

Investigating the Links Between Parent Math Anxiety, Parenting Behaviors and Child Math Outcomes in Middle Childhood

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Introduction

Existing evidence indicates that parents' math anxiety is a predictor of children's math achievement and math anxiety (Becker et al., 2022; Soni & Kumari, 2017). Given research examining these direct links, there is a newfound interest in examining the mechanisms through which math anxiety is transmitted.

For instance, research has found that parents' controlling behaviors mediate the association between parents' math anxiety and children's math achievement (Oh et al., 2022; Retanal et al., 2021). However, more research is needed to examine the mediating role of observed autonomy-supportive and controlling parenting behaviors for children's math achievement and anxiety during homework time in elementary school when parents feel the need to become involved in their children's homework (Hoover-Dempsey et al., 2001). Further, the current study pushes the literature forward by examining the longitudinal links between parent math anxiety and child math achievement and anxiety, while accounting for robust covariates.

Aims & Hypotheses

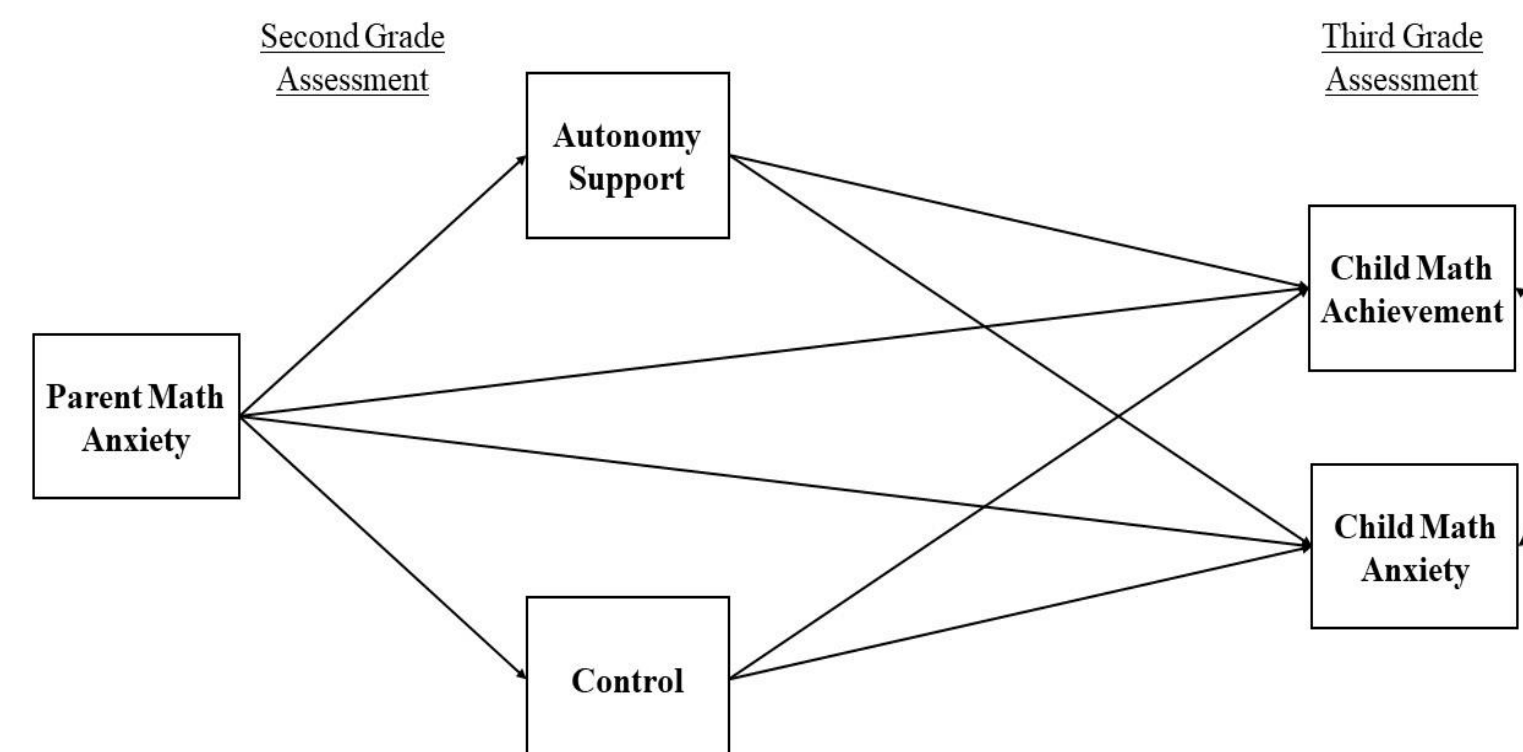
This pre-registered longitudinal study aims to examine if parents' autonomy-supportive and controlling behaviors mediated the link between parents' math anxiety and children's math achievement and math anxiety across second to third grade.

