The Link between Math Anxiety and Math Achievement: The Role of Afterschool Learning

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Abstract

The present study tested the learning avoidance model by examining the degree to which learning avoidance in various afterschool settings mediated the negative association between math anxiety and math achievement. Participants consisted of 207 third to sixth graders. Using a path model, findings showed that students' math anxiety was negatively associated with both standardized math achievement test scores and parent-reported math school grades. Additionally, higher math anxiety was associated with more negative homework behaviors and less frequent participation in math-related extracurricular activities. Finally, the association between math anxiety and math achievement was partially mediated by negative math homework behaviors and participation in math extracurricular activities. Effort in math exam preparation did not contribute to explaining the association between math anxiety and math achievement. Overall, these findings support the learning avoidance model and suggest that avoidance behaviors in everyday learning in the afterschool setting may contribute to explaining the undesired math achievement among highly math anxious students.

Keywords: math anxiety, math homework behaviors, math extracurricular activities, learning avoidance model, elementary and middle school

The Link between Math Anxiety and Math Achievement: The Role of Afterschool Learning

Math anxiety is a well-documented risk factor for negative math learning outcomes in various educational stages (Barroso et al., 2021; Namkung et al., 2019). Several theories have been put forth to explain the observed associations between math anxiety and negative math learning outcomes (Carey et al., 2016; Remirez et al., 2018), among which the learning avoidance model argues that math anxiety impairs math achievement by way of fostering learning avoidance in math related situations. Yet, relatively few studies empirically tested this model, in particular with regard to how daily learning behaviors may contribute to explaining the negative math anxiety – math achievement association in early educational stages. The present study aims to fill this major gap in the literature by investigating the mediating roles of a variety of learning behaviors in everyday afterschool settings, such as homework behaviors, exam preparations, and extracurricular activity participation, in the association between math anxiety and math achievement in elementary and middle school students.

Theoretical Models for the Math Anxiety and Math Achievement Association

In general, math anxiety is modestly negatively associated with math achievement (Barroso et al., 2021; Namkung et al., 2019). A few models have been put forth to explain the mechanism underlying this negative association (Carey et al., 2016; Remirez et al., 2018). The deficit model argues that students with lower math abilities experience more difficulties in math learning which induces higher math anxiety (Carey et al., 2016; Ma & Xu, 2004; Tobias, 1986). The learning avoidance model argues that students with higher math anxiety are more likely to avoid math learning opportunities which contributes to their lower math skill and knowledge levels (Hembree, 1990; LeFevre et al., 1992). The cognitive interference model argues that

worries or intrusive thoughts experienced by students with high math anxiety disrupt their working memory capacities temporarily during math problem solving, which undermines student's math performance (Ramirez et al., 2013). Finally, the reciprocal model argues that math achievement and math anxiety mutually influence each other such that lower math achievement elicits higher subsequent math anxiety, which in turn contributes to even lower math achievement (Cargnelutti et al., 2017; Luo et al., 2014). The present study focuses on investigating the mechanism proposed by the learning avoidance model.

Empirical Evidence for the Learning Avoidance Model and Remaining Gaps

There are different ways in which students may avoid math learning. For example, students may avoid math learning completely in some situations, such as not taking math electives in high school or pursuing math-heavy majors in college (Ashcraft & Kirk, 2001; Hembree, 1990; LeFevre et al., 1992). In situations where complete avoidance is not an option, they may exhibit avoidance in the form of negative learning behaviors, such as mentally disengaging, investing little effort in math learning, and spending little time on math work (Geary et al., 2021; Hasty et al., 2020; Quintero et al., 2021). Using this broad definition of learning avoidance, several studies have provided preliminary evidence supporting the learning avoidance model. A few studies found that students with higher math anxiety were less likely to take math related courses in high school and college or to explore math-related careers (Ashcraft & Kirk, 2001; Hembree, 1990; LeFevre et al., 1992). While these studies focused on investigating distal avoidance behaviors in high school and college students, several recent studies examined how everyday learning behaviors contributed to the low math achievement among highly math anxious elementary to high school students (Geary et al., 2021; Hasty et al., 2020; Quintero et al., 2021). Specifically, Quintero and colleagues (2021) examined the role of

classroom engagement in the negative association between math anxiety and math achievement in elementary and middle school students. They found that students with higher math anxiety were less engaged cognitively and behaviorally in math class, which in turn accounted for their lower math performance. Similarly, a study in a sample of middle school students found that students with higher math anxiety were less attentive in math class than students with lower math anxiety (Geary et al., 2021). Overall, these studies support the learning avoidance hypothesis by revealing that students with higher math anxiety exhibit avoidance in math class by being less attentive and engaged than their non-anxious peers.

The present study aims to contribute to this slowly growing literature by addressing two important gaps. First, most existing studies that investigated the learning avoidance model used samples of high school and college students. Individual differences in math anxiety emerge as early as kindergarten or first grade (Ganley & McGraw, 2016; Lu et al., 2021), which points to the potentially long-lasting negative implications of early development of math anxiety. Therefore, it is critical to elucidate the mechanism through which math anxiety may impair math learning in early educational stages. The present study aims to test the learning avoidance model in a sample of elementary and middle school students.

Second, whether highly math anxious students avoid math learning beyond the classroom setting is not well understood. Afterschool learning critically complements learning in the classroom – it is when students consolidate their knowledge through reviewing class materials, practicing learned skills, seeking for additional resources to address knowledge gaps, and applying classroom learning in various extracurricular activities (Cooper, 2007; Feldman & Matjasko, 2005). Importantly, the afterschool setting may represent a more informal and self-paced learning environment compared to the classroom setting. In the classroom, students often

face situations such as taking tests under timed conditions and solving problems in front of other students, which can be particularly anxiety-provoking for some students (Chiu & Henry, 1990; Hopko, 2003; Lukowski et al., 2019). In contrast, students may have a better sense of control over the content, pace, duration, as well as the physical and social environment of learning in the afterschool setting. As such, examining the afterschool learning behaviors among highly math anxious students would inform us the degree of pervasiveness of their learning avoidance across a variety of learning contexts.

To our best knowledge, there have been only two studies that investigated students' afterschool learning behaviors in relation to their math anxiety levels (Hasty et al., 2020; Jenifer et al., 2022). The Hasty et al. (2020) study investigated the quantity of middle and high school students' afterschool math learning, which was operationalized by the amount of time students spent on doing math homework and taking out-of-school math lessons. They found that highly math anxious students spent a similar amount of time as their non-anxious peers studying math in the afterschool setting. However, given that only the amount of learning time was examined, it is unclear whether the quality of afterschool learning differs among students with different levels of math anxiety. The study conducted by Jenifer and colleagues (2022) examined exam preparation strategies in a sample of high school students and found that students with higher math anxiety were less likely to engage in effortful leaning strategies during exam preparation, and the difference in learning strategies contributed to performance differences among students with different levels of math anxiety (Jenifer et al., 2022).

