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Mathematics Achievement and Anxiety and Their Relation to Internalizing and Externalizing Behaviors

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Abstract

Although behavioral difficulties are well documented in reading disabilities, little is known about the relationship between math ability and internalizing and externalizing behaviors. Here, we use standardized measures to investigate the relation among early math ability, math anxiety, and internalizing and externalizing behaviors in a group of 366 second and third graders. Math achievement was significantly correlated with attentional difficulties and social problems but not with internalizing symptoms. The relation between math achievement and externalizing behavioral problems was stronger in girls than in boys. Math achievement was not correlated with trait anxiety but was negatively correlated with math anxiety. Critically, math anxiety differed significantly between children classified as math learning disabled (MLD), low achieving (LA), and typically developing (TD), with math anxiety significantly higher in the MLD and LA groups compared to the TD group. Our findings suggest that, even in nonclinical samples, math difficulties at the earliest stages of formal math learning are associated with attentional difficulties and domain-specific anxiety. These findings underscore the need for further examination of the shared cognitive, neural, and genetic influences underlying problem solving and nonverbal learning difficulties and accompanying internalizing and externalizing behaviors.

Keywords

dyscalculia; behavior issues; mathematics

Math disability (MD) or dyscalculia is the persistent difficulty in the learning and mastery of number concepts (Geary, 2006) that results in achievement levels far below what would be expected given an individual's aptitude (American Psychiatric Association, 2000). MD can manifest early and interfere with the mastery of basic arithmetic concepts such as numerosity, counting, and addition facts (e.g., 2 + 3 = 5). Because these principles serve as the foundation of mathematics, children with these early difficulties will often continue to struggle later in their academic career as they encounter more advanced math concepts.

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Indeed, the early mastery of numerosity and ordinality has been found to be the most significant predictor of later educational success (Duncan et al., 2007).

MD has an early and pervasive effect on math learning, with most studies suggesting that between 5% and 8% of school-aged children have sustained difficulty with mathematics learning (American Psychiatric Association, 2000; Badian, 1983; Geary, 2006; Gross-Tsur, Manor, & Shalev, 1993, 1996). Given the widespread and sustained effects of MD and the fact that children in the United States continue to lag globally in math learning (U.S. Department of Education, National Center for Education Statistics, 2007), research examining MD is both timely and necessary.

Learning Disorders and Comorbid Disorders

To date, numerous studies have examined the underlying neural, social, and cognitive correlates of math learning disabilities. An impressive body of research has explored topics ranging from the brain regions that are involved in basic computations to social factors such as stereotype threat that may influence math learning. In contrast, little is known about whether children with MD are also more likely to develop comorbid behavioral and psychosocial problems, which include internalizing behaviors such as depression, anxiety, and withdrawal or externalizing behaviors such as conduct or aggression problems (Achenbach & Edelbrock, 1978). Although few studies have examined these difficulties in children with MD, a number of studies have assessed comorbid psychopathology in children with reading disabilities (RD), defined by the Diagnostic and Statistical Manual of Mental Disorders as reading achievement that is substantially below what would be expected given an individual's chronological age, measured intelligence, or age-appropriate education (American Psychiatric Association, 2000), and in children with general learning disorders in any academic domain. These studies indicate that children in both of these groups are at a greater risk of developing both types of behavioral problems, as well as attentional difficulties. For instance, children with RD are more likely to meet criteria for distinct disorders such as attention-deficit/hyperactivity disorder (ADHD), conduct disorder, oppositional defiant disorder, and anxiety (Willcutt & Pennington, 2000). Children with a general learning disability in an unspecified domain are more susceptible to developing a host of behavioral and emotional problems such as aggression, delinquency, hyperactivity, depression, and anxiety (Greenham, 1999; Vaughn, Zaragoza, Hogan, & Walker, 1993). The pervasive comorbidity in these other groups with an LD suggests that additional research is needed to determine if these or other similar difficulties cooccur with MD.

Math Learning Disabilities and Comorbid Disorders

In contrast to the more extensive literature on RD and overall LD, few studies have assessed the relation between comorbid psychopathology and diagnoses of MD or individual differences in math achievement. In one study using a random sample, Duncan and colleagues (2007) found no relation between math achievement at ages 8 to 9 and subsequent behavioral or emotional symptoms at age 10 to 11. Similarly, Feshbach and Feshbach (1987) also found no relation between children's math achievement and self-ratings of depression, anxiety, aggression, or self-concept. However, math achievement levels were significantly and negatively related to teachers' ratings of the children's levels of depression. These initial dimensional studies provide important insight into the relation between math achievement and behavioral symptoms, but interpretation of these findings is constrained by the use of unstandardized measures that have not been widely used in other studies of MD or psychopathology.

To date, there have only been three studies that have specifically examined the relation between MD and behavioral and emotional problems. In one study, White, Moffitt, and Silva (1992) assessed the math performance and psychosocial behaviors of 157 thirteen-year-old children, who were classified as control (i.e., having no learning disability), having a specific arithmetic or RD, or generally learning disabled. Children who had achievement scores at or below the 30th percentile in arithmetic and above the 40th percentile in reading were classified as having a specific MD, whereas children with the opposite profile of reading and arithmetic scores were classified as having a specific RD. Children were classified as having a general learning disability if both their math and reading scores were below the 30th percentile.

The results indicated that children with general LD exhibited the most psychosocial symptoms, whereas MD-and RD-only children had similarly elevated levels of depression and anxiety, a lack of self-esteem, and peer isolation symptoms. Furthermore, the results suggested that a greater percentage of the children with MD had scores greater than one standard deviation from the mean on measures of depression, lack of self-esteem, and peer isolation than the RD group. Although none of the RD children in their study met criteria for an internalizing disorder, 5% of the MD children met the criteria. Overall, these findings suggest that the MD-only children are at a greater risk for developing socioemotional problems than the RD-only children.

In another study, Shalev, Auerbach, and Gross-Tsur (1995) examined 140 fourth graders and found elevated rates of attentional problems in children with MD relative to typically developing children. Children were classified as having MD (a) if they scored below the 20th percentile on a mathematics achievement test and (b) if they scored below the mean on a second mathematics achievement test. In comparison to boys without MD, boys with MD exhibited more social problems and higher rates of externalizing symptoms such as aggression and delinquency, whereas no differences were found in the number of externalizing symptoms in girls with and without MD. In contrast, no differences were found on measures of internalizing symptoms such as anxiety and depression in either males or females.

