MATERNAL INVOLVEMENT IN MATH HOMEWORK AND ITS INFLUENCE ON ADOLESCENTS' MATH OUTCOMES DURING THE TRANSITION TO MIDDLE SCHOOL: WHO PROFITS FROM HOMEWORK ASSISTANCE?

by

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A Dissertation Submitted to the Faculty of

The Charles E. Schmidt College of Science

In Partial Fulfillment of the Requirements for the Degree of

Doctor of Philosophy

Florida Atlantic University

Boca Raton, FL

August 2017

ProQuest LLC.
789 East Eisenhower Parkway
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This dissertation was prepared under the direction of the candidate's dissertation advisor, Dr. Brett Laursen, Department of Psychology, and has been approved by the members of his supervisory committee. It was submitted to the faculty of the Charles E. Schmidt College of Science and was accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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ACKNOWLEDGEMENTS

The author wishes to thank Jill Denner, Seow Ling Ong, Eloy Ortiz, Lara Triona and their colleagues at ETR for their diligence in collecting the data used in the current study, and for answering the author's questions throughout the preparation of this dissertation. The author also wishes to thank his fellow lab colleagues for their assistance.

The author is also very appreciative of the guidance and feedback provided by dissertation committee members David Bjorklund, Erika Hoff, Mike Maniaci, and Shmuel Shulman. Their advice was essential in forming the scope of the current study.

Finally, the author is deeply thankful to his graduate advisor Brett Laursen. Brett's singular expertise, insight, and mentorship were essential in his personal and professional growth. This author is profoundly grateful for his tutelage.

ABSTRACT

Author:	Daniel J. Dickson
Title:	Maternal Involvement in Math Homework and its Influence on Adolescents' Math Outcomes During the Transition to Middle School: Who Profits from Homework Assistance?
Institution:	Florida Atlantic University
Dissertation Advisor:	Dr. Brett Laursen
Degree:	Doctor of Philosophy
Year:	2017

As adolescents transition to middle school, math confidence and performance declines (Eccles et al., 1993; Lee, Statuto, & Kadar-Voivodas, 1983). These declines are typically attributed to social and maturational changes (Eccles, Lord, & Midgley, 1991; Simmons & Blyth, 1987). In this dissertation, I explore the hypothesis that low parent support for schoolwork is also responsible.

Latino-American adolescents are especially at risk for math difficulties. Maintaining adolescents' engagement and performance in math are important goals for mothers because high levels of both are requisites for many professional careers. This dissertation will focus on Latino-American families to determine if mothers' homework involvement is associated with changes in children's math-related outcomes across the transition to secondary school.

Parental involvement in math homework is assumed to mitigate declines in math performance during this transition. Cognitive models suggest that involved parents utilize scaffolding (Rogoff & Gardner, 1984) and instruction to ensure math achievement (Pomerantz & Moorman, 2010). Motivational models suggest that involved parents foster math engagement by bolstering child confidence, modeling management strategies, and promoting values that encourage children to work hard (Grolnick & Slowiaczek, 1994; Simpkins, Fredricks, & Eccles, 2015). However, empirical evidence in support of the importance of parents in math achievement is limited. While positive forms of involvement co-occur with better math outcomes (Bhanot & Jovanovic, 2005; Rice et al., 2013), no studies have examined such associations longitudinally. Children who are uninterested in math may be more susceptible to the effects of parental homework involvement because they lack internal motivation for mastery that underlies performance in other children.

The present study examines the extent to which Latina-American mothers' involvement in math homework is effective in preventing declines in child math-related outcomes (i.e., perceptions of math ability, etc) during the transition to middle school. Child math interest was postulated to moderate this association. Results indicated that low maternal homework involvement predicts worsening child math-related outcomes, but only for children who were intrinsically uninterested in math.

The findings hold important implications for parents, who must work to ensure that they remain engaged in their children's activities, especially if children appear uninterested in math.

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INTRODUCTION

Developmental Shifts in Math Performance Across the Transition to Middle School

Mathematics matters. Students who are unable to master math are less likely to finish high school and attend college, which invariably limits employment opportunities and job quality (Buchmann & Dalton, 2002; Kieffer, Marinell, & Stephenson, 2011; Murnane, Willett, & Levy, 1995; Rivera-Batiz, 1992). Understandably, great effort has been placed on ensuring that students complete school with the essential math skills needed to enter the work force or pursue higher education. However, it is worth noting that the risk for math difficulties is not spread evenly over student populations. Transitional periods have been identified which correspond to worsening math outcomes among children and adolescents. Cultural and socioeconomic factors also increase the risks of poor math performance. In particular, Latino-American children are at special risk for math difficulties.

Mothers' activities with their children are important to their math performance in school. Past research has found positive associations between maternal involvement and math outcomes in children, however findings are inconsistent, perhaps due to a failure to investigate moderators. Children's interest in math may be a key moderator not previously considered. Children who are intrinsically uninterested in math likely have unfulfilled psychological needs for competency in math. This presents an opportunity for mothers who, by being involved in children's homework, can promote positive math-related outcomes for their children. In contrast, uninterested children with uninvolved

mothers do not have anyone pushing them to do better, and are ultimately left to their own devices. Consequently, math outcomes for uninterested children with uninvolved parents may worsen over the transition into middle school. In this dissertation, I examine the influence of maternal homework involvement in math on children's math related outcomes across the transition from primary to elementary school. I hypothesize that, for intrinsically uninterested children, lower levels of involvement will anticipate a worsening of math related outcomes in Latino-American children.

Risks to math performance specific to the transition to middle school. For most children, the transition from primary school to middle school is accompanied by declines in perceived academic ability and objective academic performance (Barber & Olsen, 2004; Eccles, Midgley, & Adler, 1984; Zanobini & Usai, 2002), the negative effects of which may last into high school and beyond (Eccles, Lord, Roeser, Barber, & Hernandez-Jozefowicz, 1997). Children's perceptions of ability in math, specifically, also decrease over the same period (Eccles et al., 1993; Lee et al., 1983). Observed performance in math is not immune to the negative effects of school transitions either. When compared to K-8 schools, students transitioning from a K-5 school typically score 0.12 to 0.22 SDs lower on math test scores in the 6^{th} through 8^{th} grades (Schwerdt & West, 2013).

Deficits in observed performance among students attending middle school are typically attributed to difficulties navigating structural changes to the school environment, navigating social relationships, and adjusting to diminished support from teachers (Barber & Olsen, 2004; Eccles et al., 1991; Eccles, Wigfield, Harold, & Blumenfeld, 1993). According to the stage-environment fit theory (Eccles & Midgley,

1989; Eccles et al., 1993) educational and social structures of middle school and their demands are often at a mismatch for the developmental capabilities of early adolescents, which increases the risk for negative child psychological and educational outcomes. Such demands are often rigorous. For example, children entering middle school often must adjust to meeting stricter standards of academic success, must adapt to a greater frequency of classroom-group instruction and assignments, and must face poorer quality interactions and relationships with teachers who, due to having a greater number of students, are more controlling, more distant, and less efficacious than teachers in earlier grades (Eccles & Midgley, 1989; Midgley, Feldlaufer, & Eccles, 1989). Naturally, children experiencing such troubles do not feel competent and integrated in their social surroundings. As a result, they become less motivated and interested in many academic subjects (Eccles et al., 1993). Furthermore, biological and social changes due to pubertal maturation may compound difficulties associated with the school transition (Simmons & Blyth, 1987). Early adolescence coincides with a period of growth in children's needs for autonomy, interconnectedness with peers, and identity exploration (Simmons & Blyth, 1987), which may be incongruent with the highly structured environments of many middle schools. When children are not forced to transition into secondary schools in early adolescence, the costs associated with transitioning aren't as pronounced when compared to those that are forced (Blyth, Simmons, & Cariton-Ford, 1983; Simmons & Blyth, 1987). In any case, it is well documented that many new middle school students report heightened anxiety and declining interest in school (Harter, Whitesell, & Kowalski, 1992; Harter, 1981), particularly if such transitions occur before the start of 6^{th} or 7^{th} grade.

Risks to math performance specific to Latino-American children. Latino children often report depressed levels of school achievement, high school graduation, and enrollment in college (Gándara, Larson, Mehan, & Rumberger, 1998). Differences between Latino American children and majority culture children are particularly pronounced in the area of math. Compared to Asian and European American children, Latino-American children perform worse on standardized mathematics tests, perceive math more negatively, and are less likely to enroll in advanced math courses (Clewell, Anderson, & Thorpe, 1992). Ethnic subgroup differences in math performance first become apparent in primary school, and typically worsen across adolescence (Clotfelter, Ladd, & Vigdor, 2006; Sonnenschein, Stapleton, & Benson, 2010).

Within-group variation in parental and familial characteristics and behaviors may further explain divergences in math performance for Latino-American children. Past studies have highlighted the negative effects of demographic factors such as poor English fluency of children (Civil & Planas, 2010; Witkow & Fuligni, 2011), the presence of cultural norms which limit parent-school collaboration (Anguiano, 2004; Civil & Menendez, 2011; Delgado-Gaitan, 2004), and a lack of financial and social resources among families (Altschul, 2011; Kao & Rutherford, 2007). Teachers who are less supportive and less efficacious in middle school, tend to have students with low levels of academic engagement (Goodenow, 1993; Midgley et al., 1989). However, none of these factors fully account for variance in math outcomes among Latino adolescents, suggesting that individual differences in parenting practices in the home may be responsible. Below I will discuss how parental involvement in math homework among Latino families may be a contributing factor for children's math performance.

The Importance of Maternal Involvement in Math Homework to Child Math Performance

Most parents believe that by providing children with homework assistance, they help promote positive child math-related outcomes. Not surprisingly, according to national surveys, parental involvement in children's academic lives is common; across social classes and ethnic groups, roughly 70% of parents assist children with homework at least once a week (U.S. Department of Education, 2006). However, empirical findings in support of the assertion that parents' assistance is beneficial are inconsistent. Additionally, relatively few studies have examined the influence of maternal homework assistance on child academic outcomes in Latino-American families. It is also unclear if Latino-American parents who are involved in children's math homework promote positive math related outcomes.

Conceptual models. Two conceptual models will be reviewed that describe how parents can directly and indirectly foster academic engagement and observed performance in children through involvement in homework. The first describes how parents socialize cognitive strategies and skills that foster children's academic achievement. The second describes how parents socialize motivation to do well in school.

Parent socialization of child cognitive skills. According to the skills development model (see Pomerantz & Moorman, 2010), when parents become involved in children's academic activities, they socialize cognitive skills and strategies that foster intellectual development and promote academic achievement. Parents socialize two types of skills-related resources: Cognitive skills, such as logical reasoning and problem solving, and metacognitive skills, such as self-monitoring, organization, and regulation.

In regards to the former, parents may help children form and test ideas (hypotheses), and engage in critical thinking skills. In regards to the latter, parents may engage in such practices as teaching children mnemonic techniques to facilitate the memorization of information, helping children break down complicated problems into smaller and easier talks, and encouraging children to routinely check their work.

Information conveyed during skill-oriented interactions is not unidirectional; parents often obtain useful information about what children are learning in school, and the extent of their current abilities (Baker & Stevenson, 1986). Parents then use scaffolding techniques to facilitate child learning, especially in areas where it is most needed (Rogoff & Gardner, 1984). Sometimes parents who are not completely familiar with an academic subject can still provide children with opportunities to learn, if they can engage in joint practice activities (Sénéchal & LeFevre, 2002).

Socialization of academic motivation. According to the motivation development model (Epstein, 1988; Hill & Taylor, 2004), by engaging in academically involved parenting practices, parents convey to children the value and importance of school success. In contrast to the socialization of cognitive skills, this model mainly pertains to the manner in which parents encourage children to strive to do well in school. Put simply, when parents work with children on their schoolwork, they often implicitly or explicitly emphasize the importance of school to children. For example, the latter can occur when parents tell students how their homework is directly related to their ability to work in the family business or when they tie current lessons to possible benefits in everyday situations in the children's lives (Hill & Tyson, 2009). Eventually, children internalize academic values. Internal motivations to succeed follow as children become engaged in

school (Ginsburg, Bempechat, & Chung, 1992; Grolnick, Ryan, & Deci, 1991; Grolnick & Slowiaczek, 1994).

There are multiple paths to the socialization of academic motivation. First, parents who utilize effective motivational strategies when helping children foster academic self-efficacy. For example, parents who are familiar with academic assignments are well positioned to assist children in completing such assignments, thereby bolstering children's confidence (Grolnick & Slowiaczek, 1994). Second, consistent with social learning theory, parents who engage in academic activities such as reading and math serve as models for similar behavior in children (Bandura, 1986, Simpkins et al., 2015). In support of this notion, Grolnick and Slowiaczek (1994) propose that parental involvement in schoolwork provides opportunities for parents to model beneficial management techniques that children need to overcome scholastic obstacles. Third, involved parents have more opportunities to shape children's motivational beliefs and attitudes about educational institutions and their future academic plans when compared to non-involved parents.