I hypothesized that higher parent math anxiety was associated with lower autonomy-supportive and higher controlling behaviors.

I hypothesized that higher parent autonomy support was associated with higher math achievement and lower math anxiety in children.

Conversely, I hypothesized that higher parent control was associated with lower math achievement and higher math anxiety in children.

Lastly, I hypothesized that parent math anxiety was negatively associated with child math achievement and positively associated with child math anxiety in third grade.



Method

Sample & Procedure. A socioeconomically-diverse sample of 170 parent-child dyads completed a two-hour assessment when the child was in second grade ($M_{age} = 8.02$) at the University of Nebraska-Lincoln. During the assessment, the parent and child completed tasks independently as well as a joint homework help task in which parents were instructed to help their children complete math and reading worksheets. One year later when the children were in third grade ($M_{age} = 9.18$), parent and their children were asked to return for an assessment to complete similar tasks.

Parent Math Anxiety. Assessed using the Abbreviated Math Anxiety Scale (Hopko et al., 2003) to indicate feelings of anxiety in specific math situations and scenarios (e.g., *thinking about an upcoming math test one day before*).

Parent Autonomy-Support and Control Behaviors. Ten observed parenting behaviors during the 10-minute homework help task were videotaped and behaviorally coded (adapted from Cheung et al., 2016).

Child Math Anxiety. Assessed using the modified Abbreviated Math Anxiety Scale (Carey et al., 2017) to indicate feelings of anxiety in math situations (e.g., *starting a new topic in math*).

Parent and Child Math Achievement. Measured by the Woodcock Johnson IV – Applied Problems to assess problem-solving knowledge (Schrang et al., 2001).

Covariates. Parent math achievement, parent education status (*years*), household income, child race (*White/Caucasian*), prior child math achievement and anxiety, time of year that assessment occurred (*in months*), and amount of time spent on math worksheets (*in minutes*) were accounted for in the model.