In an extension of this study, Auerbach, Gross-Tsur, Manor, and Shalev (2008) explored behavioral differences between 140 fourth grade children with and without MD. Children were classified as having MD in a two-step process: Children who scored below the 20th percentile on an achievement test measuring counting skills, number facts, and problem solving were administered a second achievement test. Children who scored below the 5th percentile on the second test and had full-scale IQ at or greater than 80 were classified as having MD. The results indicated that there were significant differences between children with and without MD in Attention Problems, Delinquent Behavior, and Total Behavior

Problems on the *Child Behavior Checklist* (CBCL; Achenbach, 1991; Achenbach, Dumenci, & Rescorla, 2003). Once again, no significant differences were found between children with and without MD on any of the measures of internalizing symptoms (e.g., anxiety, depression, withdrawn behaviors). Of interest, there were no gender differences on any of the externalizing or internalizing symptoms. Taken together, these studies have provided some, albeit inconsistent, evidence that children with MD may be more likely to exhibit externalizing behavioral problems and attention problems.

Math Anxiety and Math Learning

A different set of studies has examined the relation between math achievement and math anxiety, which is characterized by domain-specific internalizing symptoms associated with the “manipulation of numbers and use of mathematical concepts” (Richardson & Suinn, 1972, p. 551). Research has consistently shown that math anxiety is significantly and negatively correlated with math achievement even after controlling for trait anxiety (Ashcraft & Kirk, 2001). Moreover, the negative relationship between math anxiety and math achievement can be found in children as young as first grade (Ma, 1999; Ramirez, Gunderson, Levine, & Beilock, in press; Wigfield & Meece, 1988; Young, Wu, & Menon, 2012) and tends to persist over time into adulthood (Richardson & Suinn, 1972).

Given the existing data documenting an association between math anxiety and math achievement (Ashcraft & Kirk, 2001), it is plausible that children with MD may have higher levels of math anxiety than non-MD children. However, no study to date has examined math anxiety and its relation to distinct groups of children classified as MD (Mazzocco, 2008). Furthermore, no study has specifically examined the relation between math anxiety (Shalev et al., 1995) and general problematic behaviors as assessed with standardized measures such as the CBCL. Investigating these relations could help clarify the nature of affective factors that are related to the early development of math skills, just as previous studies have done in the domain of reading.

Gender Differences

In addition to exploring the relation between math achievement and internalizing and externalizing behaviors in the overall population, prior research on gender differences in math achievement and MD suggests that it may be important to test whether these relationships differ in males and females. Reigosa-Crespo and colleagues (2012) found a ratio of 4 boys to 1 girl with MD in a sample of children from second to ninth grades. Penner and Paret (2008) examined the math achievement of children in kindergarten and found no gender differences in overall average scores, although the boys had a larger range of scores than girls and performed more poorly than girls at the bottom of the distribution. By third grade, however, boys began to outperform girls, even at the bottom of the distribution (Penner & Paret, 2008). In contrast to these findings, however, several studies have suggested that the prevalence of dyscalculia did not differ between boys and girls in fourth grade (Gross-Tsur et al., 1996; Lewis, Hitch, & Walker, 1994). These inconsistencies suggest that additional research is necessary to clarify the possible nature of gender disparities in MD.

Researchers have consistently found gender differences in the prevalence of psychopathology. Externalizing behaviors such as ADHD and conduct disorder are more common among boys (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007; Willcutt et al., in press), whereas internalizing behaviors such as depression and anxiety (Lewinsohn, Gotlib, Lewinsohn, Seeley, & Allen, 1998) are more common among girls (Leadbeater, Kuperminc, Blatt, & Hertzog, 1999). Similarly, previous research has found that girls tend to endorse higher levels of math anxiety than boys as young as the sixth grade (Wigfield & Meece, 1988).

Therefore, given the gender disparity in externalizing and internalizing behaviors and the possible gender disparity in math anxiety and math achievement, further research is needed to clarify whether gender may influence the relations among math achievement, math learning disabilities, and internalizing and externalizing behaviors. Although Shalev and colleagues' (1995) study found within-gender differences on externalizing and internalizing measures, they did not contrast or investigate differences between boys and girls. Here, we extend previous findings by using standardized measures of math achievement and by also examining gender differences in the relation among math anxiety, math achievement, and internalizing and externalizing behavioral correlates.

Classification of MD

One difficulty in interpreting and comparing the findings of past studies on MD is the differing criteria that were used for classification (Mazzocco, 2008). For example, some studies have used an inclusion criterion based on the magnitude of the difference between the full-scale IQ and math achievement scores (Auerbach et al., 2008), whereas other studies have used percentile cutoffs on tests of math achievement (Shalev et al., 1995; White et al., 1992). Furthermore, even among the studies that have relied on percentile cutoffs, different thresholds have been used; for example, Shalev and colleagues used a cutoff 20th percentile, whereas White and colleagues (1992) used a 30th percentile cutoff.

However, previous research has suggested that children with math learning disability (MLD) who scored below the 11th percentile (Geary, 1993; Mazzocco & Myers, 2003) differ significantly from those who are low achieving (LA) in math (11th to 25th percentile). In particular, Mazzocco and Myers (2003) found that LA and MLD children identified using these cutoffs have different developmental trajectories and distinct cognitive profiles (Geary, Hoard, Byrd-Craven, & Nugent, 2008; Murphy, Mazzocco, Hanich, & Early, 2007). Based on these findings, Mazzocco (2008) has recommended separating children into groups with MLD and LA to avoid diluting any effects that may be more pronounced in one of these subgroups. We use this approach to classify children into distinct LA and MLD group and thereby overcome weaknesses of prior studies.

Current Study

In this study, we used standardized and widely used measures to investigate the relations between mathematics achievement and comorbid psychopathology in children between the ages of 7 and 9, at one of the earliest stages of formal math learning. A series of analyses were conducted to address four major questions:

1. A series of initial dimensional analyses were used to test whether individual differences in math achievement are associated with emotional and behavioral problems across the entire distribution of math achievement. We hypothesized that math achievement would be negatively and significantly correlated with attention problems and aggressive and delinquent behaviors, whereas correlations between math achievement and internalizing symptoms would be lower and nonsignificant.
2. Categorical analyses were then used to test the hypothesis that the prevalence of problematic behaviors would differ in groups of children defined as typically developing (TD), LA, or MLD based on achievement score cutoffs that have been widely used and recommended in the literature (Geary, Hamson, & Hoard, 2000; Mazzocco, 2008; Wu et al., 2008) to classify children as MLD, LA, and TD. We anticipated that the LA and MLD groups would exhibit higher rates of externalizing and internalizing behaviors than the TD group.
3. Because past research has primarily examined the relation between domain-general internalizing disorders and math achievement, a third set of analyses were completed to test for group differences on a newly developed domain-specific measure of math anxiety that is specifically appropriate for children in second and third grade (Wu, Barth, Amin, Malcarne, & Menon, 2012; Young et al., 2012). We hypothesized that math-specific anxiety would be negatively correlated with math achievement and would differ between the math groups, even after controlling for levels of overall trait anxiety symptoms.
4. Last, in light of the significant gender differences in the prevalence of internalizing and externalizing disorders and the mixed results regarding gender differences in math achievement, a series of exploratory analyses were conducted to test whether the results of each analysis differed between males and females.