The socialization of cognitive skills and academic motivation are often interconnected. According to Eccles (1993), helping children with homework provides parents with opportunities to implement multiple socialization techniques such as role modeling, scaffolding, encouragement, and material support, even if they all occur in a single session. One or more of these techniques can promote positive child outcomes depending on each child's specific needs.

Empirical evidence. There is considerable evidence to support each of the above theories of socialization. However, findings explicitly linking parent homework

involvement to child academic performance is much less consistent. Therefore, I will first conduct a brief review of findings in support of the positive benefits of the socialization of academic motivation and cognitive skills. Then, I will conduct a more detailed review of major studies investigating links between parental homework involvement and child academic outcomes. Methodological confounds that may account for inconsistent or contrary findings will be considered.

Socialization of cognitive and motivational skills. There are numerous studies that find evidence that parents effectively socialize important cognitive and motivational skills. Several studies have found that joint parent-child activities have been linked to greater activity structuring and scaffolding (Grolnick et al.., 1991; Rogoff, 1990), and child math knowledge and fluency (LeFevre et al., 2009). Parents, by simply being involved in children's schoolwork or activities, convey to children that they value their children's academic and intellectual abilities, and socialize the notion that doing well in school is a goal worth striving for (Walker, Hoover-Dempsey, Whetsel, & Green, 2004). Children who find a sense of security with their parents tend to rely on them more, possibly as a source of encouragement, in order to remain motivated and focused in school (Ryan et al., 1994). In addition, secure relationships with parents may promote secure relationships with teachers, which may foster students' receptivity to school lessons (Ryan et al., 1994).

General academic performance. Past empirical investigations tend to focus on identifying more direct links between parental homework involvement and general academic performance, with the implication that positive associations represent motivational or cognitive socialization. However, relatively little is known about

maternal influence on performance in specific subjects, such as mathematics. Nevertheless, such studies can illuminate potential casual mechanisms that are relevant for the acquisition of math skills. Furthermore, studies investigating parental effects on children's general academic performance can illustrate many of the difficulties and limitations relevant to an investigation of maternal influences on math-related outcomes.

Empirical evidence for links between parental involvement in homework and children's academic performance are inconsistent (Pomerantz, Moorman, & Litwack, 2007). In the early literature, a meta-analysis that pooled results from correlational studies found that the relationship between the two varies a fair amount (r = -.22 to .40; Cooper, 1989). Since then, while individual studies and meta-analyses have added some clarity to this issue, due to differences in methodologies and samples employed, there remains little consensus regarding how parental involvement fosters positive child academic outcomes.

Several methodological limitations have been proposed to be responsible for the inconsistent results. Two major issues are prominent. First, most studies have relied on cross-sectional data, which makes it impossible to determine the direction of effects. As a consequence it is difficult to determine if parental involvement helps or hurts children. For example, a negative correlation between parental involvement and child academic performance could be interpreted in multiple ways. It may suggest that higher parental involvement interferes with children's academic achievement, or it may imply that parents increase their level of involvement as a response to children's poor performance. Second, measures of parental homework involvement vary across studies (Fan & Chen, 2001). Associations between homework involvement and child academic achievement

tend to be evident when autonomy supportive strategies, but when not controlling strategies, are measured (Chen & Stevenson, 1999; Cooper, Lindsay, & Nye, 2000; Gonida & Cortina, 2014; Ng, Kenney-Benson, & Pomerantz, 2004; Patall, Cooper & Robinson, 2008). In some cases, seemingly positive forms of homework involvement such as monitoring (Patall et al., 2008), direct involvement (Cooper et al., 2000), and the checking of homework answers (Desimone, 1999), are negatively associated with child academic outcomes. However, because previous levels of child academic performance were not controlled for in such studies, it is difficult to determine if these relationships represent harmful parent driven effects. Given these issues, it is not surprising that null results sometimes emerge in individual studies (Barnard, 2004; Halle, Kurtz-Costes, & Mahoney, 1997; Levin et al., 1997) and in meta-analyses that pool results across studies that employ different methodologies, measures, and samples (Cooper, 1989, Hill & Tyson, 2009; Patall et al., 2008).

Fortunately, findings from longitudinal studies help to address previous ambiguities found in correlational studies, and can better illuminate which specific forms of parental involvement are more beneficial when compared to others. For example, one longitudinal study found that low initial child academic performance predicted increases in homework involvement over time, suggesting that the negative concurrent associations to emerge from previous studies was a product of parental responsiveness to child needs (Silinskas, Niemi, Lerkkanen, & Nurmi, 2013). Another longitudinal study determined that higher levels of parental intrusiveness, previously thought to be unilaterally harmful to children, was associated with longitudinal increases in child academic performance (Pomerantz & Eaton, 2001). However, in the broader context, such benefits were only

moderate; children demonstrating such increases failed to reach the same performance levels of children with less intrusive parents. Importantly, one study found that the type of homework involvement predicted differing trajectories of academic performance (Moroni, Dumont, Trautwien, Niggli, & Baeriswyl, 2015). While both the frequency of homework help and homework intrusiveness were detrimental to sixth graders' academic performance; only supportive homework assistance was linked to better academic outcomes. Consistent with this notion, after conducting an extensive review the research, Pomerantz and colleagues (2007) concluded that not all types of parental assistance are helpful; parental behaviors that support the child autonomy likely result in advantageous academic outcomes, while controlling behaviors likely led to poor performance.

Perceptions of math ability. While research investigating the relationship between parental homework involvement and child perceptions of math ability has been limited in scope, some evidence suggests that parent behaviors are an important factor. Cross-sectional studies suggest that positive forms of involvement anticipate better child outcomes, while negative forms of involvement anticipate poor outcomes. Bhanot and Jovanovic (2005) reported a negative concurrent association between parents' intrusive support (e.g., unsolicited help, monitoring, and reminding) and adolescents' perceptions of math ability. A second correlational study found a positive correlation between parents' math-related support and adolescents' perceptions of math self-efficacy (Rice et al., 2013). In each case, the concurrent nature of the research means that it is not clear if parents responded to the child's math confidence by becoming more intrusive or helpful, or if intrusiveness and helpfulness altered children's confidence in math.

A few studies have investigated longitudinal associations between parental perceptions of children's competency and children's perceptions of math ability during the transition to middle school. One study by Gniewosz, Eccles, and Noack (2012) found that when American children transition into middle school in the seventh grade, their perceptions of math ability (i.e., math self-concept) were both unstable, and decreased over time. Furthermore, variation in changes in children's perceptions of math ability was linked to parental perceptions of the children's competency. In other words, children appeared to rely more on parental perceptions to form their own perceptions of their ability in math at a time when they were less sure of the environment around them. A second study by the same authors found that parental perceptions of German and American children's competency mediated the relationship between their grades and their perceptions of math ability (i.e., math self-concept), suggesting that parental beliefs, possibly conveyed directly or indirectly when parents are involved with homework, are important sources of feedback for children (Gniewosz, Eccles, & Noack, 2015). However, only for American children was there a transition to middle school over the course of the study. Furthermore, because parental involvement in homework was assessed in neither study, additional research is needed to determine the exact mechanisms underlying these relationships.

Perceptions of math difficulty. No research has been conducted on the relationship between parental homework involvement and children's perceptions of math difficulty. As suggested by research on math self-concepts (Gniewosz, Eccles, & Noack, 2012; 2015), when parents provide input, feedback, and encouragement when helping children with homework, they help to inform the relative easiness or difficulty of their

schoolwork. It is not unreasonable to suspect that if parents withhold or avoid involvement, that children who are facing the introduction of new, and more rigorous, math concepts in middle school would be at a disadvantage because they lack such emotionally supportive experiences. In such cases, children may perceive math to be more difficult if parents continue to be unable, or unwilling, to help.

Expectations of math success. No research has been conducted on the relationship between parental homework involvement and children's expectations of math success. Children with more involved parents may expect to perform better in the future because parents have greater opportunities to offer encouragement and praise, or minimize doubts when exposed to new study materials. Involved parents may be more likely to purchase or obtain important study aids. In contrast, children with uninvolved parents will be less able to rely on emotional and material support of parents to minimize difficulties when facing more rigorous math problems. Social and institutional challenges associated with entry to middle school may also be a greater distraction for these children. Less able to deal with such challenges, these children may expect to earn lower grades as a result.

The Importance of Maternal Involvement in Math Homework to Latino-American Child Math Performance.

Latino-American children are an at-risk group when it comes to math performance in school. Not only do they perform worse on average when compared to their culture majority peers, they are less likely to achieve the same educational and work outcomes because of this gap in performance. Therefore, the identification of protective factors against declines in math is crucial. One area that is not often examined is the

contribution of Latina mothers' behaviors on longitudinal changes in their children's math outcomes in early adolescence. As such, below I will review how Latino mothers likely cognitively and motivationally socialize their children, and how each might pertain to children's math-related outcomes.

Conceptual models. Ecocultural theory (LeVine et al., 1994; Super & Harkness, 1986) posits that parenting behaviors are influenced by cultural values transmitted through the community and passed down from one generation to the next. Latino-American families are known for their fervent adherence to Latino-specific cultural beliefs and practices. Many of these cultural practices may have an impact on the level and effectiveness of parental efforts to socialize their children in math. Factors which may promote socialization may include Latino familial interconnectedness and obedience to authority (Arcia & Johnson, 1998; Gonzalez-Ramos, Zayas, & Cohen, 1998; Stein et al., 2014), whereas those that may undermine socialization could include demographic risk factors linked to ethnic-minority status, and Latino-American parents' attitudes towards schools. To better explore how Latino cultural values inform parents' attempts to academically socialize their children, the two conceptual models of socialization are reviewed through the lens of Latino culture: The socialization of cognitive skills, and the socialization of academic motivation.

Socialization of cognitive skills. Some practices and beliefs that prevail in Latino-American households may hinder parents' willingness and ability to foster children's cognitive development. Latino-American parents hold a wider concept of education (*educación*) than majority culture groups in the US. Parents high in *educación* tend to favor the socialization of moral and social values of their children (Zuniga, 2011)

over the competing need for children to advance cognitively and intellectually. For example, rather than becoming very involved in children's homework in the early school years, a time which involvement may matter the most, some studies find that Latino-American parents mostly rely on teachers to directly instruct children, and believe that their contributions are best limited to only encouraging children to do well in school (Sonnenschein et al., 2016), thereby forgoing more comprehensive socialization strategies.

Additional cultural values and norms within Latino-American families may indirectly interfere with their children's cognitive development. First, many Latino-American parents may face language barriers which discourage their involvement with schools (Sonnenschein et al., 2016). Second, Latino-American families tend to be more collectivistic when compared to cultural majority families (Marin & Marin, 1991). As such, they may favor learning by working together in a cordial and collaborative social environment. Because these cultural values are often times incongruent with the highly individualized and competitive social environment found in US schools, Latino-American parents may be dissuaded from working with schools to jointly foster their children's cognitive development (Chun & Dickson, 2011). Third, many Mexican-American immigrant families lack a familiarity with US educational systems, and therefore some suggest that they may be too quick to defer responsibilities to teachers, or challenge their decisions (Bryk & Schneider, 2002). Many Latino-American parents, possibly due to language barriers, also find it challenging to open and maintain lines of communications with schools and teachers (Ramirez, 2003). In either case, low parent-school collaboration may limit parents' recognition of children's scholastic needs. Fourth,

ethnic minority parents may also relinquish most of their responsibilities for their children's education to schools because they lack the time and money to invest in activities and resources that facilitate children's cognitive growth (Bradley, Corwyn, McAdoo, & Garcia Coll, 2001; Philips, 2011). Because of one or all of these possibilities, Latino American parents appear to be less apt, or are less able, to engage in cognitively stimulating activities with their children.

Socialization of academic motivation. Latino parents often hold ethnic-specific motivations for school success that could serve to strengthen the socialization of academic motivation. Particularly, Latino-American children who are culturally socialized to Latino values tend to be more accepting of Latino-specific parenting practices. If such practices convey the value of doing well in school, such children may receive additional benefits when compared to other ethnic groups.

One possible mechanism is the cultural value of *respeto*, which espouses adherence to the wishes of parents and other respected adults (Arcia & Johnson, 1998), and aligns with authoritarian parenting styles (e.g., high in control, low in warmth; Calzada, Huang, Anicama, Fernandez, & Bortman, 2012). There is much agreement in the literature that authoritarian parenting styles are more commonly used among Latino parents than among majority culture parents (Carlson, Uppal, & Prosser, 2000; Hill, Bush, & Roosa, 2003; Steinberg, Lamborn, Dornbusch, & Darling, 1992). While authoritarian parenting practices do anticipate poorer outcomes in ethnic majority children, because they are consistent with the values espoused in a collectivist Latino culture, they may not be problematic for Latino-American children (Suarez-Orozco & Suarez-Orozco, 1995). Some have gone so far as to suggest that Latino children actually

accept authoritarian parenting practices as a sign of parental care and investment (Darling & Steinberg, 1993), and as such might be more responsive to parents' intentions and assistance in this context.