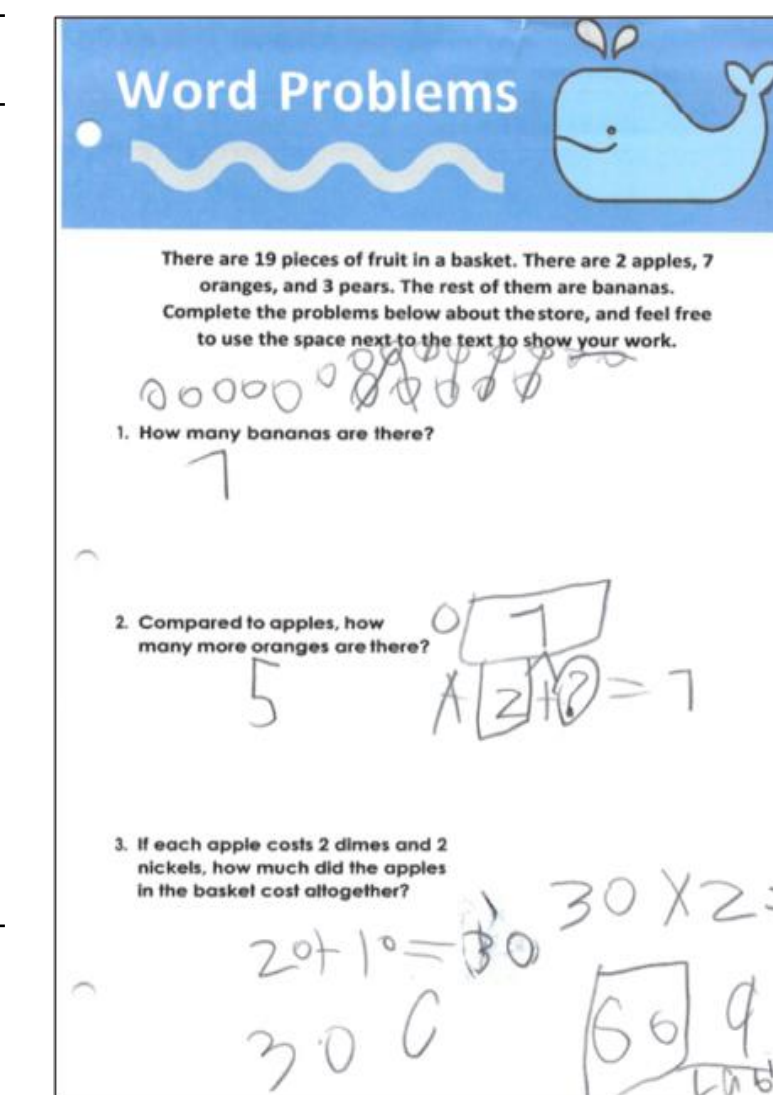
Descriptive Statistics and Bivariate Correlations

	1	2	3	4	5	6	7	8
1. Par math anxiety	---							
2. Par autonomy support	-.05	---						
3. Par control	.21*	-.38***	---					
4. Child math achievement (G3)	-.16	.28**	-.38***	---				
5. Child math anxiety (G3)	-.03	-.06	.12	-.13	---			
6. Par math achievement	-.27**	.29**	-.25*	.31**	.06	---		
7. Child math achievement (G2)	-.25**	.19*	-.49***	.75***	-.23*	.34**	---	
8. Child math anxiety (G2)	-.01	-.05	.16	-.19	.41***	.01	-.18*	---
<i>M</i>	2.25	0.31	0.26	109.79	2.09	44.92	107.44	2.23
<i>N</i>	164	157	157	107	109	107	138	150

* $p < .05$, ** $p < .01$, *** $p < .001$

Coding Scheme

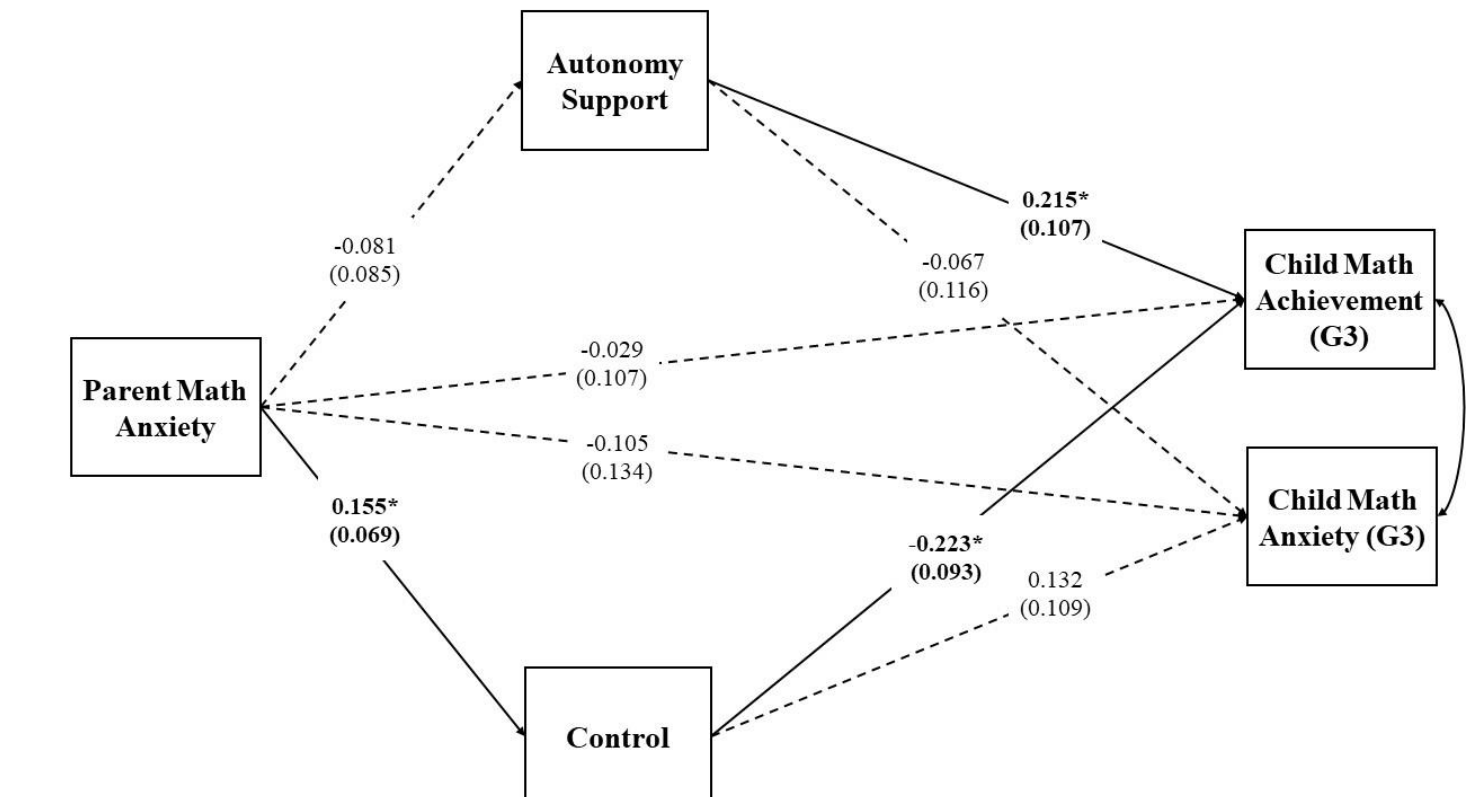
Autonomy Support		Kappa	Agreement
Waits to be needed	Focused on task but is not physically or verbally involved	.71	86.18%
Treats child as expert	Allows child to be in control or asks questions that prompts child to take the lead	.63	96.43%
Provides general feedback	General feedback or reflection, including verbal or physical encouragement	.54	77.12%
Provides information or asks a question	Provides a necessary hint or strategy, asks questions to help the child	.59	80.89%
Explains the task at the child's level	Provides explanations based on their perspective of the child's abilities	.20	93.63%
Checks answer at request	Responds to the child's answer after the child inquires if the answer is correct	.52	86.68%
Control			
Leads the child	Provides assistance when not requested, reads prompt or question	.64	84.85%
Tells answer	Tells, points at, or writes the answer before the child solves the problem	.65	97.39%
Takes over	Takes the paper and pencil from the child to write the answer	.82	96.04%
Checks answer when not requested	Responds to the child's answer despite the child moving on to the next problem	.50	88.12%