Method

Participants

A total of 366 children participated in the study. Children were recruited via flyers sent to public and private elementary schools as well as advertisements in parenting magazines, educational websites, and learning disability groups. The average age of the children was 8.27 years (*SD* = 0.65), and the group consisted of 154 second and 212 third graders. The sample included 181 girls and 185 boys. All of the measures were administered to, and completed by, the parent and child in one visit. Children who were previously diagnosed with an RD were excluded to be able to better isolate and examine the effects of math learning. For the entire sample, the Wechsler Individual Achievement Test, Second Edition (WIAT-II) Word Reading mean was 109.96 (*SD* = 13.22), and Reading Comprehension scores had a mean of 107.54 (*SD* = 13.92).

Using standardized diagnostic criteria (Mazzocco, 2008; Wu et al., 2008), WIAT-II Math Composite scores were used to classify the children as MLD (10th percentile and below), LA (11th to 24th percentile), or TD (40th percentile and above), in mathematics. In the entire sample, 17 children met criteria for MLD, 31 children were classified as LA, and 274 children were classified as TD.

Materials and Procedures

Assessment of math anxiety—Math anxiety was assessed using the *Scale for Early Mathematics Anxiety* (SEMA; Wu et al., 2012; Young et al., 2012), a new questionnaire designed specifically to assess math anxiety in children who are in the earliest stages of formal math learning. The SEMA has been shown to be a reliable and valid measure of math anxiety for children between the ages of 7 and 9 (Wu et al., 2012). Briefly, children are presented with math problems and scenarios representative of early math learning experiences and asked to rate on a 1 to 5 scale how anxious the questions make them feel. Each child was administered the measure individually in a one-on-one setting with an assessor.

Assessment of psychopathology—We used the CBCL (Achenbach, 1991; Achenbach et al., 2003), a widely used and well-validated standardized measure of social and behavioral problems in children between the ages of 6 and 18. Parents, close relatives, or legal guardians were asked to rate 113 items describing whether the child was currently exhibiting, or had exhibited within the past 6 months, specific behavioral and emotional problems or traits. Items were rated on a scale of 0 (*not true*), 1 (*somewhat true*), or 2 (*very true*). The CBCL yields nine syndrome subscales: Aggressive Behavior, Anxious/ Depressed, Attention Problems, Rule-Breaking Behavior, Social Problems, Somatic Complaints, Thought Problems, Withdrawn/Depressed, and Other Problems. In the present study, all of the syndrome subscales were used.

Assessment of math, reading, and cognitive abilities—Standardized measures were used to assess children's math, reading and cognitive abilities. The *Wechsler Abbreviated Scale of Intelligence* (WASI) is a nationally standardized IQ test that produces three scores: Verbal, Performance, and Full-Scale IQ (FSIQ; Wechsler, 1999). Verbal IQ is a measure of the ability to use language to explain vocabulary and concepts. Performance IQ is a measure of an individual's ability to complete nonverbal tasks such as puzzles and patterns. FSIQ is a composite measure derived from both Verbal IQ and Performance IQ. WIAT-II (Wechsler, 2005) is a standardized test designed to determine grade-specific academic skills in math and reading. The mathematical subsets (Numerical Operations and Math Reasoning) of the WIAT-II scores were combined to create a standardized Math Composite score.

Statistical analyses—For the dimensional analyses, we first conducted Pearson correlations to determine the overall nature of the relations. We then used linear regressions controlling for FSIQ to explore the relation between math achievement, and internalizing and externalizing behaviors. Regressions controlling for the FSIQ and CBCL Anxiety/ Depression subscale were also used to explore the relation between math achievement and math anxiety. For the categorical analyses, ANOVAs were used to explore how the MLD, LA, and TD groups differed on math anxiety, and symptoms of psychopathology. We used post hoc comparisons with a Scheffé alpha correction at .05 to determine how the three groups differed from one another. Because of differences in group sizes, we used a Levene statistic to test for the homogeneity of variance (Table 1). For the dependent variables in which the homogeneity principles were violated, we used the Brown–Forsythe statistic and corresponding degrees of freedom instead of the standard F statistic for the ANOVA. The Brown–Forsythe statistic is robust to violations in homogeneity of variance. As shown in Table 1, there were no differences in the significances between the ANOVAs and the Brown–Forsythe statistics.

We also used regressions to test for the difference of slopes between boys and girls in the relation between math achievement and internalizing and externalizing behaviors. Finally, we used a 2 × 3 ANOVA to test for interactions between math achievement groups and gender on measures of math anxiety and internalizing and externalizing behaviors.

Results

Math Achievement, Math Anxiety, and Psychopathology

WIAT-II Math Composite scores were significantly and negatively correlated with math anxiety and CBCL Attention Problems and Social Problems (Table 2). After controlling for FSIQ, math achievement was significantly correlated with Attention Problems, $\beta = -.15$, $t(352) = -2.33$, $p = .02$, $R^2 = .06$, and math anxiety, $\beta = -.25$, $t(340) = -4.24$, $p < .001$, $R^2 = .17$, but not any of the other CBCL subscales. Math anxiety was significantly correlated with math achievement after controlling for the Anxiety/Depression CBCL subscale, $\beta = -.37$, $t(335) = -7.14$, $p < .001$, $R^2 = .14$ (Figure 1), indicating that the association between math achievement and math anxiety is not simply the result of higher levels of trait anxiety.

To account for the heterogeneity in variances across measures, we also conducted the regressions after standardizing the variables. The analyses yielded the same results; after controlling for FSIQ, math achievement predicted Attention Problems, $\beta = -.13$, $t(301) = -1.94$, $p = .05$, $R^2 = .05$, and math anxiety, $\beta = -.24$, $t(352) = -4.01$, $p < .001$, $R^2 = .16$. In addition, math anxiety was significantly correlated with math achievement after controlling for CBCL Anxiety/Depression subscale, $\beta = -.35$, $t(335) = -6.87$, $p < .001$, $R^2 = .13$.

Psychopathology in MLD, LA, and TD Groups

Next, we used ANOVAs to investigate whether the three math groups (MLD, LA, and TD) differed on measures of psychopathology (Table 1). Initial omnibus tests indicated that the three groups differed significantly only on the Social Problems, $F(2, 310) = 7.255$, $p = .003$, $\eta^2 = .04$, and Attention Problems, $F(2, 310) = 6.05$, $p = .001$, $\eta^2 = .04$, subscales. Post hoc analyses indicated a differential profile of between-group differences; the MLD group differed significantly from both the TD and LA groups ($p < .05$) on Social Problems and on Attention Problems, whereas the latter two groups were not significantly different. Given the differences in the group sizes, we used the Levene statistic to determine whether there were differences in the group variances. As shown in Table 1, several of the dependent variables (WIAT-II Math Composite, FSIQ, and CBCL Attention Problems) did indeed violate homogeneity of the variances. For those variables, we also conducted between-group analyses using the Brown–Forsythe statistic, which is more robust to differences in variance. These analyses did not yield any significant differences.