Latino parents need not only rely upon overt messages of the need for children to do well in school, by emphasizing cultural family-related norms, they may also indirectly motivate children to succeed. *Familismo* is a cultural norm that espouses devotion, interconnectedness, and reciprocity within one's family (Garcia-Preto, 1996; Hardway & Fuligni, 2006; Sabogal, Marin, Otero-Sabogal, Marin, & Perez-Stable, 1987). Children in families high in *familismo* often feel compelled to "do right by" one's family, whether this means working hard on a farm, meeting family obligations, or excelling in school. While this notion aligns with collectivism, which has links to Latino-American families' disengagement with schools as described above, *familismo* may uniquely promote children's academic motivation if academic success is valued within the family.

Empirical evidence. Evidence suggests that Latino-specific cultural values and socio-demographic factors influence Latino-American parents' ability or willingness to engage in cognitive or motivational socialization. Mechanisms are considered to be indirect insofar that parental socialization efforts promote improvements in children's skillsets and dispositional characteristics, which then in turn promote positive academic outcomes. Buttressing this evidence is additional research directly linking parental involvement in homework to Latino-American children's academic outcomes. A review of these findings follows.

Socialization of cognitive skills. Compared to majority culture parents, Latino-American parents are less likely to read to their children (Keels, 2009; Sonnenschein &

Galindo, 2015; Brooks-Gunn & Markman, 2005). This is problematic as the completion of home-based reading schoolwork has been linked to Latino children's math performance in kindergarten (Sonnenschein & Galindo, 2015) and in elementary school (Lopez, Gallimore, Garnier, & Reese, 2007), such that low completion rates anticipate poorer performance. Lower disposable incomes may also interfere with minority parents' ability to rely on aids and materials to teach their children in the home environment.

Little is known about parental efforts to socialize math skills specifically. In one study, immigrant parents educated in Mexico were found to rely on different techniques and strategies for completing math problems (Civil & Menendez, 2011), which, do not often align with those taught to children in U.S. schools. This may interfere with the parents' ability to help the child with math homework. Compounding the problem, Latino-American immigrant parents often lack confidence to solve math problems in English (Delgado-Gaitan, 2004), which may dissuade them from assisting children with their math homework.

On the whole, this evidence suggests that Latino-American parents are at a greater risk for ineffectively cognitively socializing their children in math. However, a portion of this research has examined recently immigrated populations, and as a result, such conclusions may or may be appropriate for Latino-American populations that have been residing in the US for longer periods of time. Additionally, these findings may only be limited to the cognitive domain, and may not extend to academic motivation.

Socialization of academic motivation. Research is largely consistent with the notion that Latino-American parents are effective socializers of children's motivation to do well in school. When compared to European-American parents, Latino-American

parents tend to stress the importance of education more (Bempechat, 1998; Bempechat, Graham, & Jimenez, 1999; Fuligni, Tseng, & Lam, 1999; Spera, Wentzel, & Matto, 2009). Immigrant Latino parents, in particular, strongly emphasize academic success because they believe that education is a means to occupational advancement (Lopez, 2001; Stanton-Salazar, 2001; Valdes, 1996). Latino-American families tend to be close-knit and supportive, which suggests that Latino-American parents may be particularly effective role models. Latino-American children may have many opportunities to model parents' hard work and ethics, the benefits of which may extend to the academic domain. Indeed, past research has found concurrent, and longitudinal, positive associations between the number of successful or employed adults in children's lives to child academic performance among Mexican-American families (Roosa et al., 2012).

Not all Latino-American parents who emphasize academic success have the ability or availability to assist children with math homework, but those who do appear to promote successful academic outcomes. For example, among ninth grade Latino-American students, greater levels of parental academic-related support have been concurrently associated with higher levels of students' motivation to do well in school (Alfaro, Umaña-Taylor, & Bámaca, 2006; Plunkett, Henry, Houltberg, Sands, & Abarca-Mortensen, 2008). The link between maternal support and child academic motivation has been reported longitudinally (Alfaro & Umaña-Taylor, 2015). Finally, a study by Suizzo and colleagues (2012) explored mediators of the concurrent association between parental academic socialization and Mexican-American students' high school achievement. When parents emphasized school success and family obligations, adolescents demonstrated

greater determination when facing academic challenges and consequently performed better in school.

However, authoritarian parenting, although linked to poor academic outcomes among European-American students (Steinberg, Dornbusch, & Brown, 1992), is not negatively tied to school success among Latino-American students (Manongdo & Ramírez García, 2011; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). Indeed, Park and Bauer (2002) found that greater maternal strictness (indicative of authoritarianism) predicted better academic performance among Latino-American high school students. However, it is less known if similar effects are prevalent among families with younger children.

Empirical evidence supports the notion that *familismo* is linked to the development of academic motivation in Latino-American students (see Suizzo et al., 2012). Higher levels of *familismo* are concurrently associated with greater child academic achievement (Fuligni, 1997) and greater child efforts to perform well in school (Esparza & Sanchez, 2008). Several studies have also found that Latino-American families who hold strong family values also have children who are better protected against common problems that interfere with school performance (Delgado, Updegraff, Roosa, & Umaña-Taylor, 2011; Esparza & Sanchez, 2008). According to Quian and Blair (1999) low income Latino-American children who have parents who discuss school with them and provide them with study materials tend to aspire to higher school-related goals. However, studies have been limited to an exploration of direct effects of *familismo* on child outcomes, and have not yet investigated whether socialization effects are stronger within families high in *familismo*. Therefore, there is currently no evidence that academic

socialization effects are stronger among Latino-American families due to the moderating function of *familismo*.

General academic performance among Latino-American children. A few studies have examined relations between parental involvement in schoolwork and broad measures of child academic success, focused on Latino-American samples. A study by Keith and Lichtman (1994) identified a positive association between concurrent parental involvement (e.g., discussing school activities, holding high aspirations for children) and academic performance in a sample of Mexican-American eighth graders. More recent research also links parental discussions regarding educational aspirations to Latino-American children's academic achievements (Mireles-Rios & Romo, 2010; Witkow & Fuligni, 2011).

Other studies have identified positive concurrent associations between academically-supportive parental behaviors among Latino-American parents and observed academic performance (e.g., grades) among their children (Diaz Soto, 1989; Newman, Lohman, Newman, Myers, & Smith, 2000; Woolley, Kol, & Bowen, 2008). Desimone (1999) found a negative concurrent association between parental homework checking and academic performance among Latino-Americans middle school aged children, but this result may well reflect increased parental vigilance in response to children's poor performance, and not interference in child performance as a result of parental over-supervision. Additionally, Latino-American adolescents' perceptions of parents' educational expectations has also been positively associated with their school grades and to their own educational plans for the future (Carranza, You, Chhuon, & Hudley, 2009).

Perceptions of math related outcomes among Latino-American children.

Studies examining the role of parental homework assistance on Latino-American children's perceptions of math ability have been largely absent from the literature. However, one study did identify a positive concurrent association between parental involvement and Latino-American children's perceptions of their own academic ability (i.e., self-concept) during the 7th grade (Chun & Dickson, 2011). However, in this study, math was not a specific focus, and involvement was not exclusively defined as homework involvement in home settings. No studies have investigated the contributions of Latino-American parents on their children's perceptions of math difficulty or their expectations of success in math. However, it is reasonable to postulate that the costs of low parental homework involvement would not be limited to children's perceptions of math ability, but could also spill over into perceptions of math difficulty and expectations for success in math.

Children's Academic Motivations That May Influence the Effectiveness of Their Involvement in Math Homework

There are strong conceptual reasons to think that Latino-American parents should influence their children's academic math-related outcomes. But the empirical evidence is less than compelling, which raises the question: Are there individual differences in children's susceptibility to parent influence? In other words, do children differ in the degree to which parental involvement influences their academic outcomes?

Few studies have explored the possibility that parent involvement in homework is more effective under some circumstances than others. Proponents of parent X child models of socialization (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000;

Kochanska, 1993) posit that the ability of parents to influence child outcomes depends on characteristics of the child (e.g., Pomerantz, Grolnick, & Price, 2005; Pomerantz, Ng, & Wang, 2006; Pomerantz, Wang, & Ng, 2005). My dissertation examines the possibility that children's motivations to achieve may moderate susceptibility to parent influence. Children who do not perceive themselves as competent in math may also lack motivation to do well in math. Such children may be aware that they can do better and therefore may have an unfulfilled need for mastery in math. Ultimately, this need may increase their susceptibility to influence from important socializers.

The strongest support for this concept comes from Self-Determination Theory (SDT; Ryan & Deci, 2000) which posits that when children's environments are supportive of their fundamental psychological needs and desires, they will demonstrate well-being and will be engaged in completing rigorous activities and tasks. To this end, the fulfillment of three needs is crucial: the need to be self-ruling or uncontrolled (i.e., autonomous), the need to be connected to others meaningfully (i.e., relatedness), and the need to attain mastery on tasks (i.e., competency). It may be the case that if a child experiences a deficit in one or all of these needs, they may increase responsiveness to aspects of the surrounding environment which might help to bridge these gaps. For example, research has found that children who underachieve in a given domain are more likely to receive feedback from others indicating their inabilities, and as a result, believe they are less competent than their higher performing peers (Frome & Eccles, 1998; Guay, Marsh, & Boivin, 2003). It follows that, given these negative events, children should be open and responsive to assistance from others, particularly from those who are skilled in the area of need (Pomerantz et al., 2005). In contrast, children who have already satisfied

their mastery needs should be less susceptible to assistance from others. Past research provides some support for this notion. One study found that when mothers of low achieving children provide homework assistance in a non-controlling manner, children's grades improved over time (Ng et al., 2004). No parent effects were found when children were high in achievement, suggesting that children's unfulfilled competency needs increase their receptiveness to homework assistance.

It should be noted that Wigfield and Eccles (1992) also consider the possibility that children's motivations for competency could interact with others' attempts to promote efficacy in important ways. In contrast to the above, they suggest that when children perceive their math ability to be low, but highly value the need to do well in math, they may be especially receptive to assistance of those who are more experienced in math. If such interventions are beneficial, their perception of their math ability would then increase to be in line with their level of interest in math. Otherwise, students who don't value math would not be concerned whether they improve or not. Parents who are focused on improving underperforming children's math competency may also increase their self-efficacy in math (Wigfield & Eccles, 1992). Such notions align well with early research indicating that children who underachieve in math can improve in their performance if teachers provide training opportunities that focus on improving math self-efficacy (Schunk, 1981, 1983, 1984).

Consistent with self-determination theory, research suggests that intrinsic motivation, or the sake of enjoying an activity purely for its enjoyment, may be a particularly salient indicator of a need for competency. Past studies have found strong correlations between secondary school students' mastery goals in math and their intrinsic

motivation in math (Elliot & Church, 1997; Pintrich, 2000). In contrast, performance-avoidant goals (e.g., the need to avoid appearing to be incompetent to others) have also been linked to low intrinsic motivation for general academic subjects (Elliot & Church, 1997; Elliot & Harackiewicz, 1996). If intrinsic motivation is a proxy for susceptibility to influence, given this evidence, it would not be unreasonable to postulate that low intrinsic interest would increase the socialization effects of positive parenting practices.

Novel to this study is the hypothesis that maternal perceptions of children's interest in math will moderate the influence of parental homework involvement on children's math-related outcomes. I distinguish between children's intrinsic interest in math and children's extrinsic interest in math and argue that maternal perceptions of each should moderate the effectiveness of maternal homework involvement. Specifically, maternal homework involvement should be more influential when children are uninterested in math because such children have mastery needs that increase their susceptibility to maternal influence. Conversely, mothers of children who are interested in math should be less influential because, by the time such children have entered adolescence, they have already become effective self-motivated learners. It seems reasonable to assume that intrinsic motivation may be a greater factor than extrinsic motivation because it is most associated with a mastery orientation, whereas extrinsic motivation may only be related to susceptibility to influence when conditional costs and rewards are salient to the child, which is not necessarily the case for intrinsic motivation.

Intrinsic interest in math. Different theories use different terms to define intrinsic interest (or motivation), but these theories all share several commonalities (Ryan & Deci, 2000). Most notably, intrinsic motivation always comprises a desire to perform

an act for the mere satisfaction or enjoyment of completing it. Next, across all theories, intrinsic motivation is typically considered to be driven by "free choice," or the absence of enticement for external rewards and the avoidance of any potential costs. However, it should be noted, that, according to operant conditioning (Skinner, 1953), the enjoyment of completing the task in of itself counts as a reward. Regardless, intrinsic motivation is considered to be a healthy and adaptive form of motivation, as it is less likely to be driven by coercive or demanding situations. Consistent with this notion, intrinsic motivation in educational contexts is often associated with the best academic outcomes (Lepper et al., 1997).

In the expectancy-value model of motivation (Wigfield & Eccles, 2000), tasks that hold "intrinsic value" are tackled because they are interesting and gratifying. This theory is most concerned with determining why children seek out and persist on specific academic tasks, and what motivational factors are associated with the successful performance of such tasks (Eccles et al., 1983). In regards to the latter, intrinsic task value has been positively associated with math outcomes in children (Lepper et al., 1997).