The Present Study

The present study aims to extend the Hasty et al. (2020) and Jenifer et al. (2022) studies in three ways. First, we aim to examine learning behaviors in a variety of afterschool settings,

including during homework, exam preparation, and participation in math extracurricular activities, regarding how they may contribute to the negative association between math anxiety and math achievement. These three contexts were chosen to cover a diverse range of afterschool learning activities that are associated with students' achievement outcomes, which will be discussed in more details below. Second, instead of focusing on the amount of time students spend on homework as in the Hasty et al. (2020) study, we investigated the quality of homework time by examining behaviors such as procrastinating, rushing through homework, and failing to complete homework, as it is the quality of homework time that contributes to knowledge gains (Fan et al., 2017; Rosário et al., 2018; Trautwein, 2007; Xu et al., 2021). Finally, we extend the current literature by utilizing a sample of third to sixth graders, which allows us to better understand the applicability of the learning avoidance model in accounting for the early emerging association between math anxiety and math achievement.

Among the three afterschool learning settings, homework provides students with opportunities to review, practice, and apply the materials learned in class (Cooper, 2007), and has been found to contribute to students' achievement development (Fan et al., 2017). When different dimensions of homework behaviors are examined, time spent on homework is often found to not correlate or correlate negatively with achievement scores, whereas homework effort correlates positively with achievement gains (Fan et al., 2017; Rosário et al., 2018; Trautwein, 2007; Xu et al., 2021). These findings suggest that the quality, not quantity, of homework behaviors contributes to positive learning outcomes. Similarly, exams are important evaluative experiences that often induce a protracted sequence of preparation involving review and knowledge integration (Eckerlein et al., 2019; Moneta & Spada, 2009). Accordingly, students who exhibit higher levels of perseverance and use of effortful and deep-processing strategies during exam

preparation are found to have better exam performance (Ainley, 1993; Elliot et al., 1999; Jenifer et al., 2022; McGregor & Elliot, 2002). Finally, extracurricular activities are often defined as adult-supervised structured activities that take place outside of school hours (Luthar et al., 2006). They may include a variety of informal academic and nonacademic activities that offer students opportunities to develop intellectual, social, and physical skills (Feldman & Matjasko, 2005). Children often select extracurricular activities based on their skills, interests, values, and self-perceived abilities (Jacob et al., 2005; Simpkins et al., 2010). In turn, the diversity and frequency of the extracurricular activities that students participate in contribute to their positive development in the academic and social domains during childhood and adolescence (Feldman & Matjasko, 2005; Metsäpelto & Pulkkinen, 2014). In particular, more frequent participation in academic extracurricular activities is believed to foster cognitive (e.g., critical thinking) and noncognitive (e.g., positive academic motivation) skills that promote academic successes (Covay & Carbonaro, 2010; Knifsend & Graham, 2012; Morris, 2016), which subsequently contribute to the development of a series of positive academic outcomes, including better academic performance, lower dropout rates, and higher academic aspirations (Broh, 2002; Fredricks, 2012; Haghighat & Knifsend, 2019; Mahoney & Cairns, 1997; Metsäpelto & Pulkkinen, 2014).

In summary, despite the well-documented negative association between math anxiety and math achievement in elementary and middle school students, few studies examined the degree to which avoidant learning behaviors may explain this negative association. Given the paucity of research testing the learning avoidance model in early educational stages, the present study addresses this research gap by investigating, in a sample of elementary and middle school students, (1) the degree to which students with high math anxiety avoid math learning in a variety of afterschool learning contexts including homework, exam preparation, and participation

in math extracurricular activities, and (2) whether avoidance in these contexts mediate the negative association between math anxiety and math achievement. We measured math achievement using two different approaches to capture the possible differences between academic gains through the diverse afterschool learning activities. For example, students' course grades largely capture what is learned in the classroom, whereas standardized achievement tests may additionally assess students' academic skills beyond their curricula (Popham, 1999; Willingham et al., 2002). As such, effort spent on homework and exam preparation may be more strongly related to course grades than standardized test scores, whereas participation in extracurricular activities may improve standardized achievement test scores more than course grades (Duckworth et al., 2012).

Based on the learning avoidance model, we hypothesized that higher math anxiety would be associated with more avoidance behaviors in afterschool math learning (e.g., more negative homework behaviors such as procrastination or failure to complete homework, less perseverance in exam preparation, and less frequent participation in various math extracurricular activities). Additionally, we hypothesized that these avoidance behaviors in afterschool math learning would mediate the negative association between math anxiety and math achievement.

Method

Participants

Participants (N = 207 students; 50% female) were from an IRB-approved ongoing longitudinal study, which was designed to examine the affective processes in math learning. Families were recruited via digital advertisement, flyers, and community events from a city located in West Texas. The mean age of students was 10.18 years (SD = 1.04). Participating students were in Grades 3 to 6, but they were primarily in Grades 4-6 (2% third graders; 37%

fourth graders; 37% fifth graders; 24% sixth graders). In terms of participants' family background: parents of 10% of the participating students received high school degree or below, 18% attended college without graduating, 35% graduated from college, 5% attended graduate or professional school without graduating, and 31% received graduate or professional school degrees. In terms of family annual income, 9% families fell below $20,000, 14% were within the $20,000 – $40,000 range, 18% were within the $40,000 – $60,000 range, 14% were within the $60,000 – $80,000 range, 19% were within the $80,000 – $100,000 range, 15% were within the $100,000 – 150,000 range, 10% were within the $150,000 – $200,000 range, and 2% fell above $200,000. In terms of race, 68% were White, 8% were African American, 6% were Asian, 2% were Native American or Alaska Native, and 15% others. As of ethnicity, 38% were Hispanic. According to parental report, 16 (8%) students were diagnosed with one or more developmental disabilities, such as autism, dyslexia, ADHD, and ODD.

Procedure

Each family visited the lab for three hours for their initial assessment. Participants first completed the consent and assent forms. The child then completed a series of computerized math and neurocognitive tasks that are not used in the present study. Then, each child completed the standardized achievement testing. Finally, each child completed a series of questionnaires. The parent first completed the standardized achievement tests, which are not used in the present study. They subsequently filled out a series of questionnaires. Finally, they completed a few computerized math and neurocognitive tasks that are not used in the present study.

Measures

Math Anxiety

Students' math anxiety was assessed with the 22 items of the Mathematics Anxiety Scale

for Children (Chiu & Henry, 1990). Students provided their reports on how anxious they felt in various math-related situations on a 4-point scale (1 = *not nervous* to 4 = *very, very nervous*). An example item is "Thinking about a math test one day before the test." A composite score was created by taking an average of all the items, with higher scores indicating higher math anxiety. Cronbach's α for this scale was .92.

Negative Math Homework Behaviors

Parents reported child math homework behaviors using the 15 items of the Homework Problem Checklist (Anesko et al., 1987). Parents rated on a 4-point scale (1 = *never* to 4 = *very often*) how frequently their child engaged in certain behaviors while doing their math homework, such as procrastination, rushing through homework, and failure to complete homework. Example items are "Hurries through his/her math homework and makes careless mistakes", and "Procrastinate or puts off doing his/her math homework". A composite score was created by taking an average of all the items, with higher scores indicating more negative math homework behaviors. Cronbach's α for this scale was .86.

Math Exam Preparation Perseverance

Parents reported their child's perseverance in math exam preparations on a 5-point scale (1 = *strongly disagree* to 5 = *strongly agree*) using 3 items from the PISA 2012 assessment (OECD, 2013): "My child is always prepared for his/her math exams", "My child always studies hard for math quizzes", and "My child always keeps studying until s/he understands math material." A composite score was created by taking an average of all the items, with higher scores indicating more perseverance. Cronbach's α for this scale was .80.

Math Extracurricular Activity Participation

Parents reported the frequency of their child's participation in a variety of math

extracurricular activities with 4 items from the PISA 2012 assessment (OECD, 2013): “Does math as an extracurricular activity”, “Takes part in math competitions”, “Attends out-of-school math lessons”, and “Participates in a mathematics club” on a 4-point scale (1 = *never or rarely* to 4 = *always or almost always*). A composite score was created by taking an average of all four items, with higher scores indicating more participation in math extracurricular activities. Cronbach’s α for this scale was .80.

Standardized Math Achievement

Math achievement was assessed using the Applied Problem and Calculation subtests from the Woodcock-Johnson IV Tests of Achievement (Schrank et al., 2014). The Applied Problems subtest evaluates students’ ability to complete applied math word problems. Students need to listen to the problem, identify the math procedure to be used, and perform the corresponding calculations. Students need to use math skills involving number concepts, arithmetic, geometry, and trigonometry to solve these applied problems. The Calculation subtest evaluates students’ ability to solve arithmetic problems (e.g., addition, subtraction, multiplication, and division), as well as geometric, trigonometric, logarithmic, and calculus operations. Each test presents items with increasing complexity. Students of different grades and achievement levels may see different items, depending on the basal and ceiling established for each individual student. All items prior to the basal were scored 1 and all items after the ceiling were scored 0. The Mathematics Cluster (comprised of the Applied Problem and Calculation subtests) W score was used for the analyses, with higher scores indicating higher math achievement. Internal consistency reliability was .86 for the Applied Problems subtest, and .89 for the Calculation subtest.

Parent-reported Math Achievement

Parents reported their child's math school performance using a 5-point scale (1 = *F or fail,* 2 = *D or below average,* 3 = *C or average,* 4 = *B or good, and 5 = A or excellent*).

Covariates

Child gender. Child gender was coded as 1 = *male* and 2 = *female*.

Child grade. Child reported their grade level ranging from third to sixth grades.

General anxiety. Students' general anxiety is associated with not only students' academic performance, but also students' math anxiety (Pellizzoni et al., 2022). As such, general anxiety was incorporated into the analyses as a covariate to allow for the estimation of the unique effect of math anxiety on math achievement beyond the effect of general anxiety. Students' general anxiety was assessed with the 6 items of the Spence Children's Anxiety Scale (Spence, 1997). Students reported the frequency in which they experienced various general anxiety symptoms (e.g., "I worry about things") on a 4-point scale (0 = *never* to 3 = *always*). A composite score was created by averaging the item scores, with higher scores indicating more general anxiety. Cronbach's α was .82.

Household income. As household income may affect the availability of each extracurricular activity to a student, household income was incorporated into the analyses as a covariate. Household income was coded as 1 = *less than $20,000*, 2 = *$20,000 or more but less than $40,000*, 3 = *$40,000 or more but less than $60,000*, 4 = *$60,000 or more but less than $80,000*, 5 = *$80,000 or more but less than $100,000*, 6 = *$100,000 or more but less than $150,000*, 7 = *$150,000 or more but less than $200,000*, and 8 = *$200,000 or more*.

Data Analytic Strategies

SPSS version 24 (IBM Corp, 2016) was used for descriptive statistics and correlations. Using Mplus 8.4 (Muthén & Muthén, 1998-2017), we tested the conceptual model (Figure 1),

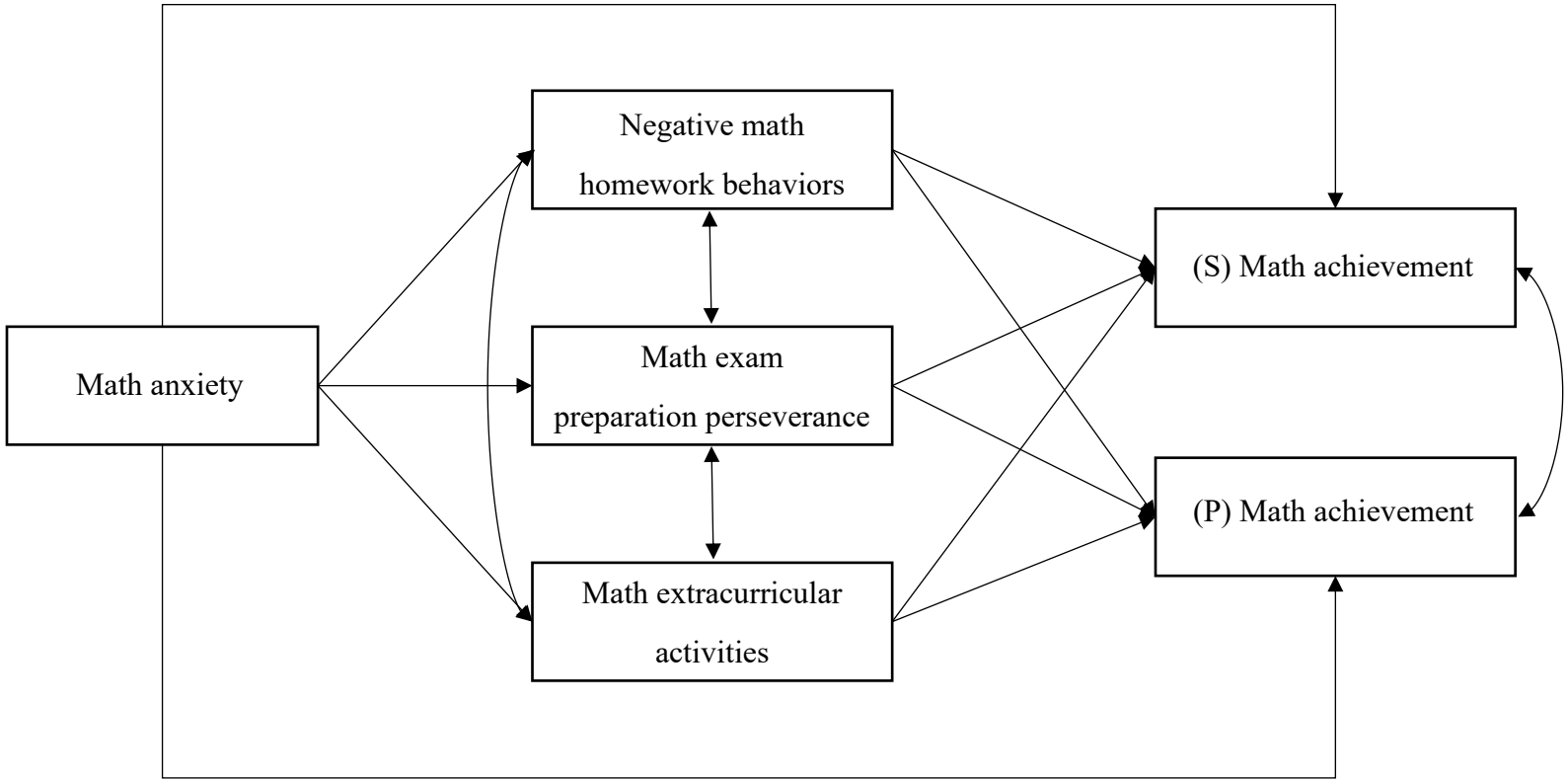
which was a path analysis that examined the direct and indirect effects of math anxiety on math achievement via math learning behaviors in the afterschool setting (i.e., math homework behaviors, math exam preparation, and math extracurricular activity participation). Child gender, grade level, general anxiety, and household income were included as covariates in the model. The maximum likelihood estimator was used to estimate parameters for the path model. In addition, 95% bias corrected bootstrap confidence intervals based on 5000 bootstrap samples were reported for all path estimates. Finally, missing values were dealt with using full information maximum likelihood.