Math Anxiety in MLD, LA, and TD Groups

The MLD, LA, and TD groups differed significantly on math anxiety, $F(2, 317) = 13.29$, $p < .001$, $\eta^2 = .08$ (Figure 2a, Table 1), but not trait anxiety, $F(2, 310) = 0.20$, $p = .82$, $\eta^2 = .001$ (Figure 2b). Specifically, the TD group had significantly lower levels of math anxiety relative to both the MLD and LA groups ($p < .05$), but the latter two groups were not significantly different from one another. As shown in Table 1, we also used the Brown–Forsythe statistic to determine whether there were group differences in SEMA despite the heterogeneity of variances. The analyses indicated that there were still significant differences when accounting for variance differences (Brown–Forsythe = 7.43, $p < .01$, df = 2, 37.21).

Gender Differences in Relation to Math Achievement and Psychopathology

We then examined whether the relation between symptoms of psychopathology and math achievement differed in boys and girls. Regression analyses for the difference of slopes indicated that there were no significant gender differences in the relationship between math achievement and Anxiety/Depression, $\beta = .18$, $t(344) = 0.56$, *ns*, Somatic Complaints, $\beta = .11$, $t(344) = 0.34$, *ns*, Thought Problems, $\beta = -.14$, $t(344) = -0.42$, *ns*, Social Problems, $\beta = -.32$, $t(344) = -0.98$, *ns*, Withdrawal/Depression, $\beta = .04$, $t(344) = 0.13$, *ns*, or Other Problems, $\beta = -.32$, $t(344) = -0.98$, *ns*.

However, the interaction term in the regression analysis approached significance for Attention Problems, $\beta = -.59$, $t(344) = -1.86$, $p < .05$, $R^2 = .06$, and was significant for Rule Breaking, $\beta = -.82$, $t(344) = -2.54$, $p < .05$, $R^2 = .04$, and Aggression, $\beta = -.68$, $t(344) = -2.08$, $p < .05$, $R^2 = .04$. More specifically, math achievement was more strongly correlated with Attention, Rule Breaking, and Aggression in girls than boys (girls: Attention Problems, $r = -.31$, $p < .001$; Rule Breaking, $r = -.24$, $p < .01$; Aggression, $r = -.21$, $p < .01$; boys: Attention Problems, $r = -.17$, $p < .001$; Rule Breaking, $r = -.01$, *ns*; Aggression, $r = -.01$, *ns*).

To account for group differences in variance, we also conducted the interaction analyses with standardized variables. The analyses indicated significant gender differences in Rule Breaking, $\beta = -4.44$, $t(344) = -2.43$, $p < .05$, $R^2 = .07$, and Aggression, $\beta = -3.65$, $t(293) = -2.35$, $p < .05$, $R^2 = .03$, but was nonsignificant for Attention Problems, $\beta = -1.24$, $t(304) = -0.83$, *ns*.

Math Group × Gender Differences in Math Anxiety and Psychopathology

Next, we examined gender differences in the relation between math group and levels of math anxiety or symptoms of psychopathology. ANOVAs with the factors of gender (boys, girls) and math group (MLD, LA and TD) indicated no significant interactions between gender and math achievement group across all of the CBCL subscales ($p > .07$). Similarly, there were no gender differences in the relation between math group and math anxiety, $F(2, 294) = 2.35$, $p = .10$.

Discussion

Although several studies have consistently shown that RD is associated with a host of problematic behaviors (Willcutt & Pennington, 2000), it is currently unclear whether children with MD experience similar difficulties. The current study extends previous research by examining the relation between math achievement and internalizing and externalizing behaviors in second and third graders who are at the earliest stages of math learning. In addition to analyses of overall symptoms of domain-general psychopathology, we investigated whether domain-specific anxiety was associated with math achievement. We also examined the relation among math achievement, math anxiety, and internalizing and externalizing behaviors in two distinct groups of children with math difficulties.

Externalizing Symptoms and Math Achievement

The results of the dimensional analyses supported our hypothesis that math achievement is negatively and significantly correlated with some aspects of externalizing behaviors. Children in second and third grade who have difficulties in math tend to exhibit higher levels of attention problems (Cohen's d = 0.56) and concurrent social difficulties (Cohen's d = 0.85). Between-group comparisons also indicated that children with MLD exhibited more social and attention problems than children in the TD group. Moreover, group differences approached significance for rule-breaking and aggressive behaviors, suggesting that future studies should continue to examine whether children with math difficulties may also be at risk for these more severe externalizing behavioral problems. Overall, these results suggest that children who are at the lowest levels of math achievement may also be at greater risk the development of ADHD and social problems and potentially conduct disorder or oppositional defiant disorder.

Many theoretical models have been proposed to attempt to account for the high comorbidity among childhood developmental disorders (Neale & Kendler, 1995). Some possible explanations include shared underlying liabilities, causality (wherein having one disorder may cause another), or that the disorders are independent and co-occur by chance. With respect to RD, for example, Willcutt and Pennington (2000) suggest that genetic vulnerabilities may be responsible for the comorbidity between RD and externalizing disorders. Research has also suggested that there are links between the core symptoms of ADHD and math difficulties (Zentall & Ferkis, 1993). Zentall and Ferkis (1993) found that hyperactive adolescents also tended to have poor organizational skills, leading to lower math and general classroom achievement (Zentall, Harper, & Stormont-Spurgin, 1993). Also, middle-school children with specific cognitive styles of inattention and disorganization characteristic of ADD and ADHD exhibited slower performance during math problem solving (Zentall & Ferkis, 1993). Additional research is necessary to further examine the underlying causes of comorbidity between MD and externalizing disorders.

Internalizing Symptoms and Math Achievement

There were no significant associations between math achievement and any of the domain-general measures of internalizing behaviors, which included trait anxiety, depression, withdrawal, and somatic complaints. These findings are consistent with previous reports by

Auerbach and colleagues (2008) and Shalev and colleagues (1995). Consequently, the data did not support our hypotheses that levels of internalizing symptoms would differ as a function of math achievement group.

Math Anxiety in MLD, LA, and TD Groups

In contrast to results for the measures of domain-general internalizing symptoms, the data supported our hypothesis that math-specific anxiety would be negatively and significantly related to math achievement. The MLD and LA groups showed significantly higher levels of math anxiety than the TD group, and the negative relation between math anxiety and math achievement remained significant when FSIQ and overall anxiety and depression were controlled.