In self-determination theory, intrinsic motivation is evident when an individual seeks out a task because it is inherently enjoyable. Central to this theory is the notion that intrinsic motivation is only maintained insofar that pursued tasks (and their outcomes) continue to align with feelings of competency and autonomy. In regards to interest in academic subjects, if children's perceptions of competency are undermined, or if the home or educational environment they are in is overly structured, directive, or rigid, intrinsic motivation may decrease. Not surprisingly, children's intrinsic interest in school

has been found to decline with age. As children enter higher grades, classroom sizes increase, teachers become more controlling, and intraindividual differences in children's abilities become more apparent (Midgley et al., 1993). In regards to math specifically, research has shown that children who find math difficult, or those who feel that they are forced to work on math, become less intrinsically motivated in math over time (Ryan & Deci, 2000).

The child's level of intrinsic interest in math may help determine whether parent assistance with math homework affects math-related outcomes. According to social learning theory (Bandura, 1977; 1994) intrinsic motivation is naturally borne out of the development of self-efficacy, or more specifically, the extent to which a person believes he or she is capable in a domain-specific task. As applied to math, self-efficacious children relish and overcome difficult math assignments in order to obtain mastery and seek high math grades. They are resilient in the face of adversity, and perceive control over potentially trying situations, such as math exams (Bandura, 1994). In this respect, math self-efficacy may be considered to be synonymous with self-motivation to do well in math. Children low in math self-efficacy are driven by disinterest and doubt, relent when faced with adversity, are unable to bounce back from failure, and are not goal driven. Most importantly, children low in math self-efficacy have little confidence in their ability to form and carry out management strategies regarding math schoolwork, and may come to rely on others for assistance.

Consistent with these notions, past research has found that intrinsically motivated individuals persist when there is risk of failure, dedicate more time on tasks, seek out challenges on their own, and employ richer performance and learning strategies (Lepper,

1988; Pintrich & Garcia, 1991). These findings strongly suggest that intrinsically interested children aim to be diligent, seek competency, and attempt to master subjects independently. Not surprisingly, intrinsic motivation in children and adolescents is associated with positive self-perceptions of competency, lower school anxiety, and better academic performance (Gottfried, Cook, Gottfried, & Morris, 2005). Highly self-motivated children know that they likely do well on their own, and therefore should be less responsive to parental influence, even influence in the form of homework involvement.

In contrast, intrinsically uninterested children recognize that they lack mastery in math, and therefore, in order to address a psychological need for competency, should be responsive to parental involvement in schoolwork. Parents who are frequently involved in children's math homework would then be in the best position to ensure that homework was completed and abilities were mastered. This presumes, however, that the form of involvement is not intrusive to the child's other psychological needs, such as their need for autonomy. In contrast, uninvolved parents lack or forgo opportunities to socialize practices supporting even marginally-acceptable levels of math performance in children. These children, when left to their own devices, have little motivation to do well.

Extrinsic interest in math. When compared to intrinsic interest, extrinsic interest (or motivation) is more varied in terms of the way it is operationalized across different theoretical perspectives. There is general agreement, however, that extrinsic motivation typically occurs when an individual seeks the completion of a goal in order to receive an instrumental benefit or avoid a negative outcome (Ryan & Deci, 2000). Beyond this, theories differ in regard to what contingencies fall under extrinsic

motivations purview, and to what extent individuals remain autonomous during its process.

Expectancy-value theory (Wigfield, 1994; Wigfield & Eccles, 2000) proposes that a task has "utility value" when children recognize that doing well will result in the attainment of substantive rewards that further goals (Eccles et al., 1983; Wigfield & Eccles, 2000). While utility value is closely tied to extrinsic motivations for engaging in a task, in comparison to other theories, it only pertains to the positive expected outcomes of the completion of a task; it does not subsume any anticipated costs. An extrinsically motivated child should find utility value for math homework if, for example, he or she recognizes the need to do well in a math class to get into college or to obtain a scholarship. Utility value does not encompass the desire to avoid punishments from their parents for poor performance.

According to Self-Determination Theory (Deci & Ryan, 1985), extrinsic motivation occurs when a child completes a task to either avoid a negative outcome or to receive a desirable outcome. Extrinsic motivation can be further subdivided into four subtypes, each of which differs in terms of the degree to which a child is autonomous: (1) external regulation, wherein external forces compel the completion of a task; (2) introjected regulation, wherein a child completes the task in order to maintain self-worth in the face of external demands for compliance; (3) identified regulation, wherein a child recognizes the value of the task in terms of the fulfillment of his or her larger goals; (4) integrated regulation, wherein the child incorporates and internalize into his or her value system the need to complete the task, and so is no longer motivated by risks or rewards. Eccles' conceptualization of utility value most strongly aligns with identified regulation.

Of note however, both intrinsic motivation and integrated regulation correspond with a high level of autonomy, and as such, both are considered functionally similar in terms of their ability to foster positive child outcomes (Gagné & Deci, 2005).

Theoretical perspectives on human motivation agree that extrinsically motivated children are, at least in part, driven to succeed in order to obtain rewards, whether they be material or social. Children who wish to excel in math may do so in order to obtain short term benefits such as increased visibility and status among peers who also value math, or the obtainment of financial or other material rewards from family members incentivizing math performance. Benefits may be long term as well, such as obtaining a good job after high school, or using math as a knowledge base to pursue more advanced careers. The search for success may lead highly extrinsically motivated students to those who are more skilled, as they are the most capable of helping them reach their goals. In short, the greater the potential for reward, the more open the extrinsically motivated person will be to external influence.

Intrinsic interest and extrinsic interest are orthogonal variables. Children who are low in intrinsic interest are not necessarily high in extrinsic interest, and children who are low in extrinsic interest are not necessarily high in intrinsic interest (Husman & Lens, 1999). Children who are quite low in both appear to be rare (Corpus & Wormington, 2014). Several studies report only modest positive associations between the two constructs (Eccles & Wigfield, 1995; Lepper, Corpus, & Iyengar, 2005; Watt, 2004). However, in order to properly distinguish the two as contextual factors, it is important to explore how each may separately moderate the effectiveness of parental homework involvement on child math outcomes.

Research Questions and Hypotheses

The present study examined the longitudinal influence of Latina mothers' homework involvement on children's math outcomes (child perceptions of math ability and math difficulty, and child expectations of math success). Moderated effects were tested whereby the interaction between maternal homework involvement and the child's interest in math predicted changes in Latino-American children's math related outcomes. I expected that mothers will be most influential when child intrinsic interest in math is low and extrinsic interest in math is high. To this end, three sets of hypotheses were addressed.

1. Do child perceptions of math ability and expectations for math success decrease across the transition to middle school? Do child perceptions of math difficulty increase across the transition to middle school?

Consistent with previous studies investigating ethnic majority students (Gniewosz et al., 2012, Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002; Midgley, et al., 1989; Wigfield et al., 1991), changes in child perceptions of child math ability and child expectations of math success were hypothesized to decrease across the transition to middle school, in part due to changes in the school environment and changes in interpersonal relationships (Eccles et al., 1993; Lee et al., 1983). In contrast, child perceptions of math difficulty should increase over the transition to middle school as children are exposed to more cognitively demanding mathematical concepts and problems (Midgley et al., 1989).

2. Do lower levels of maternal involvement in homework predict greater decreases in child perceptions of math ability and expectations for math success across the transition

to middle school? Do lower levels of maternal involvement in homework predict greater increases in child perceptions of math difficulty across the transition to middle school?

Consistent with previous findings (Azmitia, Cooper, & Brown, 2009; Pomerantz & Eaton, 2001), lower initial levels of maternal involvement in math homework in the 5th grade should anticipate decreases in child perceptions of math ability from the 5th grade to the 6th grade because uninvolved parents forgo opportunities to socialize adaptive strategies and build up children's math confidence. Lower initial levels of maternal involvement in math homework in the 5th grade should also anticipate decreases in child expectations of math success over the same period because children recognize their inability to rely on parents for help or material support with homework and anticipate that they will not perform as well in math in the future. Lower initial levels of maternal involvement in math homework in the 5th grade should also anticipate greater increases in child perceptions of math difficulty from the 5th grade to the 6th grade because children whose parents were not engaged in schoolwork lack the emotional and cognitive support needed to keep up with the introduction of ever-more complex math concepts.

3. Does the child's intrinsic or extrinsic interest in math exacerbate associations from maternal homework involvement to subsequent changes in child math-related outcomes?

Intrinsic interest in math in the 5th grade was expected to moderate associations between maternal homework involvement in the 5th grade and changes in children's math-related outcomes from the 5th to the 6th grade. It was anticipated that maternal homework involvement will yield positive influence for intrinsically uninterested children's math outcomes because they wish to resolve an unfulfilled need for mastery in math. As a consequence, they should be more susceptible to maternal socialization

strategies. Maternal homework involvement should have little bearing on intrinsically interested children's math-related outcomes as they are already skilled and motivated self-learners. Additionally, initial maternal perceptions of the child's extrinsic interest in math in the 5th grade should also moderate associations between maternal involvement in math in the 5th grade and changes in children's math-related outcomes from the 5th to the 6th grade because extrinsically uninterested children are less likely than extrinsically interested children to seek out validation from, and conform to the expectations of parents.

METHOD

Participants

Participants included 251 Latino/a children (114 males, 137 females) and their mothers, who resided in a small agricultural community in Northern California. Students ranged in age from 9 to 12 years (M = 10.51, SD = .60) at the start of the study; mothers ranged in age from 26 to 58 years (M = 37.29, SD = 6.27). Most mothers (n = 183; 73%) were born in Mexico; the remainder (n = 68; 27%) were born in the United States. Most of the children (n = 231; 92%) were born in the United States; the remainder (n = 20; 8%) were born in Mexico. Roughly half of the mothers (n = 120; 48%) did not complete high school, approximately a quarter (n = 65; 26%) held a high school degree, approximately a quarter (n = 60; 24%) attended or completed college, and 6 (2%) did not provide reports of maternal education. Most of the children lived in two-parent households (n = 193; 77%); the remainder lived in single mother households (n = 56; 22%) or did not report on household structure (n = 2; 1%). A majority of mothers completed surveys in Spanish (n = 173-193; 69-77%) and a majority of children completed surveys in English (n = 216-229; 86-91%). Because most fathers were frequently absent during the school years because they were employed as migrant farm workers, no data from fathers were collected.

Procedure

Participants were recruited at school-based presentations and meetings and at family community events. Written parental consent and student assent were required for participation. All measures were translated from English to Spanish by a professional translator and a bilingual staff member. The two versions were reviewed by bilingual staff members; discrepancies were resolved by discussion and in consultation with bilingual school staff. Three waves of data were collected. The first wave occurred when children were in the Spring semester of 5th grade. At this time, children attended 11 different public primary schools. The second and third waves occurred when children were in the Fall semester of 6th grade and the Spring semester of 6th grade (respectively). At these times, children attended 7 different public middle schools. One child (who participated in later waves of data collection) did not participate in the first wave of data collection. All mothers participated in the first wave of data collection. Attrition was low. Approximately 7.6% of children (n = 19) and 6.4% of mothers (n = 16) did not participate in the second wave of data collection, and 8.8% (n = 22) of children and mothers did not participate in the third. There were no statistically significant differences on any study variable between those who participated in one, two, and three waves of data collection.

A staggered cohort design was employed. The first cohort consisted of 131 mother-child dyads who were followed from Spring 2014 to Spring 2015. The second cohort consisted of 120 mother-child dyads who were followed from Spring 2015 to Spring 2016. There were no differences across cohorts on any study variables.

At the first wave of data collection, trained researchers administered surveys to mothers and children at a public library (n = 135, 54%), school (n = 86, 34%), home (n = 6, 2%), or other locations (n = 24, 10%). Surveys were completed on computer tablets. Mothers and children completed the surveys separately without the opportunity to communicate. A majority of children (n = 230; 91%) chose to take the survey in English, whereas a majority of mothers (n = 193, 77%) chose to take the survey in Spanish.

Instruments

Maternal homework involvement. At all waves of data collection, mothers completed a 4-item questionnaire assessing math-related support provided to the child at home (Bouchey & Harter, 2005; See Appendix A). Items were rated on a scale ranging from 1 (*never*) to 5 (*very often*). Responses were averaged across items. Internal reliability was good (α = .83-.84).

Maternal perceptions of the child's intrinsic interest in math. At all waves of data collection, mothers completed a 3-item questionnaire assessing maternal perceptions of the child's intrinsic interest in math subjects (Conly, 2011; Eccles & Wigfield, 1995; See Appendix B). Items were rated on a scale ranging from 1 (*not at all*) to 5 (*a lot*). Responses were averaged across items. Internal reliability was high (α = .93-.94). Maternal perceptions of the child's intrinsic interest in math were moderately correlated with maternal perceptions of the child's extrinsic interest in math (r = .32-.46). To disentangle the two, at each wave of data collection, maternal perceptions of the child's intrinsic interest in math was regressed onto maternal perceptions of the child's extrinsic interest in math to create a new variable: Residualized maternal perceptions of the child's intrinsic interest in math.