Transparency and Openness

Survey measures of all the main study variables are provided in the supplemental materials Table S1. De-identified data and analysis scripts are available at https://doi.org/10.17605/OSF.IO/CRJM4.

Figure 1

Conceptual model



Note. (S) = Standardized achievement test scores, (P) = Parent report.

Results

Descriptive Statistics

Descriptive statistics are presented in Table 1. On average, students reported modest levels of math anxiety. Parents reported modest levels of child negative math homework behaviors, moderate levels of perseverance in math exam preparation, low levels of extracurricular activity participation, and high levels of math achievement. All variables were distributed widely across their respective scales, suggesting a good range of variability.

Correlations

Table 2 presents correlations among the study variables. Math anxiety was negatively correlated with perseverance in math exam preparation, frequency of math extracurricular activity participation, and math achievement. Math anxiety was positively correlated with negative math homework behaviors. More perseverance in math exam preparation and more frequent participation in math extracurricular activities were correlated with higher math achievement, whereas more negative math homework behaviors were correlated with lower math achievement. Students' learning behaviors in the various afterschool settings were also modestly to moderately correlated with one another.

Table 1

Descriptive Statistics

	N	% missing	*M*	*SD*	Min	Max	Possible Range	Skewness	Kurtosis
(C) Math anxiety	205	1%	1.92	0.54	1	4	1 – 4	0.71	0.22
(P) Negative math homework behaviors	204	1%	1.92	0.51	1	4	1 – 4	0.60	0.34
(P) Math exam preparation perseverance	205	1%	3.42	0.89	1	5	1 – 5	-0.14	-0.20
(P) Math extracurricular activities	205	1%	1.31	0.51	1	4	1 – 4	2.54	7.08
(S) Math achievement	206	1%	501.69	17.11	452	553	--	0.09	0.46
(P) Math achievement	205	1%	4.43	0.79	1	5	1 – 5	-1.42	1.84
(C) General anxiety	202	2%	2.10	0.69	1	4	1 – 4	0.95	0.70

Note. (C) = Child report, (P) = Parent report, (S) = Standardized achievement test.

Table 2

Bivariate Correlations

	1	2	3	4	5	6	7	8	9
1. Child gender (1 = male, 2 = female)	--								
2. Child grade	.06	--							
3. Household income	-.03	-.04	--						
4. (C) General anxiety	.13	.05	-.01	--					
5. (C) Math anxiety	.10	.04	-.11	.42*	--				
6. (P) Negative math homework behaviors	.04	-.02	-.25*	.23*	.27*	--			
7. (P) Math exam preparation perseverance	-.02	.07	.16*	-.15*	-.16*	-.61*	--		
8. (P) Math extracurricular activities	-.04	-.14*	.16*	-.15*	-.21*	-.24*	.21*	--	
9. (S) Math achievement	-.09	.37*	.31*	-.21*	-.28*	-.39*	.24*	.30*	--
10. (P) Math achievement	-.17*	-.00	.35*	-.22*	-.33*	-.54*	.43*	.25*	.53*

Note. (C) = Child report, (P) = Parent report, (S) = Standardized achievement test. * indicates statistical significance under type I error rate of .05.

Path Analysis

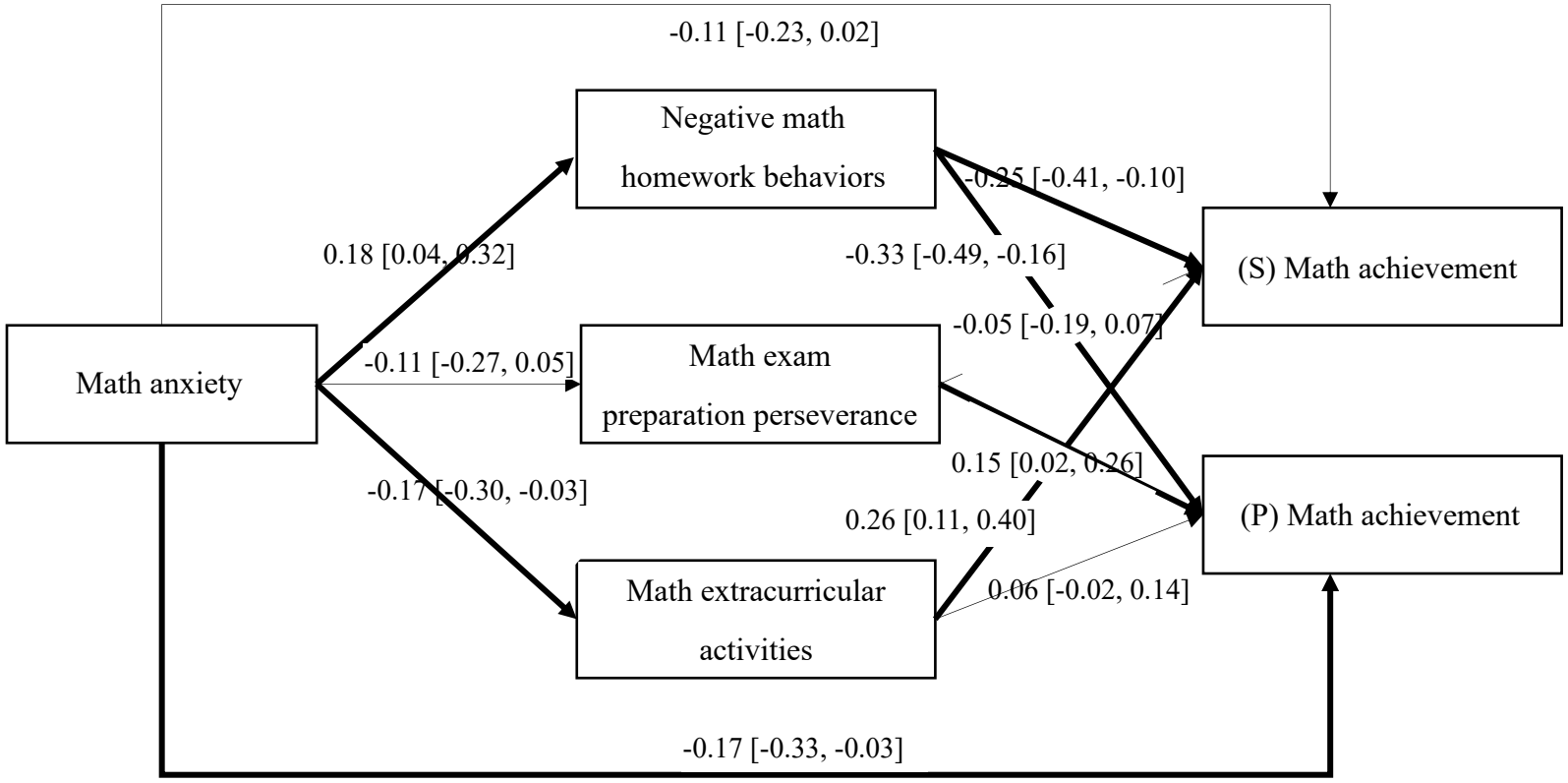
The path model examining the mediating roles of math learning behaviors in the association between math anxiety and math achievement is shown in Figure 1. Standardized path coefficients and 95% bias corrected bootstrap confidence intervals for the direct predictive paths are presented in Figure 2. Standardized path coefficients, standard errors, and 95% bias corrected bootstrap confidence intervals for all paths are presented in Table 3. This path model is saturated. After controlling for child gender, grade level, general anxiety, and household income, there were negative total effects of math anxiety on both the standardized math achievement test scores (β = -0.19, 95% CI = [-0.32, -0.05]) and parent-reported math achievement (β = -0.26, 95% CI = [-0.42, -0.09]). This suggests that children with higher math anxiety exhibited lower math achievement. In addition, math anxiety positively predicted negative math homework behaviors (β = 0.18, 95% CI = [0.04, 0.32]), and negatively predicted participation in math extracurricular activities (β = -0.17, 95% CI = [-0.30, -0.03]). That is, children with higher math anxiety showed more negative math homework behaviors and participated less frequently in math extracurricular activities. Math anxiety did not predict levels of perseverance in math exam preparation (β = -0.11, 95% CI = [-0.27, 0.05]). Math anxiety negatively indirectly predicted both standardized math achievement test scores (β = -0.05, 95% CI = [-0.11, -0.01]) and parent-reported math achievement (β = -0.06, 95% CI = [-0.13, -0.01]) via negative math homework behaviors. Math anxiety also negatively indirectly predicted standardized math achievement test scores via math extracurricular activity participation (β = -0.04, 95% CI = [-0.11, -0.01]). These findings indicated that negative math homework behaviors and participation in math extracurricular activities partially contributed to the negative association between math anxiety and math achievement. Math exam preparation did not uniquely mediate the association between