To our knowledge, this is the first study to show that math anxiety differs significantly between math achievement groups, with TD children having significantly less math anxiety than MLD and LA children. The finding that LA children do not differ from MLD children on math anxiety has several implications. First, below-average levels of math achievement are associated with higher levels of math anxiety even among individuals who do not meet criteria for MLD. Second, the fact that math anxiety can interfere with one's ability to undertake and perform basic computational processes through adulthood (Ashcraft, 1995) suggests that math anxiety may adversely affect the development of math skills in second and third grade children with math disabilities. It is striking that both groups showed math anxiety, although neither group had "clinically" elevated CBCL anxiety scores.

Gender Differences in Relation to Math Achievement and Psychopathology

We also examined whether rates of externalizing and internalizing behaviors in the math achievement groups differ as a function of gender. Although prior research on gender differences in math have focused on factors such as stereotype threat (Spencer, Steele, & Quinn, 1998) and teacher's math anxiety (Beilock, Gunderson, Ramirez, & Levine, 2010), we found that gender differences approached significance in the relation between math anxiety and math achievement. However, the relation between math achievement and multiple CBCL measures was different in boys and girls. It is surprising that our data indicated that girls who are struggling in math may tend to have higher levels of externalizing behavioral problems, notably inattention, rule breaking, and aggression, than boys who struggle in math.

Our findings suggest that math and reading may have a differential relation to behavior in boys and girls. Within the extant RD literature, Willcutt and Pennington (2000) found significant differences between boys and girls in externalizing and internalizing behaviors; externalizing behaviors were more closely tied to reading in boys than girls whereas the opposite was true for internalizing behaviors. In combination with our current results, these findings suggest that low reading achievement is more strongly associated with problematic behavior in boys, whereas low math scores are more highly associated with these behaviors in girls. It is unclear whether this differential relationship is the result of the content of the academic materials themselves, differences in underlying cognitive and genetic vulnerabilities between the genders, or some other factor. Additional research is needed to replicate and examine the cause of these differential relations.

Comparison With Previous Studies of RD

Consistent with previous studies of RD (Hinshaw, 1992; Willcutt & Pennington, 2000), our results indicate that children with lower math achievement are more likely to exhibit a range of problematic externalizing behaviors. Previous studies have shown that RD is often comorbid with ADHD (Willcutt & Pennington, 2000), oppositional defiant disorder and conduct disorder (Martin, Levy, Pieka, & Hay, 2006), in part because these disorders have common genetic influences (Martin et al., 2006) and shared underlying neuropsychological deficits (Hinshaw, 1992; Willcutt, Pennington, Olson, Chhabildas, & Hulslander, 2005). Because of high levels of comorbidity between MD and RD, one possibility is that the association among MD, social and attention problems, and math anxiety is being driven by low reading ability. However, given that our sample had a mean reading score of half a standard deviation above average, we can infer that our results are at least partially independent from the effects of low reading scores. Nonetheless, this is an area of particular interest, and future research should examine the relation between comorbid reading and math disabilities and psychopathology.

In contrast to the convergent findings for the relation between externalizing disorders and RD and MD, our data indicate no such parallels for domain-general internalizing behaviors. Although children with MD and low math achievement in our study did not show elevated levels of internalizing behaviors, several previous studies of RD have reported higher levels of internalizing behaviors, including depression and anxiety (Maag & Reid, 2006). Several explanations have been offered as to why children with learning disabilities, including RD, tend to develop depression or anxiety. Willcutt and Pennington (2000) suggest that the children who are struggling with reading may experience elevated levels of stress when faced with academic work. In addition, according to Tomblin and Zhang (2000), children with RD are more likely to have language and social skills deficits, which may in turn have a negative impact on their socioemotional well-being. Given the heavy emphasis schools and teachers place on reading and its necessary role in school (Hinshaw, 1992), children who have difficulty specifically with reading may be especially prone to social pressures. In contrast, we may speculate that the impact of difficulties in math may be more circumscribed, particularly in younger age groups when reading development is emphasized so strongly. This may help to explain why math difficulties are only weakly related to general internalizing symptoms but are significantly associated with elevated levels of math-specific anxiety.

Limitations and Future Directions

Because of the cross-sectional design of the study, we were unable to examine the causal relationship among math achievement, externalizing behaviors, and math anxiety. Ongoing longitudinal studies can help clarify the directional and causal nature of math anxiety, math achievement, and behavioral problems (e.g., Hart et al., 2010) as well as cognitive and behavioral factors that contribute to risk for the development of MD. Similar to other previous studies, our study relied on a mixture of parent-report and child self-report measures (i.e., the CBCL for anxiety and SEMA for math anxiety). Future research may want to examine how multiple sources of report may affect findings, or repeat the study through the use of only child reports.

Although our sample had a prevalence rate of MD similar to those reported in the literature (American Psychiatric Association, 2000; Badian, 1983; Geary, 2006; Gross-Tsur et al., 1993, 1996), our MLD group consisted of only 15 children. We addressed the effects of potential differences in variance between the groups by using analyses that were robust to violations in homogeneity of variance. All of the findings remained unchanged. Only one finding—gender differences in the relationship between math achievement and attention problems—became nonsignificant. Furthermore, the fact that the sample was drawn from the general population avoids potential bias toward more severe cases when participants are recruited from a sample that has been referred for clinical evaluation. Therefore, our results are likely to be generalizable to the overall population of individuals with MD.

The current results suggest several important directions for future research. First, it is important to investigate the differential role of attention and math anxiety in MD and how they contribute independently to math learning. Additional research is also needed to examine gender differences in the relation between externalizing and internalizing behaviors on one hand and math and reading achievement on the other.

Conclusion

The current study extends previous research by examining domain-general internalizing and externalizing behavioral problems and domain-specific math anxiety in three distinct groups of children in the second and third grades, an important period for the development of foundational mathematical abilities. Our results suggest that children with math difficulties exhibit higher rates of externalizing behavioral problems as well as math anxiety at these earliest stages of math learning. These findings suggest that educators and clinicians assessing MD and other learning disorders should also carefully screen for comorbid psychopathology. These findings also underscore the need for additional research on the effects of math anxiety and attentional problems on math performance and skill acquisition in young children with MD.

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References

Achenbach, TM. Manual for the Child Behavior Checklist/4-18 and 1991 profile. University of Vermont, Department of Psychiatry; Burlington: 1991.

Achenbach TM, Dumenci L, Rescorla LA. DSM-oriented and empirically based approaches to constructing scales from the same item pools. Journal of Clinical Child & Adolescent Psychology. 2003; 32(3):328–340. doi:10.1207/S15374424JCCP3203_02. [PubMed: 12881022]

Achenbach TM, Edelbrock CS. The classification of child psychopathology: A review and analysis of empirical efforts. Psychological Bulletin. 1978; 85(6):1275–1301. [PubMed: 366649]

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed., text rev. Author; Washington, DC: 2000. doi:10.1176/appi.books.9780890423349

Ashcraft MH. Cognitive psychology and simple arithmetic: A review and summary of new directions. Mathematical Cognition. 1995; 1:3–34.