Maternal perceptions of the child's extrinsic interest in math. At all waves of data collection, mothers completed a 4-item questionnaire assessing maternal perceptions of the child's extrinsic interest in math subjects (Conly, 2011; Eccles & Wigfield, 1995; See Appendix C). Items were rated on a scale ranging from 1 (*not at all*) to 5 (*very useful*). Responses were averaged across items. Internal reliability was acceptable (α = .67-.91). Maternal perceptions of the child's extrinsic interest in math were moderately correlated with maternal perceptions of the child's intrinsic interest in math (r = .32-.46). To disentangle the two, at each wave of data collection, maternal perceptions of the child's extrinsic interest in math was regressed onto maternal perceptions of the child's intrinsic interest in math to create a new variable: Residualized maternal perceptions of the child's extrinsic interest in math.

Child perceptions of the child's intrinsic interest in math and child perceptions of the child's extrinsic interest in math were also administered, however, because internal reliabilities were low at some waves (α = .60), they could not be included in analyses as moderators.

Child perceptions of math ability. At all waves of data collection, children completed a 3-item questionnaire assessing self-perceptions of math ability (Frome & Eccles, 1998; See Appendix D). Items were rated on a scale ranging from 1 (*not good at all; the worst; much worse*) to 5 (*very good; the best; much better*). Responses were averaged across items. Internal reliability was acceptable (α = .79-.85).

Child perceptions of math difficulty. At all waves of data collection, children completed a 3-item questionnaire assessing self-perceptions of math difficulty (Frome & Eccles, 1998; See Appendix E). Items were rated on a scale ranging from 1 (*very easy; much more time; my easiest subject*) to 5 (*very hard; much less time; my hardest subject*). Responses were averaged across items. Internal reliability was acceptable (α = .73-.80).

Child expectations of math success. At all waves of data collection, children completed a 3-item questionnaire assessing expectations of success in math (Frome & Eccles, 1998; See Appendix F). Items were rated on a scale ranging from 1 (*not at all well; fail; not very successful*) to 5 (*very well; highest grade; very successful*). Responses were averaged across items. Internal reliability was acceptable (α = .75-.86).

Potential confounding variables. Mothers and children completed additional surveys from which potential confounding variables were drawn. Supplemental analyses included these potential confounding variables. These variables are described below.

Children completed a 35-item questionnaire designed to measure math performance in 4 subjects in the Spring of 5th grade and the Spring of 6th grade (See Appendix G): (1) fractions as number lines (8 items); (2) fraction comparisons (5 items); (3) fraction arithmetic (8 items); and (4) ratio and rate reasoning (8 items), and (5) proportional reasoning (6 items). Each subject aligned with "critically important" content areas for fifth and sixth graders as designated by the Common Core State Standards in Mathematics (Zimbra, 2011). Internal reliability was good (α = .83). Math performance scores were correlated with math scores on the State of California common core assessment (measured at the Spring of the 5th grade for the second cohort only), r = .71, p < .01.

In the Spring of 5th grade, children also completed a 4-item questionnaire (α = .74) assessing *Child English Acculturation* (Cuéllar, Arnold, & Maldonado, 1995), a 5-item questionnaire (α = .75) assessing *Child Anxiety* (Reynolds & Richmond, 1978), a 4-item questionnaire (α = .70) assessing *Child Conduct Problems* (Goodman, 1997), and a 3-item questionnaire (α = .64) assessing self-reports of *Child School Burnout* (Salmela-Aro, Kiuru, Leskinen, & Nurmi, 2009) (See Appendix H). In the Spring of 5th grade, mothers completed a 4-item questionnaire (α = .62-.83) assessing *Maternal English Acculturation* (Cuéllar, et al., 1995), a 5-item questionnaire (α = .79) assessing *Maternal Autonomy Granting* (Wang, Pomerantz, & Chen, 2007), and a 4-item questionnaire (α = .68) assessing *Maternal Psychological Control* (Wang et al., 2007) (See Appendix I).

PLAN OF ANALYSIS

Longitudinal Changes in Child Math Outcomes

The first set of questions concern changes in child perceptions of math outcomes: 1) Do child perceptions of math ability decrease over the school transition from 5th to 6th grade? 2) Do child perceptions of math difficulty increase over the school transition from 5th to 6th grade? 3) Do child expectations of math success decrease over the school transition from 5th to 6th grade?

To determine the degree to which child perceptions of math ability change across the transition into middle school, a repeated measure ANOVA was conducted with time (Spring Grade 5, Fall Grade 6, and Spring Grade 6) as the within-subjects factor and child sex as the between subjects factor. Support for the hypothesis that children perceive their own math ability to decrease over the transition to middle school was indicated by a significant negative linear effect of time.

To determine the degree to which child perceptions of math difficulty change across the transition into middle school, a repeated measure ANOVA was conducted with time (Spring Grade 5, Fall Grade 6, and Spring Grade 6) as the within-subjects factor and child sex as the between subjects factor. Support for the hypothesis that children perceive math to be increasingly difficult over the transition to middle school was indicated by a significant positive linear effect of time.

To determine the degree to which child expectations of math success change across the transition into middle school, a repeated measure ANOVA was conducted with time (Spring Grade 5, Fall Grade 6, and Spring Grade 6) as the within-subjects factor and child sex as the between subjects factor. Support for the hypothesis that children expect success in math to decrease over the transition to middle school was indicated by a significant negative linear effect of time.

Two additional repeated measure ANOVAs was conducted to determine if there were changes in (a) maternal perceptions of the child's intrinsic interest in math or (b) maternal perceptions of the child's extrinsic interest in math. In both ANOVAs, time (Spring Grade 5, Fall Grade 6, and Spring Grade 6) was the within-subjects factor and child sex was the between subjects factor.

The Influence of Maternal Involvement in Homework on Changes in Child's Math Outcomes

The second set of questions concern the degree to which maternal homework involvement influence subsequent changes in the child's math outcomes: 1) Do lower levels of maternal involvement in homework at the end of primary school predict greater decreases in child perceptions of math ability across the transition into middle school? 2) Do lower levels of maternal involvement in homework at the end of primary school predict greater increases in child perceptions of math difficulty across the transition into middle school? 3) Do lower levels of maternal involvement in homework at the end of primary school predict greater decreases in child expectations of math success across the transition into middle school?

Three latent change score cross-lagged analyses (McArdle, 2009) were conducted, one for each math-related child outcome. Latent change scores reflect changes in a variable that occur during a given interval of time. This procedure provides researchers with the ability to explicitly test whether relative levels of a predictor corresponds with over time linear changes in an outcome variable (Paleari & Fincham, 2015). At the dyadic level, latent change score analyses isolate the influence that one member exerts over subsequent changes in the other member, controlling for the initial scores of each member of the dyad and the correlation between changes in each members' scores.

Three separate analyses (one for each math-related outcome variable) determined the degree to which (a) maternal homework involvement in the Spring of 5th grade predicted changes in the child's math outcomes over the school transition from the Spring of 5th grade to the Fall of 6th grade (path a_1; Figure 1) and (b) the degree to which maternal homework involvement in the Fall of 6th grade predicted changes in the child's math outcomes from the Fall of 6th grade to the Spring of 6th grade (path a_2; Figure 1). The first analysis concerns child perceptions of math ability. Support for the hypothesis that maternal homework involvement positively predicted changes in child perceptions of math ability was indicated by statistically significant positive over time associations from maternal homework involvement in the Spring of 5th grade to child perceptions of math ability in the Fall of 6th grade and from maternal homework involvement in the Fall of 6th grade to child perceptions of math ability in the Spring of 6th grade. The second analysis concerns child perceptions of math difficulty. Support for the hypothesis that maternal homework involvement positively predicted changes in child perceptions of math

difficulty were indicated by statistically significant inverse over time associations from maternal homework involvement in the Spring of 5th grade to child perceptions of math difficulty in the Fall of 6th grade and from maternal homework involvement in the Fall of 6th grade to child perceptions of math difficulty in the Spring of 6th grade. The third analysis concerns child expectations of math success. Support for the hypothesis that maternal homework involvement positively predicted changes in child expectations of math success, were indicated by statistically significant positive over time associations from maternal homework involvement in the Spring of 5th grade to child expectations of math success in the Fall of 6th grade and from maternal homework involvement in the Fall of 6th grade to child expectations of math success in the Spring of 6th grade.

A progressive model fitting procedure was used in which pairs of equivalent cross-lagged associations were constrained to be equal over time (Widaman & Thompson, 2003). Constraints were not retained if model fit significantly worsened ($p<.05$).

Supplemental analyses. Three different sets of supplemental analyses were conducted.

First, supplemental latent change score cross-lagged panel analyses controlled for the contribution of potential confounding variables. Starting from the measurement model depicted in Figure 1, 18 additional models included the following variables as predictors: Child cohort, child sex, child survey language, child place of birth, child perceptions of English acculturation, child reports of child anxiety, child reports of child conduct problems, child perceptions of child school burnout, child perceptions of child intrinsic interest in math, child perceptions of child extrinsic interest in math, maternal

age, maternal survey language, maternal education, marital status, maternal place of birth, maternal perceptions of maternal English acculturation, maternal perceptions of autonomy granting, and maternal perceptions of maternal psychological control.

Second, supplemental cross-lagged panel analyses examined if family-related demographic variables moderated longitudinal associations between maternal homework involvement and subsequent changes in child math outcomes. To this end, a series of two-way interaction terms were created by crossing maternal involvement in homework in the Spring of 5th grade with the following demographic moderators: child sex, child cohort, mother's marital status, and mother's place of birth. Each were separately included in the model as predictor variables.

Third, supplemental cross-lagged panel analyses were conducted to isolate the effects of each child math outcome variable. Because the three math outcome variables were correlated, separate models included concurrent and over time associations with each additional math outcome variable. For instance, additional analyses for models that focused on child perceptions of math difficulty included child perceptions of math ability and child expectations of math success. Children's math performance scores were also entered as controls at the Spring of 5th grade, and at the Spring of 6th grade.

The Moderating Effects of Maternal Perceptions of the Child's Interest in Math

The next set of analyses concern the extent to which maternal perceptions of the child's interest in math moderated the degree to which maternal homework involvement predicted changes in the child's math outcomes. 1) Do maternal perceptions of the child's intrinsic interest in math exacerbate associations from maternal homework involvement to subsequent changes in child math-related outcomes? 2) Do maternal perceptions of the

child's extrinsic interest in math exacerbate associations from maternal homework involvement to subsequent changes in child math-related outcomes? For the first question, it was expected that positive associations between maternal homework involvement to subsequent changes in child math-related outcomes were stronger when maternal perceptions of intrinsic interest in math was relatively low. For the second question, it was expected that positive associations between maternal homework involvement to subsequent changes in child math-related outcomes were stronger when maternal perceptions of extrinsic interest in math is relatively high.

Intrinsic interest in math. The first set of analyses included residualized maternal perceptions of the child's intrinsic interest in math as a moderator of associations from maternal homework involvement to subsequent child math outcomes (paths a_1 and a_2: Figure 2). Separate cross-lagged panel analyses were conducted for child perceptions of math ability, child perceptions of math difficulty, and child perceptions of math success. In each of these models, maternal homework involvement was crossed with residualized maternal perceptions of the child's intrinsic interest in math to create a moderator term that predicted subsequent math outcomes.

Do maternal perceptions of low child intrinsic interest in math exacerbate associations from maternal homework involvement to subsequent decreases in child perceptions of math ability? Support for the hypothesis that maternal perceptions of the child's intrinsic interest in math exacerbated the associations from initial maternal homework involvement to changes in child perceptions of math ability were indicated by statistically significant negative associations from the moderator term (maternal

perceptions of the child's intrinsic interest in math by maternal homework involvement) to subsequent child perceptions of child math ability.

Do maternal perceptions of low child intrinsic interest in math exacerbate associations from maternal homework involvement to subsequent increases in child perceptions of math difficulty? Support for the hypothesis that maternal perceptions of the child's intrinsic interest in math exacerbated the associations from initial maternal homework involvement to changes in child perceptions of math difficulty were indicated by statistically significant positive associations from the moderator term (maternal perceptions of the child's intrinsic interest in math by maternal homework involvement) to subsequent child perceptions of child math difficulty.

Do maternal perceptions of low child intrinsic interest in math exacerbate associations from maternal homework involvement to subsequent decreases in child expectations of math success? Support for the hypothesis that maternal perceptions of the child's intrinsic interest in math exacerbated the associations from initial maternal homework involvement to changes in child expectations of math success were indicated by statistically significant negative associations from the moderator term (maternal perceptions of the child's intrinsic interest in math by maternal homework involvement) to subsequent child expectations of math success.

A progressive model fitting procedure was used in which pairs of equivalent cross-lagged associations were constrained to be equal over time (Widaman & Thompson, 2003). Constraints were not retained if model fit significantly worsened ($p<.05$).