math anxiety and math achievement (β = 0.01, 95% CI = [-0.00, 0.04] for standardized math achievement test scores; β = -0.02, 95% CI = [-0.05, 0.01] for parent-reported math achievement).[1]

[1] We conducted the analyses using a subsample that excluded 3rd graders because there were only four 3rd graders in the sample. We also conducted the analyses using a subsample excluding students with developmental disabilities. Results from both sets of analyses remain essentially the same as the results obtained using the full sample. These results are reported in the supplemental materials Tables S2 and S3.

Figure 2

Standardized Path Coefficients and 95% Bias Corrected Bootstrap Confidence Intervals for Direct Predictive Paths



Note. (S) = Standardized achievement test scores, (P) = Parent report. Correlational paths and effects of covariates are not shown in the figure for simplicity of presentation. Significant (i.e., 95% bias corrected bootstrap confidence interval does not include zero) path estimates are bolded.

Table 3

Standardized Path Coefficients and 95% Bias Corrected Bootstrap Confidence Intervals

Path	Coefficient	Standard error	95% Bias Corrected Bootstrap CI
Predictors → mediators			
MA → Negative math homework behaviors	**0.18**	**.07**	**[0.04, 0.32]**
MA → Math exam preparation perseverance	-0.11	.08	[-0.27, 0.05]
MA → Math extracurricular activities	**-0.17**	**.07**	**[-0.30, -0.03]**
Mediators → outcomes			
Negative math homework behaviors → (S) Math achievement	**-0.25**	**.08**	**[-0.41, -0.10]**
Math exam preparation perseverance → (S) Math achievement	-0.05	.07	[-0.19, 0.07]
Math extracurricular activities → (S) Math achievement	**0.26**	**.08**	**[0.11, 0.40]**
Negative math homework behaviors → (P) Math achievement	**-0.33**	**.09**	**[-0.49, -0.16]**
Math exam preparation perseverance → (P) Math achievement	**0.15**	**.06**	**[0.02, 0.26]**
Math extracurricular activities → (P) Math achievement	0.06	.04	[-0.02, 0.14]
Direct effects of predictor on outcomes			
MA → (S) Math achievement	-0.11	.07	[-0.23, 0.02]
MA → (P) Math achievement	**-0.17**	**.08**	**[-0.33, -0.03]**
Indirect effects of predictor on outcomes			
MA → Negative math homework behaviors → (S) Math achievement	**-0.05**	**.02**	**[-0.11, -0.01]**
MA → Math exam preparation perseverance → (S) Math achievement	0.01	.01	[-0.01, 0.04]
MA → Math extracurricular activities → (S) Math achievement	**-0.04**	**.03**	**[-0.11, -0.01]**
MA → Negative math homework behaviors → (P) Math achievement	**-0.06**	**.03**	**[-0.13, -0.01]**
MA → Math exam preparation perseverance → (P) Math achievement	-0.02	.02	[-0.05, 0.01]
MA → Math extracurricular activities → (P) Math achievement	-0.01	.01	[-0.04, 0.00]
Total effects of predictor on outcomes			

MA → (S) Math achievement	**-0.19**	**.07**	**[-0.32, -0.05]**
MA → (P) Math achievement	**-0.26**	**.08**	**[-0.42, -0.09]**
Effects of covariates			
General anxiety → MA	**0.41**	**.07**	**[0.28, 0.54]**
Child gender → MA	0.05	.07	[-0.08, 0.18]
Child grade → MA	0.03	.06	[-0.09, 0.15]
Household income → MA	-0.09	.06	[-0.20, 0.03]
General anxiety → Negative math homework behaviors	**0.15**	**.07**	**[0.01, 0.29]**
Child gender → Negative math homework behaviors	-0.01	.07	[-0.15, 0.12]
Child grade → Negative math homework behaviors	-0.04	.07	[-0.17, 0.09]
Household income → Negative math homework behaviors	**-0.23**	**.07**	**[-0.36, -0.10]**
General anxiety → Math exam preparation perseverance	-0.11	.08	[-0.27, 0.04]
Child gender → Math exam preparation perseverance	-0.01	.07	[-0.15, 0.13]
Child grade → Math exam preparation perseverance	0.09	.07	[-0.05, 0.23]
Household income → Math exam preparation perseverance	0.15	.08	[-0.01, 0.29]
General anxiety → Math extracurricular activities	-0.06	.07	[-0.18, 0.08]
Child gender → Math extracurricular activities	-0.01	.07	[-0.14, 0.13]
Child grade → Math extracurricular activities	-0.12	.06	[-0.23, 0.01]
Household income → Math extracurricular activities	0.14	.07	[-0.01, 0.25]
General anxiety → (S) Math achievement	-0.10	.06	[-0.22, 0.02]
Child gender → (S) Math achievement	-0.06	.06	[-0.16, 0.05]
Child grade → (S) Math achievement	**0.44**	**.06**	**[0.33, 0.54]**
Household income → (S) Math achievement	**0.22**	**.06**	**[0.10, 0.33]**
General anxiety → (P) Math achievement	-0.03	.07	[-0.17, 0.11]
Child gender → (P) Math achievement	-0.11	.06	[-0.21, 0.01]
Child grade → (P) Math achievement	0.03	.07	[-0.10, 0.16]
Household income → (P) Math achievement	**0.21**	**.05**	**[0.10, 0.32]**
Correlations between mediators			

Negative math homework behaviors & Math exam preparation perseverance	**-0.60**	**.05**	**[-0.68, -0.50]**
Math exam preparation perseverance & Math extracurricular activities	**0.15**	**.07**	**[0.01, 0.28]**
Negative math homework behaviors & Math extracurricular activities	**-0.17**	**.06**	**[-0.29, -0.04]**
Correlations between outcomes			
(S) Math achievement & (P) Math achievement	**0.38**	**.07**	**[0.22, 0.51]**

Note. (P) = Parent report, (S) = Standardized achievement test, MA = math anxiety. Statistical significance is defined by a 95% bias corrected bootstrap confidence interval that does not include zero. Significant path estimates are in bold face.