Ashcraft MH, Kirk EP. The relationships among working memory, math anxiety, and performance. Journal of Experimental Psychology–General. 2001; 130(2):224–237. [PubMed: 11409101]

Auerbach JG, Gross-Tsur V, Manor O, Shalev RS. Emotional and behavioral characteristics over a six-year period in youths with persistent and nonpersistent dyscalculia. Journal of Learning Disabilities. 2008; 41(3):263–273. doi:10.1177/0022219408315637. [PubMed: 18434292]

Badian, NA. Dyscalculia and nonverbal disorders of learning. In: Myklebust, HR., editor. Progress in learning disabilities. Vol. Vol. 5. Stratton; New York, NY: 1983. p. 235-264.

Beilock SL, Gunderson EA, Ramirez G, Levine SC. Female teachers' math anxiety affects girls' math achievement. Proceedings of the National Academy of Sciences USA. 2010; 107(5):1860–1863. doi:10.1073/pnas.0910967107.

Duncan GJ, Dowsett CJ, Claessens A, Magnuson K, Huston AC, Klebanov P, Japel C. School readiness and later achievement. Developmental Psychology. 2007; 43(6):1428–1446. doi: 10.1037/0012-1649.43.6.1428. [PubMed: 18020822]

Feshbach ND, Feshbach S. Affective processes and academic achievement. Child Development. 1987; 58(5):1335–1347. [PubMed: 3665649]

Geary DC. Mathematical disabilities: Cognitive, neuropsychological, and genetic components. Psychological Bulletin. 1993; 114(2):345–362. [PubMed: 8416036]

Geary, DC. Dyscalculia at an early age: Characteristics and potential influence on socio-emotional development. In: Tremblay, RE.; Barr, RG.; Peters, RD., editors. Encyclopedia on early childhood development. Centre of Excellence for Early Childhood Development; Montreal, Canada: 2006. p. 1-4.

Geary DC, Hamson CO, Hoard MK. Numerical and arithmetical cognition: A longitudinal study of process and concept deficits in children with learning disability. Journal of Experimental Child Psychology. 2000; 77:236–263. [PubMed: 11023658]

Geary DC, Hoard MK, Byrd-Craven J, Nugent L. Development of number line representations in children with mathematical learning disability. Developmental Neuropsychology. 2008; 33(3): 277–299. [PubMed: 18473200]

Greenham SL. Learning disabilities and psychosocial adjustment: A critical review. Child Neuropsychology. 1999; 5(3):171–196.

Gross-Tsur V, Manor O, Shalev RS. Developmental dyscalculia, gender, and the brain. Archives of Disease in Childhood. 1993; 68(4):510–512. [PubMed: 7684890]

Gross-Tsur V, Manor O, Shalev RS. Developmental dyscalculia: Prevalence and demographic features. Developmental Medicine & Child Neurology. 1996; 38(1):25–33. [PubMed: 8606013]

Hart SA, Petrill SA, Willcutt E, Thompson LA, Schatschneider C, Deater-Deckard K, Cutting LE. Exploring how symptoms of attention-deficit/hyperactivity disorder are related to reading and mathematics performance: General genes, general environments. Psychological Science. 2010; 21(11):1708–1715. doi:10.1177/0956797610386617. [PubMed: 20966487]

Hinshaw SP. Academic underachievement, attention deficits, and aggression: Comorbidity and implications for intervention. Journal of Consulting and Clinical Psychology. 1992; 60(6):893–903. [PubMed: 1460150]

Leadbeater BJ, Kuperminc GP, Blatt SJ, Hertzog C. A multivariate model of gender differences in adolescents' internalizing and externalizing problems. Developmental Psychology. 1999; 35(5): 1268–1282. [PubMed: 10493653]

Lewinsohn PM, Gotlib IH, Lewinsohn M, Seeley JR, Allen NB. Gender differences in anxiety disorders and anxiety symptoms in adolescents. Journal of Abnormal Psychology. 1998; 107(1): 109–117. [PubMed: 9505043]

Lewis C, Hitch GJ, Walker P. The prevalence of specific arithmetic difficulties and specific reading difficulties in 9-year-old to 10-year-old boys and girls. Journal of Child Psychology and Psychiatry and Allied Disciplines. 1994; 35(2):283–292.

Ma X. Meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. Journal for Research in Mathematics Education. 1999; 30(5):520–540.

Maag JW, Reid R. Depression among students with learning disabilities: Assessing the risk. Journal of Learning Disabilities. 2006; 39(1):3–10. [PubMed: 16512079]

Martin NC, Levy F, Pieka J, Hay DA. A genetic study of attention deficit hyperactivity disorder, conduct disorder, oppositional defiant disorder and reading disability: Aetiological overlaps and implications. International Journal of Disability, Development & Education. 2006; 53(1):21–34. doi:10.1080/10349120500509992.

Mazzocco MM. Introduction: Mathematics ability, performance, and achievement. Developmental Neuropsychology. 2008; 33(3):197–204. doi:10.1080/87565640801982270. [PubMed: 18473196]

Mazzocco MMM, Myers GF. Complexities in identifying and defining mathematics learning disability in the primary school-age years. Annals of Dyslexia. 2003; 53:218–253. [PubMed: 19750132]

Murphy MM, Mazzocco MMM, Hanich LB, Early MC. Cognitive characteristics of children with mathematics learning disability (MLD) vary as a function of the cutoff criterion used to define MLD. Journal of Learning Disabilities. 2007; 40(5):458–478. doi: 10.1177/0022219407040005090117915500. [PubMed: 17915500]

Neale MC, Kendler KS. Models of comorbidity for multifactorial disorders. American Journal of Human Genetics. 1995; 57:935–953. [PubMed: 7573055]

Penner AM, Paret M. Gender differences in mathematics achievement: Exploring the early grades and the extremes. Social Science Research. 2008; 37(1):239–253. doi:10.1016/j.ssresearch. 2007.06.012.

Polanczyk G, de Lima MS, Horta BL, Biederman J, Rohde LA. The worldwide prevalence of ADHD: A systematic review and metaregression analysis. American Journal of Psychiatry. 2007; 164(6): 942–948. doi:10.1176/appi.ajp.164.6.94217541055. [PubMed: 17541055]

Ramirez G, Gunderson EA, Levine SC, Beilock SL. Math anxiety, working memory and math achievement in early elementary school. Journal of Cognition and Development. (in press).

Reigosa-Crespo V, Valdes-Sosa M, Butterworth B, Estevez N, Rodriguez M, Santos E, Lage A. Basic numerical capacities and prevalence of developmental dyscalculia: The Havana Survey. Developmental Psychology. 2012; 48(1):123–135. doi:10.1037/a002535621910533. [PubMed: 21910533]

Richardson FC, Suinn RM. Mathematics Anxiety Rating Scale—Psychometric data. Journal of Counseling Psychology. 1972; 19(6):551–554.

Shalev RS, Auerbach J, Gross-Tsur V. Developmental dyscalculia behavioral and attentional aspects: A research note. Journal of Child Psychology and Psychiatry. 1995; 36(7):1261–1268. [PubMed: 8847384]

Spencer SJ, Steele CM, Quinn DM. Stereotype threat and women's math performance. Journal of Experimental Social Psychology. 1998; 35(1):4–28.

Tomblin JB, Zhang X. The association of reading disability, behavioral disorders, and language impairment among second-grade children. Journal of Child Psychology and Psychiatry and Allied Disciplines. 2000; 41(4):473–482.

U.S. Department of Education. National Center for Education Statistics. The condition of education 2007 (NCES 2007– 064). Government Printing Office; Washington, DC: 2007.

Vaughn S, Zaragoza N, Hogan A, Walker J. A four-year longitudinal investigation of the social skills and behavior problems of students with learning disabilities. Journal of Learning Disabilities. 1993; 26(6):404–412. [PubMed: 8354944]

Wechsler, D. Wechsler Abbreviated Scale of Intelligence. Harcourt; San Antonio, TX: 1999.

Wechsler, D. Wechsler Individual Achievement Test. 2nd ed. Psychological Corporation; San Antonio, TX: 2005.

White JL, Moffitt TE, Silva PA. Neuropsychological and socio-emotional correlates of specific-arithmetic disability. Archives of Clinical Neuropsychology. 1992; 7(1):1–16. [PubMed: 14589674]

Wigfield A, Meece JL. Math anxiety in elementary and secondary-school students. Journal of Educational Psychology. 1988; 80(2):210–216.

Willcutt EG, Pennington BF. Psychiatric comorbidity in children and adolescents with reading disability. Journal of Child Psychology and Psychiatry. 2000; 41(8):1039–1048. [PubMed: 11099120]

Willcutt EG, Pennington BF, Olson RK, Chhabildas N, Hulslander J. Neuropsychological analyses of comorbidity between reading disability and attention deficit hyperactivity disorder: In search of the common deficit. Developmental Neuropsychology. 2005; 27(1):35–78. doi:10.1207/s15326942dn2701_3. [PubMed: 15737942]

Willcutt EG, Petrill SA, Wu SS, Boada R, DeFries JC, Olson RK, Pennington BF. Implications of comorbidity between reading disability and math disability: Academic, social, and neuropsychological functioning. Journal of Learning Disabilities. (in press).

Wu S, Barth M, Amin H, Malcarne V, Menon V. Mathematics anxiety in 2nd and 3rd grades and its relation to math achievement. Frontiers in Developmental Psychology. 2012; Vol. 3:1–11.

Wu SS, Meyer ML, Maeda U, Salimpoor V, Tomiyama S, Geary DC, Menon V. Standardized assessment of strategy use and working memory in early mental arithmetic performance. Developmental Neuropsychology. 2008; 33(3):365–393. doi:10.1080/87565640801982445. [PubMed: 18473204]

Young CB, Wu S, Menon V. Neurodevelopmental basis of math anxiety. Psychological Science. 2012; 23(5):492–501. [PubMed: 22434239]

Zentall SS, Ferkis MA. Mathematical problem-solving for youth with ADHD, with and without learning-disabilities. Learning Disability Quarterly. 1993; 16(1):6–18.

Zentall SS, Harper GW, Stormont-Spurgin M. Children with hyperactivity and their organizational abilities. Journal of Educational Research. 1993; 87(2):112–117.

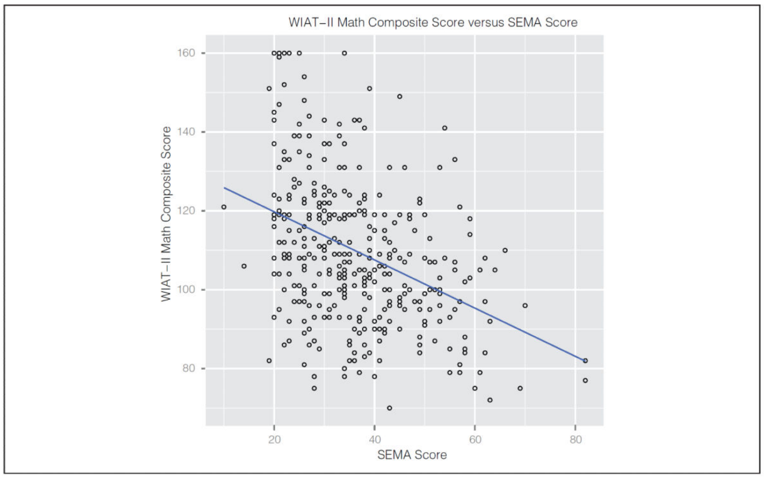

Figure 1.

Math achievement (WIAT-II Math Composite) was significantly correlated with math anxiety, β = −.38, $t(357) = -7.73$, $p < .001$, $R^2 = .14$, even after controlling for CBCL Anxiety/Depression subscale, β = −.37, $t(335) = -7.14$, $p < .001$, $R^2 = .14$.

Note. CBCL = *Child Behavior Checklist;* SEMA = *Scale for Early Mathematics Anxiety;* WIAT-II = Wechsler Individual Achievement Test, Second Edition.