Simple slope follow up analyses. Simple slope analyses (Aiken & West, 1991) were conducted to probe statistically significant associations between two-way interactions and subsequent changes in child math outcomes (paths g_1 and g_2; Figure 2). Two regression equations were calculated: (1) The association between maternal homework involvement and child math outcomes was plotted at relatively low (1 SD below the mean) levels of maternal perceptions of child intrinsic interest in math and (2) the association between maternal homework involvement and child math outcomes was plotted at relatively high (1 SD above the mean) levels of maternal perceptions of child intrinsic interest in math.

Supplemental analyses. Three different sets of supplemental analyses were conducted for each model with maternal perceptions of the child's intrinsic interest in math as a moderator.

First, supplemental latent change score cross-lagged panel analyses controlled for the contribution of potential confounding variables. Starting from the measurement model depicted in figure 2, 18 additional models included the following variables as predictors: Child cohort, child sex, child survey language, child place of birth, child perceptions of English acculturation, child reports of child anxiety, child reports of child conduct problems, child perceptions of child school burnout, child perceptions of child intrinsic interest in math, child perceptions of child extrinsic interest in math, maternal age, maternal survey language, maternal education, marital status, maternal place of birth, maternal perceptions of maternal English acculturation, maternal perceptions of autonomy granting, and maternal perceptions of maternal psychological control.

Second, supplemental cross-lagged panel analyses examined if family-related demographic variables moderated longitudinal associations between maternal homework involvement and subsequent changes in child math outcomes. To this end, a series of two- and three-way interaction terms were created with each of the following demographic moderators: child sex, child cohort, mother's marital status, and mother's place of birth. Each were separately included in the model as predictor variables.

Third, supplemental cross-lagged panel analyses were conducted to isolate the effects of each child math outcome variable. Because three math outcome variables were correlated, separate models included concurrent and over time associations with each additional math outcome variable. For instance, additional analyses for models that focus on child perceptions of math difficulty included child perceptions of math ability and child expectations of math success.

Extrinsic interest in math. The second set of analyses included residualized maternal perceptions of the child's extrinsic interest in math as a moderator of associations from maternal homework involvement to subsequent child math outcomes (paths a_1 and a_2: Figure 3). Separate cross-lagged panel analyses were conducted for child perceptions of math ability, child perceptions of math difficulty, and child perceptions of math success. In each of these models, maternal homework involvement was crossed with residualized maternal perceptions of the child's extrinsic interest in math to create a moderator term that predicted subsequent math outcomes. These analyses were conducted in nearly the same manner as those involving maternal perceptions of the child's intrinsic interest in math. However, for each math related outcome, the hypothesis tested was that high, not low, child extrinsic interest in math exacerbated associations

from maternal homework involvement to subsequent changes in child math-related outcomes.

Missing Data

All path analyses were conducted in a structural equation modeling framework using Mplus v7.3 (Muthén & Muthén, 2017). Missing data accounted for an average of 3.23% of reports (*Range:* 0-9.56%). Little's MCAR test indicated that data were not missing completely at random, $\chi^2(401) = 476.85$, $p = .01$. which was a result of a significant negative relationship between child English acculturation in the Spring of 5th grade with missingness for maternal homework involvement in the Spring of 5th grade (2 cases; 0.80% missingness). Mothers with missing data on maternal homework involvement had children with lower English acculturation scores.

A follow up analysis omitted the two cases which were missing on maternal homework involvement in the Spring of 5th grade. The same pattern of statistically significant associations were maintained, suggesting that missingness on this variable did not bias results. Missing data at the item level was imputed using an EM algorithm with 25 iterations. Missing data at the wave level was handled with full information maximum-likelihood estimation (FIML).

RESULTS

Preliminary Analyses

Tables 1 and 2 presents means, standard deviations, and intercorrelations for all study variables. Autocorrelations were statistically significant. Child perceptions of math ability were positively correlated with child expectations of math success (concurrently and over time). Child perceptions of math difficulty were negatively correlated with (a) child perceptions of math ability (concurrently and over time), and (b) child expectations of math success (concurrently and over time). Child perceptions of math difficulty in the Fall of 6th grade was negatively correlated with maternal homework involvement in the Spring of 6th grade. In the Spring of 5th grade, math performance scores were positively correlated with child perceptions of math ability (r = .37) and child expectations of math success (r = .36), and were negatively correlated with child perceptions of math difficulty (r = -.32).

The residualized scores of maternal perceptions of the child's intrinsic interest in math in the Spring of 5th grade were positively correlated with (a) maternal homework involvement in the Spring of 5th grade and the Fall of 6th grade, (b) child perceptions of math ability at all waves, and (c) child expectations of math success at all waves. The residualized scores of maternal perceptions of the child's intrinsic interest in math in the Spring of 5th grade were negatively correlated with child perceptions of math difficulty in the Spring of 5th grade and the Fall of 6th grade.

The residualized scores of maternal perceptions of the child's intrinsic interest in math in the Fall of 6th grade and in the Spring of 6th grade were positively correlated with (a) maternal homework involvement at all waves, (b) child perceptions of math ability at all waves, and (c) child expectations of math success at all waves. The residualized scores of maternal perceptions of the child's intrinsic interest in math in the Fall of 6th grade and in the Spring of 6th grade were negatively correlated with child perceptions of math difficulty at all waves.

Maternal homework involvement in the Spring of 5th grade was positively correlated with the residualized scores of maternal perceptions of the child's extrinsic interest in math at the Spring of 5th grade and the Fall of 6th grade. Maternal homework involvement in the Fall of 6th grade was positively concurrently correlated with the residualized scores of maternal perceptions of the child's extrinsic interest in math. The residualized scores of maternal perceptions of the child's extrinsic interest in math in the Spring of 5th grade and in the Fall of 6th grade were positively correlated with maternal homework involvement in the Spring of 6th grade. The residualized scores of maternal perceptions of the child's extrinsic interest in math in the Spring of 5th grade was negatively correlated with child perceptions of math difficulty in the Spring of 6th grade.

Additional correlations and independent samples t-tests were conducted to determine whether maternal homework involvement might be a proxy for maternal demographic variables. At all three waves of the study, mothers who completed the surveys in Spanish had significantly higher levels ($p < .02$) of homework involvement when compared to mothers who completed the surveys in English ($d = .35$-$.40$). All other

maternal demographic variables were not significantly associated with maternal homework involvement.

Repeated measures ANOVAs were conducted with sex as a between subjects variables and time (i.e., Spring 5th grade, Fall 6th grade, Spring 6th grade) as a repeated measure. The results revealed a statistically significant linear decrease in child perceptions of math ability, $F(1,248) = 4.40$, $p = .037$, $\eta^2 = .02$. There were no statistically significant linear changes in maternal homework involvement, child perceptions of math difficulty, child expectations of math success, maternal perceptions of the child's intrinsic interest in math, and maternal perceptions of the child's extrinsic interest in math. There were neither main effects nor two-way interactions involving sex.

Longitudinal Associations between Maternal homework involvement and Child Math Outcomes

The first analyses examined whether maternal homework involvement predicted changes in child math outcomes. The analyses were designed to test the hypothesis that lower levels of maternal involvement predict greater decreases in child perceptions of the child math ability, greater increases in child perceptions of math difficulty, and greater decreases in child expectations of math success.

Child perceptions of math ability. A latent change score cross-lagged panel model was conducted to explore longitudinal associations between maternal homework involvement and child perceptions of math ability. Model fit was acceptable, $\chi^2(6, n=251) = 4.68$, $p = .58$; $CFI = 1.00$; $RMSEA = .00$.

Figure 4 presents results. There was a borderline significant positive association between maternal homework involvement in the Spring of 5th grade and subsequent changes in child perceptions of math ability from the Spring of 5th grade to the Fall of 6th grade, β = .08, p = .06. There was also a borderline significant positive association between maternal homework involvement in the Fall of 6th grade and subsequent changes in child perceptions of math ability from the Fall of 6th grade to the Spring of 6th grade, β = .05, p = .06. There were no statistically significant associations from initial levels of child perceptions of math ability to subsequent changes in maternal homework involvement.

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math difficulty at each wave, (b) child expectations of math success at each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Child perceptions of math difficulty. A latent change score cross-lagged panel model was conducted to explore longitudinal associations between maternal homework involvement and child perceptions of math difficulty. Model fit was acceptable, $\chi^2(6, n=251) = 6.45$, p = .38; *CFI* = 1.00; *RMSEA* = .02.

Figure 5 presents results. There was a borderline significant negative association between maternal homework involvement in the Spring of 5th grade and subsequent changes in child perceptions of math difficulty from the Spring of 5th grade to the Fall of 6th grade, β = -.06, p = .10. There was also a borderline significant negative association between maternal homework involvement in the Fall of 6th grade and subsequent changes

in child perceptions of math difficulty from the Fall of 6th grade to the Spring of 6th grade, β = -.04, p = .10. There were no statistically significant associations from initial levels of child perceptions of math difficulty to subsequent changes in maternal homework involvement.

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math ability at each wave, (b) child expectations of math success at each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Child expectations of math success. A latent change score cross-lagged panel model was conducted to explore longitudinal associations between maternal homework involvement and child expectations of math success. Model fit was acceptable, $\chi^2(6, n=251) = 2.17$, p = .90; *CFI* = 1.00; *RMSEA* = .00.

Figure 6 presents results. There was a borderline significant positive association between maternal homework involvement in the Spring of 5th grade and subsequent changes in child expectations of math success from the Spring of 5th grade to the Fall of 6th grade, β = .10, p = .06. There was also a borderline significant positive association between maternal homework involvement in the Fall of 6th grade and subsequent changes in child expectations of math success from the Fall of 6th grade to the Spring of 6th grade, β = .05, p = .06. There were no statistically significant associations from initial levels of child expectations of math success to subsequent changes in maternal homework involvement.

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math ability at each wave, (b) child perceptions of math difficulty at each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Supplemental analyses. Supplemental latent change score cross-lagged panel analyses were conducted to control for the contribution of potential confounding variables. For each latent change score model investigating changes in a given math outcome, three supplemental analyses were conducted. For example, for the model exploring changes in child perceptions of math ability, child perceptions of math difficulty was entered into the model at each possible wave. Associations from initial levels of math difficulty to changes in the model variables, and associations from the model variables to changes in math difficulty were included in the supplemental model. For the next two models, child expectations of math success, and math performance scores were separately entered in the same fashion. The same patterns of statistically significant associations were maintained.

Separate cross-lagged panel analyses were conducted to determine if longitudinal associations between maternal homework involvement and child math outcomes were moderated by child cohort, child sex, maternal marital status, and maternal place of birth. To this end, two-way interaction terms (between each moderator and maternal homework involvement) were added to the model to determine if there were statistically significant associations from the interaction terms to subsequent changes in math outcomes. In all

cases, associations from two-way interaction terms did not reach conventional levels of statistical significance.

Longitudinal Associations between Maternal Perceptions of Maternal Homework Involvement and Child Math Outcomes Moderated by Maternal Perceptions of The Child's Interest in Math.

Two sets of analyses examined whether maternal perceptions of the child's interest in math moderated associations from maternal homework involvement to changes in the child's math outcomes over the transition to middle school. In the first set of analyses, maternal perceptions of the child's intrinsic interest in math moderated was the moderator. Three models were tested. The first was designed to test the hypothesis that associations between maternal homework involvement and decreasing child perceptions of math ability are exacerbated when mothers perceive the child be intrinsically uninterested in math. The second was designed to test the hypothesis that associations between maternal homework involvement and increasing child perceptions of math difficulty are exacerbated when mothers perceive the child to be intrinsically uninterested in math. The third was designed to test the hypothesis that associations between maternal homework involvement and decreasing child expectations of math success are exacerbated when mothers perceive the child to be intrinsically uninterested in math.

In the second set of analyses, maternal perceptions of the child's extrinsic interest in math was the moderator. The three analyses described above with intrinsic interest in math as a moderator were repeated for extrinsic interest in math as a moderator.

Intrinsic interest in math as a moderator.

Child perceptions of math ability. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child perceptions of math ability, moderated by maternal perceptions of the child's intrinsic interest in math. Model fit was acceptable, $\chi^2(33, n=251) = 37.87$, $p = .26$; *CFI* = .99; *RMSEA* = .02.

Figure 7 presents the results. There was a statistically significant negative association from the interaction term (i.e., maternal perceptions of the child's intrinsic interest in math and maternal homework involvement) in the Spring of 5th grade to subsequent changes in child perceptions of math ability from the Spring of 5th grade to the Fall of 6th grade, $\beta = -.14$, $p < .01$. There was also a statistically significant negative association from the interaction term in the Fall of 6th grade to subsequent changes in child perceptions of math ability from the Fall of 6th grade to the Spring of 6th grade, $\beta = -.08$, $p < .01$. In addition to the moderated associations predicting to changes in the child's perceptions of math ability, there were also statistically significant paths predicting changes in the child's intrinsic interest in math. Specifically, both initial maternal homework involvement and initial child perceptions of math ability positively predicted subsequent changes in maternal perceptions of the child's intrinsic interest in math ($\beta = .05$-$.08$ & $.10$-$.16$, respectively).