Discussion

Building on the learning avoidance model, the present study sought to examine the direct and indirect effects of math anxiety on math achievement by way of learning avoidance in diverse afterschool learning contexts. Overall, our findings suggest that students with higher math anxiety had lower math achievement, and this negative association was partially mediated by negative math homework behaviors and math extracurricular activity participation.

Overall, we found that math anxiety and math achievement were modestly negatively correlated, a finding that is highly consistent with the existing literature (Barroso et al., 2021; Namkung et al., 2019). In terms of learning behaviors in various contexts, higher math anxiety was associated with more negative math homework behaviors and less frequent participation in math extracurricular activities. These findings are consistent with our hypothesis, which are also in line with the literature suggesting lower math homework effort and less frequent participation in math extracurricular activities from students who are less interested in math and who value math less (Trautwein et al., 2009; LeFevre et al., 1992). These findings are, however, in contrast to a recent study which did not find an association between math anxiety and the amount of time students spent on homework (Hasty et al., 2020). Together, these findings suggest that highly math anxious students may spend as much time as their non-anxious peers doing homework, but they may not be as engaged or efficient during their homework time as their non-anxious peers.

Additionally, we found that math anxiety was not associated with the level of perseverance in math exam preparation. This finding is at odds with a recent study which found that highly math anxious high school students were less likely to use effortful study strategies during exam preparation (Jenifer et al., 2022). This inconsistency may be because these two studies focused on different aspects of exam preparation, with the present study focusing on the

overall perseverance and the Jenifer et al. (2022) study focusing on strategy choices. It is also possible that exams are less frequent and often of lower stake in earlier educational stages as compared to high school. As such, there may be a lower pressure and expectation for younger students to prepare for exams at home. This may have contributed to explaining why exam preparation accounted for the association between math anxiety and math performance among high school students in the Jenifer et al., 2022 study, but not in the current sample of 3rd to 6th graders.

Furthermore, our findings showed that the negative association between math anxiety and math achievement was partially mediated by homework behaviors and participation in math extracurricular activities. Specifically, students with higher math anxiety participated less frequently in math extracurricular activities and exhibited more avoidant homework behaviors such as procrastination, attempts to rush through homework, and failures to complete homework than their peers with lower math anxiety. These differences in homework behaviors and extracurricular activity participation were, in turn, associated with achievement differences among students with different math anxiety levels. These findings are consistent with a few studies that support the learning avoidance model (Ashcraft & Kirk, 2001; Hembree, 1990; Jenifer et al., 2022; LeFevre et al., 1992; Quintero et al., 2021). Our finding extends the existing literature in several important ways. First, math anxiety-related learning avoidance is not only observed in high school and college students (e.g., Hembree, 1990; Jenifer et al., 2022; LeFevre et al., 1992); it is also observable in early educational stages among elementary and middle school students. Second, highly math anxious students exhibit avoidance in not only formal math learning contexts (e.g., math class; Quintero et al., 2021), but also informal math learning contexts including the afterschool setting. Third, it is not the amount of time students devote to

afterschool learning that contributes to their undesired performance (Hasty et al., 2020); rather, it is the quality of time spent on homework that critically differentiates students with different levels of math anxiety in their math performance.

Finally, our findings point to the contextual specificity of learning avoidance. In contrast to homework behaviors and extracurricular activity participation, lower levels of perseverance in exam preparation did not mediate the association between math anxiety and math achievement. Therefore, it is the accumulation of effort in everyday learning activities such as homework and participation in organized extracurricular activities, not the occasional effort spurt in activities such as exam preparation, that differentiates students with high vs. low math anxiety in their achievement.

It is worth noting that participation in math extracurricular activities only mediated the association between math anxiety and standardized math achievement test scores, but not the association between math anxiety and parent-reported math grades. This is consistent with the literature on the differences between school grades and standardized tests as achievement measures. Specifically, although students' course grades largely capture what is learned in the classroom, standardized achievement tests additionally assess students' academic skills beyond their curricula (Popham, 1999; Willingham et al., 2002). This may explain why participation in extracurricular activities was associated with standardized achievement test scores more strongly than it was associated with course grades (Duckworth et al., 2012).

Limitations

The current findings should be interpreted in light of several limitations. First, the present study was a cross-sectional study. Therefore, the associations in the path model should not be interpreted as causal effects. For example, despite the predictive path from participation in

extracurricular activities to math achievement, participation in certain extracurricular activities (e.g., taking part in math competition and taking out-of-school math lessons) may depend on students' levels of math achievement. Future longitudinal studies are needed to elucidate the temporal precedence among these variables. Second, although math achievement was measured using both course grades and standardized test scores, parent-reported course grades may be subject to reporter-bias such as the social desirability effect. If possible, future studies would benefit from using school records to assess students' classroom achievement. Thirdly, only parent reports were used to measure students' afterschool learning behaviors. It is possible that students' subjective experience of their effort and perseverance may not be completely captured by parental observation. Relatedly, although learning avoidance behaviors are conceptualized as students' voluntary avoidance, the current operationalization of some avoidance behaviors may also capture involuntary avoidance. For example, parents and other adults may decide what extracurricular activities their children could take part in especially in early educational stages. Parental report of their child's homework behaviors may also relate to parents' roles in homework as well as their own perceptions of family schedules around homework time. Therefore, alternative methods, such as student self-report, in-person interviews, and observations should be employed in future studies to better understand students' perspectives on their own learning behaviors for young learners. Finally, the present sample only included a small proportion of 3rd graders. Further investigations are needed to evaluate the generalizability of the present findings to early elementary school students.

Conclusions and Implications

In summary, the present study provided evidence supporting the learning avoidance model in the association between math anxiety and math achievement. Our findings demonstrate

that negative homework behaviors (e.g., complaints, procrastination, rushing through homework, and failure to complete homework) and less frequent participation in math extracurricular activities may contribute to explaining the undesired math achievement outcomes among math anxious students in early educational stages. Homework provides students with regular opportunities to review the learned materials and practice problem solving in their own pace, which are instrumental for knowledge consolidation and integration (Cooper, 2007). Academic extracurricular activities also provide students with additional opportunities to develop their cognitive and noncognitive skills conducive to academic learning (Covay & Carbonaro, 2010; Knifsend & Graham, 2012; Morris, 2016). Unfortunately, our findings suggest that highly math anxious students may not be able to make effective use of their homework time or to actively participate in math extracurricular activities to promote their math performance. Therefore, effective practices that aim to promote math achievement among highly math anxious students need to address learning behaviors both in and after class. These may include practices that foster positive homework behaviors such as promoting the intrinsic and utility value of homework, training students how to self-regulate, and designing afterschool environments that are conducive to independent learning. Such efforts may prove fruitful in mitigating the negative link between math anxiety and math achievement.

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Supplemental Materials

1. Two studies have been published using the same dataset. The first study investigated how students' engagement in the math classroom mediated the association between students' math anxiety and standardized math achievement test scores (Quintero et al., 2022). The second study investigated students' attentional distribution patterns during math problem solving, and how difference in attention distribution between students with high and low math anxiety predicted their performance difference in a computerized math task (Li et al., 2022). Both the math anxiety (Li et al., 2022; Quintero et al., 2022) and standardized math achievement test scores were used in the present study.

2. Table S1 reported measures of the main constructs.

3. Tables S2 and S3 report, respectively, path coefficients, standard errors, and 95% bias corrected bootstrap confidence intervals obtained from the sample excluding 3rd graders (Table S2) and the sample excluding students with developmental disabilities (Table S3).

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Table S1

Measures for the Main Study Variables

General Anxiety	Never	Sometimes	Often	Always
1. I worry about things.	0	1	2	3
2. When I have a problem, I get a funny feeling in my stomach.	0	1	2	3
3. I feel afraid.	0	1	2	3
4. When I have problems, my heart beats really fast.	0	1	2	3
5. I worry that something bad will happen to me.	0	1	2	3
6. When I have a problem, I feel shaky.	0	1	2	3

Math Anxiety	Not nervous	A little bit nervous	Very nervous	Very very nervous
1. Getting a new math textbook.	1	2	3	4
2. Reading and interpreting graphs or charts.	1	2	3	4
3. Listening to another student explain a math problem.	1	2	3	4
4. Watching a teacher work a math problem on the chalkboard.	1	2	3	4
5. Walking into a math classroom.	1	2	3	4
6. Looking through the pages in a math book.	1	2	3	4
7. Starting a new chapter in a math book.	1	2	3	4
8. Thinking about math outside of class.	1	2	3	4
9. Picking up a math book to begin working on a homework assignment.	1	2	3	4
10. Working on a math problem, such as: “If I spend $3.87 at the store, how much change will I get from a $5 bill?”	1	2	3	4
11. Reading a formula in science.	1	2	3	4
12. Listening to the teacher in a math class.	1	2	3	4
13. Using the tables in the back of a math book.	1	2	3	4
14. Being told how to interpret math statements.	1	2	3	4
15. Being given a homework assignment of many difficult math problems which is due the next time.	1	2	3	4
16. Thinking about a math test one day before the test.	1	2	3	4
17. Doing a long division problem.	1	2	3	4
18. Taking a quiz in a math class.	1	2	3	4

19. Getting ready to study for a math test.	1	2	3	4
20. Being given a math quiz that you were not told about.	1	2	3	4
21. Waiting to get a math test returned in which you expect to do well.	1	2	3	4
22. Taking an important test in a math class.	1	2	3	4

Negative Math Homework Behaviors	Never	At times	Often	Very often
1. Fails to bring math home assignments and necessary materials.	1	2	3	4
2. Knows exactly what math homework has been assigned.	1	2	3	4
3. Denies having math homework assignments.	1	2	3	4
4. Whines or complains about math homework.	1	2	3	4
5. Must be reminded to sit down and start his/her math homework.	1	2	3	4
6. Procrastinates or puts off doing his/her math homework.	1	2	3	4
7. Does math homework satisfactorily without the help of someone else.	1	2	3	4
8. Daydreams or plays with objects during math homework sessions.	1	2	3	4
9. Is not distracted by noises or activities of others during math homework sessions.	1	2	3	4
10. Does not get frustrated easily by math homework assignments.	1	2	3	4
11. Fails to complete his/her math homework.	1	2	3	4
12. Takes an unusually long time to do his/her math homework.	1	2	3	4
13. Produces neat or organized math homework.	1	2	3	4
14. Hurries through his/her math homework and makes careless mistakes.	1	2	3	4
15. Forgets to bring math homework assignments back to class.	1	2	3	4

Math Extracurricular Activities	Never or rarely	Sometimes	Often	Always or almost always
1. Does math as an extracurricular activity.	1	2	3	4
2. Takes part in math competitions.	1	2	3	4
3. Attends out-of-school math lessons.	1	2	3	4
4. Participates in a mathematics club.	1	2	3	4

Math Exam Preparation Perseverance	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1. My child is always prepared for his/her math exams.	1	2	3	4	5

2. My child always studies hard for math quizzes.	1	2	3	4	5
3. My child always keeps studying until s/he understands math material.	1	2	3	4	5

Table S2

Standardized Path Coefficients, Standard Errors, and 95% Bias Corrected Bootstrap Confidence Intervals Excluding 3rd Graders

Path	Coefficient	Standard Error	95% Bias Corrected Bootstrap CI
Predictors → mediators			
MA → Negative math homework behaviors	**0.18**	**.07**	**[0.03, 0.32]**
MA → Math exam preparation perseverance	-0.12	.08	[-0.28, 0.04]
MA → Math extracurricular activities	**-0.18**	**.07**	**[-0.31, -0.03]**
Mediators → outcomes			
Negative math homework behaviors → (S) Math achievement	**-0.26**	**.08**	**[-0.42, -0.11]**
Math exam preparation perseverance → (S) Math achievement	-0.05	.07	[-0.19, 0.09]
Math extracurricular activities → (S) Math achievement	**0.25**	**.08**	**[0.09, 0.41]**
Negative math homework behaviors → (P) Math achievement	**-0.32**	**.09**	**[-0.48, -0.15]**
Math exam preparation perseverance → (P) Math achievement	**0.16**	**.06**	**[0.04, 0.28]**
Math extracurricular activities → (P) Math achievement	0.06	.06	[-0.02, 0.14]
Direct effects of predictor on outcomes			
MA → (S) Math achievement	-0.12	.07	[-0.25, 0.01]
MA → (P) Math achievement	**-0.17**	**.07**	**[-0.32, -0.03]**
Indirect effects of predictor on outcomes			
MA → Negative math homework behaviors → (S) Math achievement	**-0.05**	**.02**	**[-0.11, -0.01]**
MA → Math exam preparation perseverance → (S) Math achievement	0.01	.01	[-0.01, 0.04]
MA → Math extracurricular activities → (S) Math achievement	**-0.05**	**.03**	**[-0.12, -0.01]**
MA → Negative math homework behaviors → (P) Math achievement	**-0.06**	**.03**	**[-0.13, -0.01]**
MA → Math exam preparation perseverance → (P) Math achievement	-0.02	.02	[-0.06, 0.00]
MA → Math extracurricular activities → (P) Math achievement	-0.01	.01	[-0.04, 0.00]

Total effects of predictor on outcomes			
MA → (S) Math achievement	**-0.20**	**.07**	**[-0.34, -0.07]**
MA → (P) Math achievement	**-0.26**	**.08**	**[-0.41, -0.10]**
Effects of covariates			
General anxiety → MA	**0.41**	**.07**	**[0.27, 0.54]**
Child gender → MA	0.07	.07	[-0.07, 0.20]
Child grade → MA	-0.00	.06	[-0.13, 0.13]
Household income → MA	-0.09	.06	[-0.20, 0.04]
General anxiety → Negative math homework behaviors	**0.15**	**.07**	**[0.01, 0.30]**
Child gender → Negative math homework behaviors	-0.02	.07	[-0.15, 0.12]
Child grade → Negative math homework behaviors	-0.03	.07	[-0.16, 0.11]
Household income → Negative math homework behaviors	**-0.23**	**.07**	**[-0.35, -0.09]**
General anxiety → Math exam preparation perseverance	-0.12	.08	[-0.28, 0.04]
Child gender → Math exam preparation perseverance	0.02	.07	[-0.13, 0.16]
Child grade → Math exam preparation perseverance	0.05	.07	[-0.09, 0.19]
Household income → Math exam preparation perseverance	**0.17**	**.07**	**[0.02, 0.30]**
General anxiety → Math extracurricular activities	-0.06	.07	[-0.18, 0.08]
Child gender → Math extracurricular activities	0.01	.07	[-0.12, 0.15]
Child grade → Math extracurricular activities	**-0.14**	**.06**	**[-0.26, -0.02]**
Household income → Math extracurricular activities	**0.14**	**.07**	**[0.01, 0.27]**
General anxiety → (S) Math achievement	-0.10	.06	[-0.22, 0.02]
Child gender → (S) Math achievement	-0.05	.06	[-0.16, 0.06]
Child grade → (S) Math achievement	**0.41**	**.06**	**[0.29, 0.52]**
Household income → (S) Math achievement	**0.22**	**.06**	**[0.11, 0.34]**
General anxiety → (P) Math achievement	-0.02	.07	[-0.17, 0.11]
Child gender → (P) Math achievement	-0.11	.06	**[-0.22, -0.00]**
Child grade → (P) Math achievement	0.03	.07	[-0.10, 0.16]

Household income → (P) Math achievement	**0.22**	**.06**	**[0.11, 0.33]**
Correlations between mediators			
Negative math homework behaviors & Math exam preparation perseverance	**-0.61**	**.05**	**[-0.69, -0.51]**
Math exam preparation perseverance & Math extracurricular activities	**0.15**	**.07**	**[0.01, 0.28]**
Negative math homework behaviors & Math extracurricular activities	**-0.17**	**.06**	**[-0.29, -0.04]**
Correlations between outcomes			
(S) Math achievement & (P) Math achievement	**0.37**	**.08**	**[0.22, 0.51]**

Note. (P) = Parent report, (S) = Standardized achievement test, MA = math anxiety. Statistical significance is defined by a 95% bias corrected bootstrap confidence interval that does not include zero. Significant path estimates are in bold face.

Table S3

Standardized Path Coefficients, Standard Errors, and 95% Bias Corrected Bootstrap Confidence Intervals Excluding Students with Developmental Disabilities

Path	Coefficient	Standard Error	95% Bias Corrected Bootstrap CI
Predictors → mediators			
MA → Negative math homework behaviors	**0.18**	**.08**	**[0.03, 0.33]**
MA → Math exam preparation perseverance	-0.13	.09	[-0.29, 0.04]
MA → Math extracurricular activities	**-0.21**	**.07**	**[-0.34, -0.05]**
Mediators → outcomes			
Negative math homework behaviors → (S) Math achievement	**-0.22**	**.07**	**[-0.36, -0.07]**
Math exam preparation perseverance → (S) Math achievement	-0.04	.07	[-0.18, 0.10]
Math extracurricular activities → (S) Math achievement	**0.25**	**.09**	**[0.08, 0.41]**
Negative math homework behaviors → (P) Math achievement	**-0.29**	**.09**	**[-0.46, -0.12]**
Math exam preparation perseverance → (P) Math achievement	**0.16**	**.07**	**[0.03, 0.29]**
Math extracurricular activities → (P) Math achievement	0.06	.04	[-0.03, 0.15]
Direct effects of predictor on outcomes			
MA → (S) Math achievement	-0.11	.07	[-0.25, 0.03]
MA → (P) Math achievement	**-0.18**	**.08**	**[-0.34, -0.03]**
Indirect effects of predictor on outcomes			
MA → Negative math homework behaviors → (S) Math achievement	**-0.04**	**.02**	**[-0.10, -0.01]**
MA → Math exam preparation perseverance → (S) Math achievement	0.01	.01	[-0.01, 0.04]
MA → Math extracurricular activities → (S) Math achievement	**-0.05**	**.03**	**[-0.13, -0.01]**
MA → Negative math homework behaviors → (P) Math achievement	**-0.05**	**.03**	**[-0.13, -0.01]**

MA → Math exam preparation perseverance → (P) Math achievement	-0.02	.02	[-0.07, 0.00]
MA → Math extracurricular activities → (P) Math achievement	-0.01	.01	[-0.04, 0.00]
Total effects of predictor on outcomes			
MA → (S) Math achievement	**-0.20**	**.07**	**[-0.34, -0.05]**
MA → (P) Math achievement	**-0.27**	**.09**	**[-0.44, -0.09]**
Effects of covariates			
General anxiety → MA	**0.40**	**.07**	**[0.26, 0.53]**
Child gender → MA	0.03	.07	[-0.11, 0.17]
Child grade → MA	-0.00	.07	[-0.13, 0.13]
Household income → MA	-0.10	.06	[-0.21, 0.02]
General anxiety → Negative math homework behaviors	0.15	.08	[-0.01, 0.30]
Child gender → Negative math homework behaviors	0.05	.07	[-0.09, 0.17]
Child grade → Negative math homework behaviors	-0.05	.07	[-0.18, 0.08]
Household income → Negative math homework behaviors	**-0.24**	**.07**	**[-0.37, -0.10]**
General anxiety → Math exam preparation perseverance	-0.11	.08	[-0.28, 0.05]
Child gender → Math exam preparation perseverance	-0.03	.07	[-0.17, 0.11]
Child grade → Math exam preparation perseverance	0.05	.07	[-0.09, 0.19]
Household income → Math exam preparation perseverance	0.16	.08	[0.00, 0.31]
General anxiety → Math extracurricular activities	-0.06	.07	[-0.19, 0.07]
Child gender → Math extracurricular activities	-0.03	.07	[-0.17, 0.11]
Child grade → Math extracurricular activities	**-0.15**	**.06**	**[-0.26, -0.02]**
Household income → Math extracurricular activities	0.12	.07	[-0.01, 0.25]
General anxiety → (S) Math achievement	**-0.14**	**.06**	**[-0.26, -0.01]**
Child gender → (S) Math achievement	-0.07	.06	[-0.17, 0.05]
Child grade → (S) Math achievement	**0.47**	**.05**	**[0.36, 0.56]**
Household income → (S) Math achievement	**0.20**	**.06**	**[0.09, 0.31]**
General anxiety → (P) Math achievement	-0.02	.08	[-0.16, 0.14]

Child gender → (P) Math achievement	**-0.14**	**.05**	**[-0.24, -0.03]**
Child grade → (P) Math achievement	0.03	.07	[-0.10, 0.17]
Household income → (P) Math achievement	**0.19**	**.06**	**[0.08, 0.30]**
Correlations between mediators			
Negative math homework behaviors & Math exam preparation perseverance	**-0.59**	**.05**	**[-0.68, -0.49]**
Math exam preparation perseverance & Math extracurricular activities	0.12	.08	[-0.04, 0.26]
Negative math homework behaviors & Math extracurricular activities	**-0.16**	**.07**	**[-0.29, -0.01]**
Correlations between outcomes			
(S) Math achievement & (P) Math achievement	**0.33**	**.07**	**[0.17, 0.47]**

Note. (P) = Parent report, (S) = Standardized achievement test, MA = math anxiety. Statistical significance is defined by a 95% bias corrected bootstrap confidence interval that does not include zero. Significant path estimates are in bold face.