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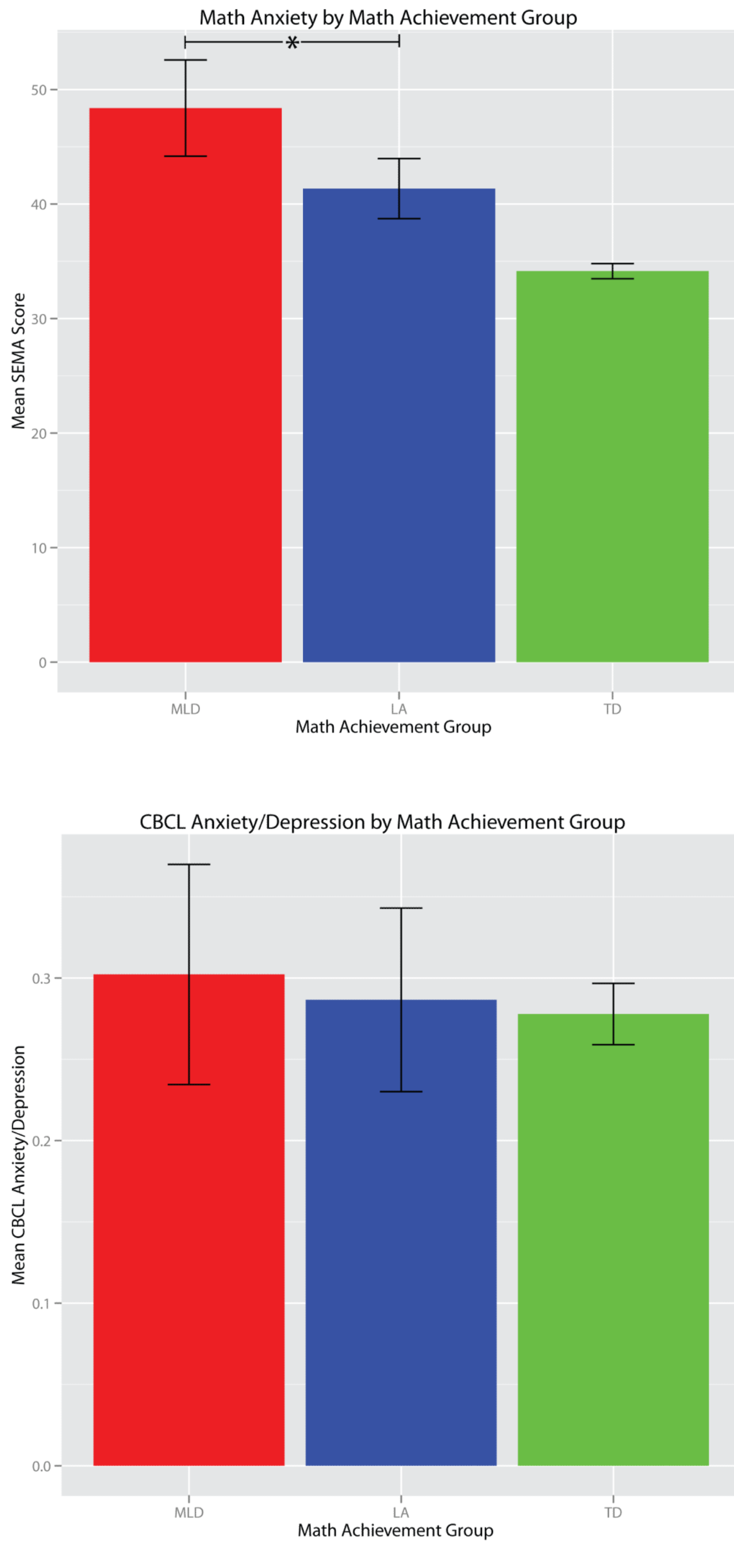

Figure 2.

(a) Math anxiety was significantly different among the three math achievement groups, $F(2, 296) = 13.29$, $p < .001$. Post hoc Tukey analyses indicated that the MLD and LA groups had significantly higher levels of math anxiety than the TD group. (b) CBCL Anxiety and Depression did not differ significantly among the three math achievement groups, $F(2, 296) = 0.20$, *ns*.

Note. CBCL = *Child Behavior Checklist*; LA = low achieving; MLD = math learning disabled; TD = typically developing.

Table 1

Comparisons of Means and Variances of the Three Groups on Measures of Math Achievement, Math Anxiety, and CBCL Subscales.

	MLD (*n* = 15)		LA (*n* = 28)		TD (*n* = 256)				
Measure	***M***	***SD***	***M***	***SD***	***M***	***SD***	***F***	***df***	**Levene Statistic**
SEMA	46.88_b	17.38	41.45_b	14.07	34.34_a	10.90	13.29***	2, 317	8.12***
WIAT-II Math Composite	75.18_c	9.06	85.39_b	2.17	117.46_a	15.43	127.72***	2, 327	23.25***
FSIQ	91.53_b	11.91	97.77_b	9.44	115.92_a	15.98	37.09***	2, 322	6.24**
CBCL Anxiety/Depression	0.33_a	0.26	0.29_a	0.31	0.28_a	0.31	0.20	2, 310	0.21
CBCL Withdrawal/Depression	0.27_a	0.44	0.20_a	0.22	0.18_a	0.29	0.64	2, 310	0.71
CBCL Somatic Problems	0.17_a	0.20	0.15_a	0.17	0.13_a	0.23	0.48	2, 310	0.01
CBCL Social Problems	0.52_b	0.42	0.29_a	0.31	0.24_a	0.31	7.55**	2, 310	2.11
CBCL Thought Problems	0.16_a	0.19	0.16_a	0.14	0.18_a	0.20	0.13	2, 310	0.72
CBCL Attention Problems	0.80_b	0.67	0.67_a	0.47	0.46_a	0.43	6.05**	2, 310	3.52*
CBCL Rule Breaking	0.16_a	0.20	0.13_a	0.16	0.10_a	0.14	1.43	2, 310	1.84
CBCL Aggression	0.38_a	0.37	0.27_a	0.29	0.26_a	0.30	1.07	2, 310	1.46
CBCL Other Problems	0.26_a	0.27	0.25_a	0.23	0.25_a	0.21	0.01	2, 310	0.26

Note. CBCL = *Child Behavior Checklist*; FSIQ = full-scale IQ; LA = low achieving; MLD = math learning disabled; SEMA = *Scale for Early Mathematics Anxiety*; TD = typically developing; WIAT-II = *Wechsler Individual Achievement Test, Second Edition*. Means with no common subscripts are significantly different ($p < .05$). F values with a superscript of 1 approached significance at $p = .07$ level. Significant Levene statistic indicates significant differences in group variances. For the dependent variables with significant Levene statistics, the Brown–Forsythe statistic and degrees of freedom are as follows: SEMA, Brown–Forsythe = 7.43**, *df* = 2, 37.21; WIAT-II Math Composite, Brown–Forsythe = 457.00***, *df* = 2, 35.50; FSIQ, Brown–Forsythe = 68.77***, *df* = 2, 47.30; CBCL Attention Problems, Brown–Forsythe = 3.88*, *df* = 2, 29.4.

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

Table 2

Relation Among Math Achievement, Math Anxiety, and CBCL Internalizing and Externalizing Behaviors.

Measure	1. WIAT-II Math Composite	2. SEMA	3. WASI FSIQ
1. WIAT-II Math Composite	—		
2. SEMA	−.38***	—	
3. WASI FSIQ	.60***	−.37***	—
4. CBCL Anxiety/ Depression	−.05	.12*	−0.08
5. CBCL Withdraw/ Depression	−.03	.23***	−0.05
6. CBCL Somatic Problems	−.10	.10	−.18**
7. CBCL Social Problems	−.17***	.23***	−.23***
8. CBCL Thought Problems	−.02	.08	−0.03
9. CBCL Attention Problems	−.22***	.19***	−.20***
10. CBCL Rule Breaking	−.11	.08	−.19***
11. CBCL Aggression	−.10	.16**	−.17**
12. CBCL Other Problems	−.01	.13*	.10

Note. CBCL = *Child Behavior Checklist*; FSIQ = full-scale IQ; SEMA = *Scale for Early Mathematics Anxiety*; WASI = *Wechsler Abbreviated Scale of Intelligence*; WIAT-II = *Wechsler Individual Achievement Test, Second Edition*.

*p < .05. **p < .01. ***p < .001.