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math difficulty at each wave, (b) child expectations of math success at

each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Follow up simple slope analyses were conducted to probe statistically significant two-way interactions. Figure 10 presents the results. At low (1 SD below the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, there was a statistically significant positive association between maternal homework involvement and subsequent changes in child perceptions of math ability, B = .16, $p < .01$. At high (1 SD above the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, the association between maternal homework involvement and changes in child perceptions of math ability did not reach conventional levels of statistical significance, B = -.03, $p = .62$. Given mean level decreases in child perceptions of math ability, the findings indicate that lower levels of homework involvement correspond with greater decreases in child perceptions of math ability when maternal perceptions of the child's intrinsic interest in math was low, but not when maternal perceptions of the child's intrinsic interest in math was high.

Child perceptions of math difficulty. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child perceptions of math difficulty, moderated by maternal perceptions of the child's intrinsic interest in math. Model fit was acceptable, $\chi^2(33, n=251) = 37.27$, $p = .28$; *CFI* = .99; *RMSEA* = .02.

Figure 8 presents the results. There was a statistically significant positive association from the interaction term (i.e., maternal perceptions of the child's intrinsic interest in math and maternal homework involvement) in the Spring of 5th grade to

subsequent changes in child perceptions of math difficulty from the Spring of 5th grade to the Fall of 6th grade, β = .09, p = .04. There was also a statistically significant positive association from the interaction term in the Fall of 6th grade to subsequent changes in child perceptions of math difficulty from the Fall of 6th grade to the Spring of 6th grade, β = .06, p = .04. In addition to the moderated associations predicting to changes in the child's perceptions of math ability, there were also statistically significant paths predicting changes in the child's intrinsic interest in math. Specifically, initial maternal homework involvement positively predicted subsequent changes in maternal perceptions of the child's intrinsic interest in math (β = -.05-.08, p < .05), and initial child perceptions of math difficulty inversely predicted subsequent changes in maternal perceptions of the child's intrinsic interest in math (β = -.12-.20, p < .01).

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math ability at each wave, (b) child expectations of math success at each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Follow up simple slope analyses were conducted to probe statistically significant two-way interactions. Figure 11 presents the results. At low (1 SD below the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, there was a statistically significant negative association between maternal homework involvement and subsequent changes in child perceptions of math difficulty, B = -.15, p < .01. At high (1 SD above the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, the association between maternal homework involvement and

subsequent changes in child perceptions of math difficulty did not reach conventional levels of statistical significance, B = .01, p = .80. Given the absence of mean level decreases in child perceptions of math difficulty, the findings indicate that lower levels of homework involvement correspond with greater increases in child perceptions of math difficulty for some children, but also corresponded with lower decreases in child perceptions of math difficulty, for other children, when maternal perceptions of the child's intrinsic interest in math were low, but not when maternal perceptions of the child's intrinsic interest in math were high.

Child expectations of math success. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child expectations of math success, moderated by maternal perceptions of the child's intrinsic interest in math. Model fit was acceptable, $\chi^2(33, n=251) = 21.56$, p = .93; *CFI* = 1.00; *RMSEA* = .00.

Figure 9 presents the results. There was a statistically significant negative association from the interaction term (i.e., maternal perceptions of the child's intrinsic interest in math and maternal homework involvement) in the Spring of 5th grade to subsequent changes in child expectations of math success from the Spring of 5th grade to the Fall of 6th grade, β = -.13, p = .04. There was also a statistically significant negative association from the interaction term in the Fall of 6th grade to subsequent changes in child expectations of math success from the Fall of 6th grade to the Spring of 6th grade, β = -.07, p = .04. In addition to the moderated associations predicting to changes in the child's perceptions of math ability, there were also statistically significant paths predicting changes in the child's intrinsic interest in math. Specifically, both initial

maternal homework involvement and initial child expectations of math success positively predicted subsequent changes in maternal perceptions of the child's intrinsic interest in math (β = .06-.09 & .11-.17, respectively).

The same pattern of associations were maintained after including concurrent correlations and over time associations between all model variables and (a) child perceptions of math ability at each wave, (b) child expectations of math success at each wave, and (c) child math performance in the Spring of 5th grade and the Spring of 6th grade.

Follow up simple slope analyses were conducted to probe the two-way interactions. Figure 12 presents the results. At relatively low (1 SD below the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, there was a statistically significant positive association between maternal homework involvement and subsequent changes in child expectations of math success, B = .15, p = .03. At relatively high (1 SD above the mean) initial levels of maternal perceptions of the child's intrinsic interest in math, the relationship between maternal homework involvement and subsequent changes in child expectations of math success did not reach conventional levels of statistical significance, B = -.04, p = .51. Given the absence of mean level decreases in child expectations of math success, the results of the simple slope analyses indicate that lower levels of homework involvement corresponded with greater decreases in child math success, for some children, but also corresponded with lower increases in child math success for other children when maternal perceptions of the child's intrinsic interest in math were low, but not when maternal perceptions of the child's intrinsic interest in math were high.

Supplemental analyses. Supplemental latent change score cross-lagged panel analyses were conducted to control for the contribution of potential confounding variables. For each latent change score model investigating changes in a given math outcome, three supplemental analyses were conducted. For example, for the model exploring changes in child perceptions of math ability, child perceptions of math difficulty was entered into the model at each possible wave. Associations from initial levels of math difficulty to changes in the model variables, and associations from the model variables to changes in math difficulty were included in the supplemental model. For the next two models, child expectations of math success, and math performance scores were separately entered in the same fashion. The same patterns of statistically significant associations were maintained.

Separate cross-lagged panel analyses were conducted to determine if longitudinal associations between maternal homework involvement and child math outcomes were moderated by child cohort, child sex, maternal marital status, and maternal place of birth. To this end, three-way interaction terms (between each moderator, maternal homework involvement, and child intrinsic interest in math) were added to the model to determine if there were statistically significant associations from the interaction terms to subsequent changes in math outcomes. In all cases, associations from the three-way interaction terms did not reach conventional levels of statistical significance, indicating that the moderating effect of intrinsic interest in math was not limited to those participants of a single cohort, sex, family structure, or family origin.

Extrinsic interest in math as a moderator.

Child perceptions of math ability. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child perceptions of math ability, moderated by maternal perceptions of the child's extrinsic interest in math. Model fit was poor after the addition of the interaction term, $\chi^2(33, n=251) = 55.27$, $p < .01$; *CFI* = .97; *RMSEA* = .05. There were no significant associations from the interaction term (i.e., initial levels of maternal perceptions of the child's extrinsic interest in math and initial levels of maternal homework involvement) to subsequent changes in child perceptions of math ability.

Child perceptions of math difficulty. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child perceptions of math difficulty, moderated by maternal perceptions of the child's extrinsic interest in math. Model fit was poor after the addition of the interaction term, $\chi^2(33, n=251) = 73.61$, $p < .01$; *CFI* = .94; *RMSEA* = .07. There were no significant associations from the interaction term (i.e., initial levels of maternal perceptions of the child's extrinsic interest in math and initial levels of maternal homework involvement) to subsequent changes in child perceptions of math difficulty.

Child expectations of math success. A latent change score cross lagged panel model was conducted to explore longitudinal associations from initial maternal homework involvement to subsequent changes in child expectations of math success, moderated by maternal perceptions of the child's extrinsic interest in math. Model fit was

poor after the addition of the interaction term, $\chi^2(33, n=251) = 55.02$, $p < .01$; *CFI* = .97; *RMSEA* = .05. There were no significant associations from the interaction term (i.e., initial levels of maternal perceptions of the child's extrinsic interest in math and initial levels of maternal homework involvement) to subsequent changes in child perceptions of math success.

DISCUSSION

The present study addressed three research questions: (1) Do child perceptions of their math-related outcomes worsen across the transition into middle school? (2) Do lower levels of maternal homework involvement predict a worsening of child math-related outcomes across the transition to middle school? (3) Does mothers' perceptions of the child's interest in math exacerbate associations from maternal homework involvement to subsequent in child math-related outcomes? Each will be discussed in turn.

Results from the present study replicated previous research indicating that child perceptions of math ability decrease across the transition to middle school (Cole et al., 2001; Gniewosz et al., 2012). The consequences of low math achievement are staggering. Poor math performance in secondary school has been linked to a lower likelihood of graduating high school (Kieffer et al., 2011), and obtaining high quality employment in adulthood (Murnane et al., 1995; Rivera-Batiz, 1992). Problems linked to poor math achievement are particularly acute among Latino-American children, who struggle with math when compared to their Anglo-American counterparts (Aud et al., 2011; Borman, Stringfield, & Rachuba, 2000; Clewell et al., 1992).

The results of my dissertation underscore the important role that mothers play in preventing declines in child math related outcomes during the early adolescent years. Despite the common perception that parent involvement in schoolwork has only beneficial effects, there is limited empirical support for this proposition. I hypothesize that for some at-risk children, parental failure to engage and assist with homework

involvement may be particularly harmful to math-related outcomes. For the sample as a whole, maternal involvement in homework was not significantly related to changes in child math-related outcomes. New to this study, however, is the finding that maternal influence on academic outcomes varied according to child motivational characteristics. Maternal homework involvement matters most for Latino-American children who are intrinsically uninterested in math from their mothers' perspective.

Do Child Perceptions of Children's Math-related Outcomes Worsen Across the Transition to Middle School?

Previous studies from majority culture children have found that children's perceptions of math ability decrease across the transition from primary to secondary school (Cole et al., 2001; Eccles, et al., 1984; Gniewosz et al., 2012, Jacobs et al., 2002; Marsh, 1989; Wigfield et al., 1991). The present investigation is the first longitudinal study to replicate such findings among Latino-American children, extending the results to examine children's perceptions of math difficulty and children's expectations of math success.

As expected, results indicated that Latino-American children's perceptions of their own math ability decreased during these years. There are a number of reasons why this may occur. Secondary school accompanies major changes in the structure and quality of the classroom environment, which may result in a mismatch between children's developmental stage and the educational demands of the school (Eccles & Midgley, 1989). Such changes include grading scales, classroom organization, and the cognitive demands of schoolwork (Eccles et al., 1989). Children must also navigate changes to the peer group that serve as a frame of reference for self-concepts (Marsh, Relich, & Smith,

1983). As children move from primary school to middle school, they are exposed to a larger number of competitors, and have stronger cues (e.g., entry into advanced math classes) that they are succeeding or lagging behind their peers (Eccles & Midgley, 1989; Jacobs & Eccles, 2000). Puberty brings with it added stress, further complicating entry into middle school (Simmons & Blyth, 1987).

Unexpectedly, Latino-American children's perceptions of math difficulty and child expectations of success in math did not significantly worsen from the Spring of 5th grade to the Spring of 6th grade. These results are inconsistent with previous studies indicating that perceptions of math difficulty increased over the transition to middle school (although only for high achieving, but not low achieving, US Midwestern students), and that expectations for math success decreased over the transition to middle school for a representative sample of US students (Midgley, et al., 1989). Consistent with results from my study, Watt (2004) found no evidence for linear increases in children's perceptions of math difficulty following the transition into secondary school in a sample of Australian children followed from 7th to 11th grade. There are several possible reasons for this failure of replication. The study by Midgley and colleagues (1989) followed a much larger number of students (N = 1323). Differences in power increased their ability to detect small effect sizes. Additionally, Midgley and colleagues (1989) followed students across the transition into high school, between 6th and 7th grades. It is possible that declines are specific to junior high school or the seventh grade.

Do Lower Levels of Maternal Homework Involvement Predict a Greater Subsequent Worsening of Child Math-related Outcomes Across the Transition to Middle School?

In the main effects model, associations from maternal homework involvement to changes in child perceptions of math ability, child perceptions of math difficulty, and child expectations of math success did not rise to conventional levels of statistical significance (p = .06 to .10). I am not the first to report weak associations between parent homework involvement and academic outcomes (Hill & Craft, 2003; Hill & Tyson, 2009). Some report significant and positive associations between the two (Gonida & Cortina, 2014; Ng et al, 2004). Others find that maternal homework involvement actually predicts worsening academic outcomes (Cooper et al., 2000; Patall et al., 2008).

The most compelling explanations for these differences concern the ways in which parental homework involvement has been operationalized. Previous studies have often mixed parental involvement with school (e.g., attending meetings, maintaining lines of communications with teachers, and volunteering) and items assessing home-based involvement practices, such as homework monitoring, into a single composite measure. This is problematic as school-based involvement is most often associated with positive child outcomes (Hill & Taylor, 2009; Pomerantz et al., 2007). Measures of home-based involvement also vary in the extent to which they assess quantities of involvement and qualities of involvement (Cooper et al., 2000; Gonida & Cortina, 2014; Ng et al., 2004). Research on quality suggests that autonomy support is linked to higher child academic performance (e.g., test scores, grades, and homework completion rates) whereas controlling behaviors is linked to poorer performance (Cooper, Lindsay, & Nye, 2000).

Unfortunately, my measure of quantity of parent involvement did not distinguish between these qualities. Finally, other measures of academic performance may be more sensitive to the beneficial influence of the quality of parental involvement than the ones used in the present study. For example, global measures of performance such as GPA are more likely to be positively associated with parental homework involvement than subject-specific measures (Fan & Chen, 2001). This may be because parents vary in their abilities to help children in specific subjects, and children vary in their need for assistance across subjects. Targeting assistance should improve GPA if not grades in students that may or may not have been the focus of interventions.

The timing of assessments matters. In the studies reviewed above, null or negative associations between parental homework involvement and child academic outcomes involved middle school students, whereas those identifying positive associations typically involved primary school students (Patall et al., 2008). As a general rule, results for parent involvement seem to be stronger during the primary school years because children's cognitive and organizational habits are underdeveloped (Dufresne & Kobasigawa, 1989), and therefore they are more likely to benefit from parental socialization efforts (Patall et al., 2008; Hill & Taylor, 2004). Parents are also better able to provide assistance in primary school because the homework is less challenging than in middle school (Cooper, 2001). Furthermore, adolescents may be more inclined to perceive parent efforts to assist with schoolwork as controlling, unwanted intrusions into their growing sense of autonomy (Gutman & Midgley, 2000; Hill & Holbeck, 1985). As a consequence, assistance efforts may be counterproductive.

Does Children's Interest in Math Exacerbate Associations from Maternal Homework Involvement to Subsequent Changes in Child Math-related Outcomes?

Consistent with the parent x child model of socialization (Collins et al., 2000), maternal involvement in homework predicted child math outcomes, but only for children with relatively low intrinsic interest in math from their mothers' perspective. This indirectly implicates children's need for mastery as a key gateway of influence from parents (Frome & Eccles, 1998; Guay, Marsh, & Boivin, 2003; Ng et al., 2004). Extrinsic motivation did not moderate associations between maternal involvement in homework and child math-related outcomes. I discuss each moderator in turn.

Intrinsic movitation. Low intrinsic interest in math signaled susceptibility to influence from mothers. The greatest declines in math outcomes occurred among children whose mothers perceived them to be intrinsically uninterested in math and reported low levels of homework involvement. Two possible scenarios may account for this finding. First, children who are intrinsically uninterested in math may not care about math, but still need to do well to satisfy parents' and teachers' requests or demands. Those who are uninterested, but do not face demands, will have little incentive to work on math competently. Second, uninterested children, driven by previous experiences where they received negative feedback regarding their abilities, may have unfulfilled psychological needs which increase their susceptibility to parental influence. To this end, when parents engage in cognitively rich interaction styles, or emphasize how math can be rewarding and interesting in its own right, many uninterested children may begin to feel more in control of their abilities, may gain more self-confidence, and may begin to see the virtues of succeeding in math. This optimistic interpretation, if true, may mean that, for many

low performing or uninterested young adolescents, it is not too late for parents to intervene. Alternatively, children may just need to be reminded to keep track of their math homework because they don't intrinsically care about math.

Perceptions of math ability. As hypothesized, maternal homework involvement predicted decreases in child perceptions of math ability (i.e., math self-concept) across the transition into middle school, but only for children who were not intrinsically interested in math. Children who are uninterested in math may receive the most benefits from parental socialization strategies that communicate the value and importance of succeeding in math (Hill & Taylor, 2004). This may be particularly relevant for Latino-American children, who may perceive participating in rigorous academic activities as acquiescing to the demands of the majority culture. Latino-American children may interpret parental involvement in math as an implicit acknowledgement that working on math is valued culturally. With repeated socialization attempts, uninterested children may internalize parental academic values. Even if they don't, parent involvement should help students remain engaged and perform well, limiting perceptions that math abilities are lagging behind their peers.

The transition to middle school may be a period when parents have the greatest influence on child math self-concept (Gniewosz et al., 2012). Children's concepts of their ability in a given subject are thought to be influenced by several factors such as the grades children receive in school (Marsh, Köller, Trautwein, Lüdtke, & Baumert, 2005), children's perceptions of their relative rank of ability within their peer group (Cole, Maxwell, & Martin, 1997), and feedback from important adults such as teachers and parents (Jacobs, Davis-Kean, Bleeker, Eccles, & Malanchuk, 2005; Jacobs & Eccles,

2000). Notably, the first two of these three influences undergo pronounced changes during the transition to middle school, which can explain why child perceptions of their academic ability suffer the most over the transition to middle school (Watt, 2004).

To my knowledge, this is the first study to investigate the influence of home-based parental involvement practices on changes in child perceptions of math ability. The novel results of this study indicate that only children who are intrinsically uninterested in math are susceptible to parental influence over math self-concept. There are several possible mechanisms that may explain these results. Children who are intrinsically uninterested in math have few internal incentives to perform well in math. Absent intervention by parents, these children may ultimately do poorly in school, and incorporate this information into their self-evaluations. Alternatively, it is possible that intrinsically uninterested children view parental non-involvement as confirmation that they are not competent enough to warrant parents' time and energy.

Mothers held no sway over children who were intrinsically interested in math, probably because interest co-occurs with self-efficacy and self-motivated learning (Bandura, 1994). In other words, interested children may be less susceptible to influence because they are self-reliant and have already adopted math achievement as a value. Because intrinsically interested children are likely to have higher self-efficacy in math, and to be self-reliant learners, they respond to math problems by challenging themselves, and under these circumstances, perceptions of math difficulty should not be tied to the degree mothers provide homework help. Alternatively, children may recognize they enjoy math, but have also come to the conclusion that they can continue to do so without always caring about earning high math grades. Finally, parental involvement in math

homework may be, at best, an obligation, and at worse, a nuisance, for children who already enjoy working on math problems, and who will likely continue to do well on their own accord.

It is not yet known whether the moderated association between maternal homework involvement and child perceptions of math ability is uniquely specific to Latino-American families. Latino-American parents have been reported to be highly involved in children's academic activities at home, probably because they recognize that children need to do well in school to traverse social and economic barriers (Bempechat, 1998). *Familismo*, or the maintenance of strong bonds and interconnectedness within families (Stein et al., 2014) has potential as a mechanism to communicate important educational values from parents to children. Past research has found that the extent to which Latino-American families to promote the cultural socialization of *familismo* has been positively linked to the relative academic performance of adolescents (Huynh & Fuligni, 2008). However, it is less clear if *familismo* itself was linked to positive academic outcomes, or if it was merely the vessel for the socialization of academic motivation (Hill & Tyson, 2009). To address this concern, a study by Rivas-Drake and Marchand (2016) individually investigated the influence of both Latino-American children's endorsement of *familismo* and their perceptions of parental educational expectations on their level of school engagement. Results indicated that after accounting for parents' education level, both were positively associated with children's engagement.

Perceptions of math difficulty. The present study was the first to examine the association between maternal homework involvement and child perceptions of math difficulty. As hypothesized, maternal homework involvement was negatively associated with changes in child perceptions of math difficulty across the transition to middle school, but only for children who were not intrinsically interested in math. Due to the absence of mean-level changes in child perceptions of math difficulty, the findings should be interpreted to mean that, for some children, lower levels of maternal involvement precipitated increases in math difficulty, but for others, higher maternal involvement forecast decreases in math difficulty.

The results suggest that uninterested children are open to changing their views about math on the basis of input from parents. There may be several reasons why children perceive math to be difficult. They may have the natural ability to do well in math, but lack the confidence to focus on math activities. They may have had previous negative experiences in school, and may avoid math as a response, thereby leaving themselves unprepared for new math concepts. They may have had an absence of role models who demonstrated the value of math. Parents who seek and take advantage of opportunities to work on math with intrinsically uninterested children will find themselves in a position to alleviate perceptions of math difficulty.

Several strategies may be effective. Parents can focus on addressing the negative mindsets of intrinsically uninterested children by providing experiences of success. Parents can teach children how to tackle complex problems one step at a time, or may demonstrate logical or numerical short-cuts that children may not have been aware of before. After a few successful sessions, intrinsically uninterested children may begin to

recognize that math is less challenging than previously perceived, and may respond by becoming more confident and engaged.

Expectations for math success. The present study was the first to examine the association between maternal homework involvement and child expectations of math success. As hypothesized, initial levels of maternal homework involvement were positively associated with changes in child expectations of math success across the transition to middle school, but only for children who were intrinsically uninterested in math. Given the absence of mean-level changes in child expectations of math success, the findings should be interpreted to mean that for some children, lower levels of maternal involvement precipitated decreases in expectations of math success, and for other children, higher involvement precipitated increases in expectations of math success.

The results of this study suggest that uninterested children are open to maternal influence over expectations about school. When compared to uninvolved parents, parents who are frequently involved in children's schoolwork have a greater number of opportunities to provide feedback and praise in response to children's work. Such interactions bolsters children's confidence in themselves. Emboldened children will likely anticipate that they will perform better in the future. Involved parents may also provide more material resources such as books or learning aids to help children acquire new math concepts, materials which children know that they can rely upon to do well in the future.

Extrinsic motivation. Child extrinsic motivation did not moderate associations between maternal homework involvement and subsequent changes in child math outcomes. Of course null effects must be interpreted with caution, but the evidence

suggests that maternal homework involvement had the same influence on math outcomes for all children, regardless of their level of extrinsic motivation.

These null findings may be due to several reasons. First, it is not clear that parents are a successful motivator of young adolescent social behavior. Students who reject school culture may be extrinsically motivated to please peers who might be school burnouts (Eckert, 1989). In short, such children may favor peer influence in lieu of parental influence. Second, extrinsic motivation was operationalized as perceptions of the extent to which math is important to children's short and long term goals (i.e., utility value). This measure did not directly assess the extent to which children sought to receive rewards and avoid negative outcomes arising from math related behaviors. In short, utility value may not be the same as extrinsic motivation. Third, extrinsic motivation was measured in terms of maternal perceptions of the extent to which math was important to *their children's* goals. It is possible this measure instead tapped the extent to which math is important to *mothers' goals for their children*. Fourth, extrinsic motivations for doing well in math may be less relevant to middle school students than to high school students. Worth noting, one of the four items in this measure tapped usefulness for math for after high school graduation. When compared to middle school students, high school students are closer to graduation, and are therefore more likely to be concerned with getting into a good college, or finding a well-paying full-time job.

Future Research Directions

Forms of involvement. The present study assessed maternal involvement in terms of the amount of homework assistance. Other studies have identified qualitative factors of involvement that vary according to how much autonomy is granted to the child. Forms of assistance that are low in control and high in autonomy granting have been linked to better motivational and academic outcomes when compared to more directive and intrusive forms of involvement (Dumont et al., 2012; Gonida & Cortina, 2014; Moroni et al., 2015). However, further investigation is needed to resolve remaining ambiguities. For example, a recent study that controlled for the effect of each found that only controlling forms of homework involvement were harmful among 5th and 6th graders, whereas autonomy supportive behaviors were not predictive of academic achievement (Núñez et al., 2015).

There has only been one study to date which attempted to disentangle the effects of quantity from quality of homework involvement (Moroni et al., 2015). Results indicated that, after controlling for previous levels of child academic achievement, quantity of involvement, and negative forms of involvement, were inversely associated with children's academic achievement. In contrast, supportive forms of involvement were positively associated with achievement. Needed are studies that assess the frequency of both positive and negative forms of involvement.

Paternal involvement. In many households, fathers play an important role supporting math homework. For example, a recent meta-analysis found that although mothers and fathers differ in the extent to which they are involved in children's academic pursuits at home (not limited to just homework involvement), both maternal and paternal

involvement had similarly positive influences on children's academic outcomes (Kim & Hill, 2015). Subsequent moderator analyses, however, found few effects for Latino-American fathers. A second meta-analysis agreed that ethnic-minority father involvement was also not positively associated with child academic outcomes (Jeynes, 2015). In the present study, most fathers were employed in migrant farm labor and were absent during much of the school years. Many of the children in the current study did not have regular access to their fathers on school nights. As a consequence, no data from fathers were collected.

Math performance. The present study focused on child math outcomes such as child perceptions of math performance and on perceptions of difficulty in math. Objective measures, such as math performance and math grades, could only be used as control variables. Math performance, measured annually, could not be included in the 3 lag model. Math grades, available for each semester in the study, could not be used in the 3 lag model because the primary schools used a different grading metric than the middle schools, making it impossible to track change across the school transition.

Implications and Recommendations

The current study expands our understanding of the ways in which parents influence child math outcomes. Importantly, the results point to a specific group of Latino-American children who are at risk for declines in math-related outcomes across the transition from primary to secondary school. Math outcomes are worse for intrinsically uninterested children with uninvolved parents. Given the identification of this risk group, parents should be in a better position to intervene. To this end, below I proffer a few suggestions.

Parents should be aware of the child's motives for math achievement. Intrinsic motivation is a desirable state. Mothers of children who lack intrinsic motivation have a variety of tools at their disposal to promote success in the absence of intrinsic motivation. First, mothers should dedicate time and resources to helping children with math homework. Second, mothers should avoid intrusive and controlling management styles when working with children on their schoolwork. Instead, mothers should rely on autonomy-supportive forms of homework involvement when possible. