

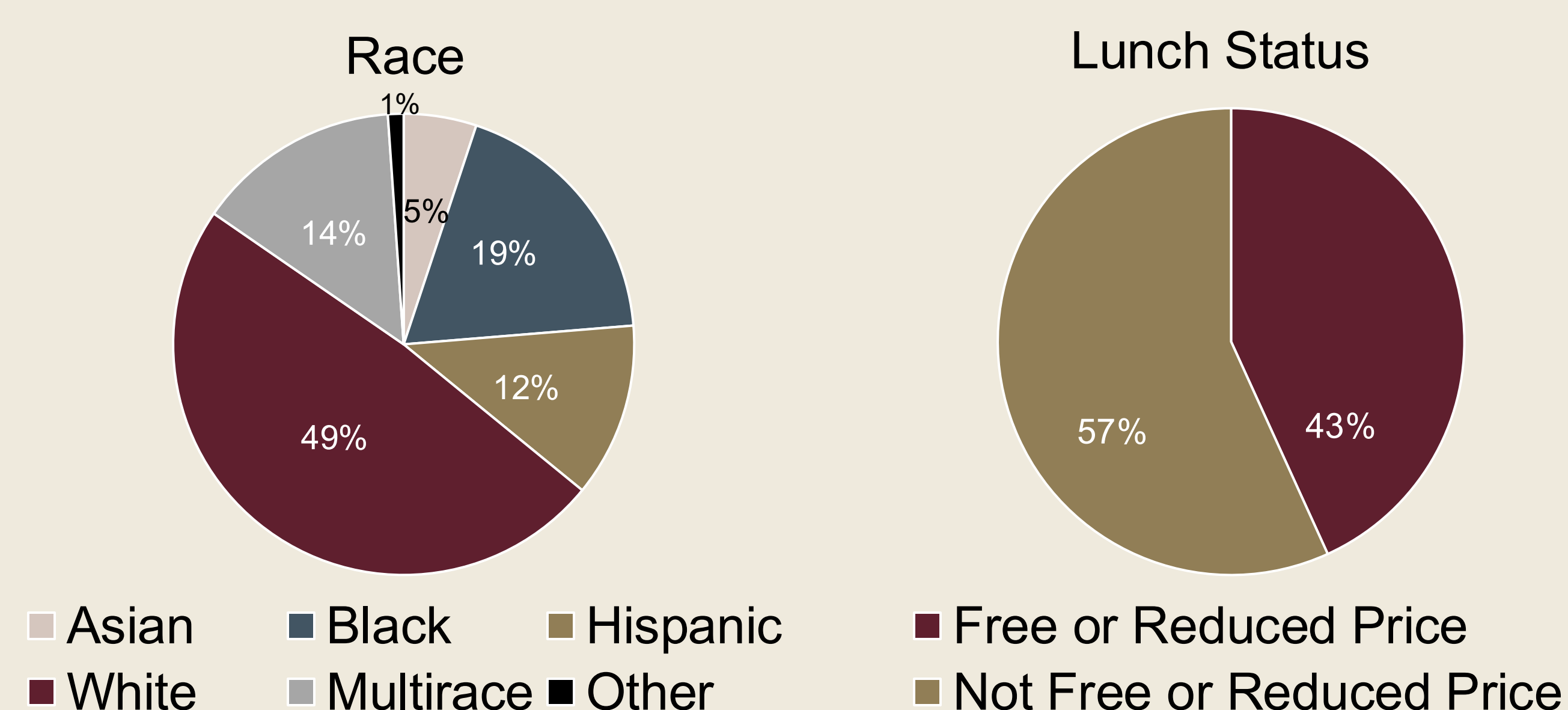
Math self-concept, or students' beliefs about their math abilities, is negatively related to math anxiety and may help explain gender differences in math emotions (Ganley & Lubienski, 2016).

Research Questions

- Are there gender differences in math anxiety and math self-concept?
- Are there reciprocal influences between math self-concept and math anxiety over time?

Figure 1. Participants

3,018 K-3 students; 50.5% were girls



Methods

Measures

Gender: Parent-reported (0 = male, 1 = female).

Math Self-Concept: 5-item measure adapted from Fredricks & Eccles (2002); 4-point scale (No, Not really, Kind of, Yes).

Math Anxiety: Math Anxiety Scale for Young Children-Revised (MASYC-R2; Ganley & McGraw, 2016); 14 items, 4-point scale.

Procedure

Students completed measures of math self-concept and math anxiety at two time points: fall (T1) and spring (T2). Teachers read each item aloud and students responded in a survey booklet.

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Math Self-Concept (T1)	2,667	1.00	4.00	3.40	0.66
Math Self-Concept (T2)	2,545	1.00	4.00	3.47	0.58
Math Anxiety (T1)	2,643	1.00	4.00	2.07	0.77
Math Anxiety (T2)	2,527	1.00	4.00	1.88	0.71

Results

Preliminary Analyses

Descriptive statistics are in Table 1. Correlations in Table 2 show that math self-concept and math anxiety have a moderate negative relation at both time points. Girls reported significantly higher math anxiety than boys.

Cross-Lagged Panel Analyses

The model demonstrated adequate fit ($\chi^2(2) = 26.90, p < .001$; CFI = .970; RMSEA = .064; SRMR = .020; see Figure 2).

Gender Differences

Gender significantly predicted T1 math anxiety ($\beta = .094, p < .001$), but not T1 math self-concept ($\beta = .021, p = .286$).

Cross-Lagged Effects

- T1 math anxiety significantly predicted lower T2 math self-concept ($\beta = -.143, p < .001$).
- T1 math self-concept did not significantly predict T2 math anxiety ($\beta = -.048, p = .066$).

Stability Paths

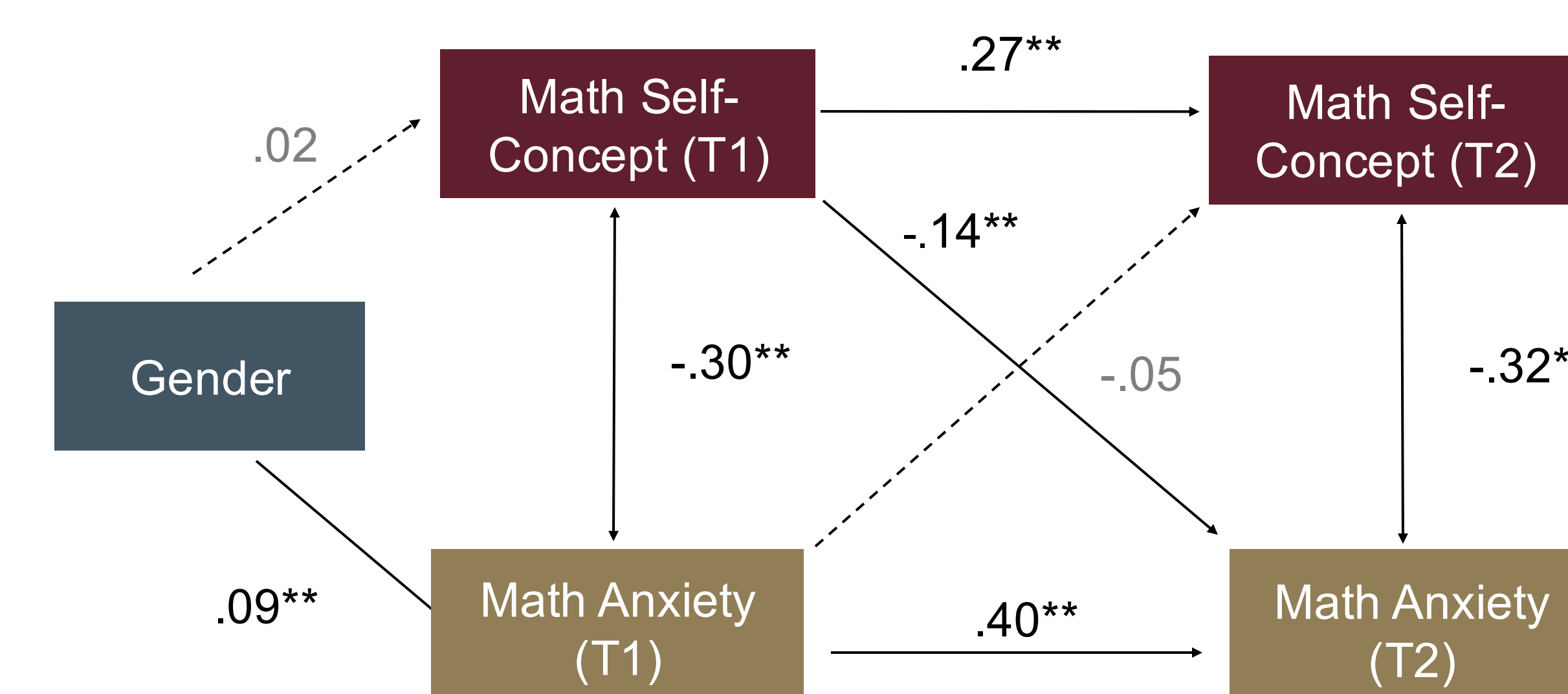
- T1 math self-concept predicted T2 math self-concept ($\beta = .265, p < .001$).
- T1 math anxiety predicted T2 math anxiety ($\beta = .397, p < .001$). See Figure 2.

Table 2. Correlations

	Gender	Math Self-Concept (T1)	Math Self-Concept (T2)	Math Anxiety (T1)
Gender	--			
Math Self-Concept (T1)	.02	--		
Math Self-Concept (T2)	.00	.31**	--	
Math Anxiety (T1)	.09**	-.29**	-.22**	--
Math Anxiety (T2)	.13**	-.17**	-.38**	.41**

Note. ** $p < .01$

Figure 2. Cross-Lagged Panel Model with Standardized Coefficients



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

Girls reported significantly higher math anxiety than boys, but there were no gender differences in math self-concept. Math anxiety at T1 significantly predicted lower math self-concept at T2, suggesting an indirect relation from gender to math self-concept through math anxiety.

Discussion

Girls reported higher math anxiety than boys, but there were no gender differences in math self-concept.

Math anxiety at T1 predicted lower math self-concept at T2, suggesting an indirect relation from gender to math self-concept through math anxiety.

Our results highlight that girls' higher math anxiety may negatively impact their math self-beliefs over time, suggesting math anxiety as a key intervention target for reducing gender disparities in math attitudes.