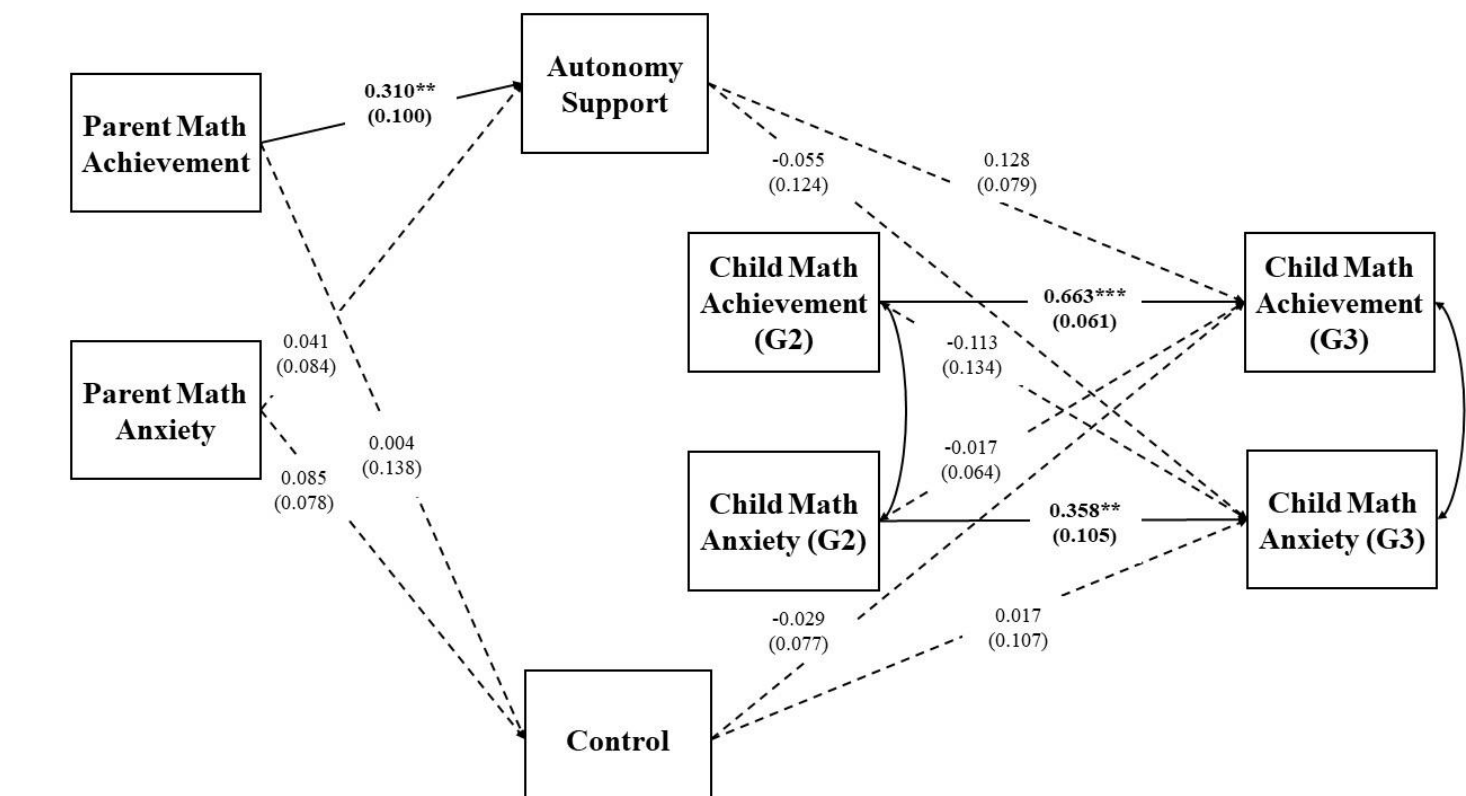
Results

Using path analyses, two models were examined. The first model examined the mediating role of autonomy support and control between parents' math anxiety and children's math achievement and anxiety one year later. The second model examined the same pathways, while accounting for parents' math achievement and children's math achievement and anxiety in second grade.

Results indicated that parents' math anxiety was positively associated with control, which was negatively associated with children's math achievement in third grade, although the 95% confidence interval for the indirect effect included zero [-0.257, 0.034]. Further, autonomy support was positively associated with child math achievement in third grade.



When accounting for parents' math achievement, parents' math anxiety was no longer associated with control. Parents' math achievement was positively associated with autonomy support. Further, there was strong longitudinal continuity between child math achievement and math anxiety across second and third grade.



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References can be found on the pre-registration link.

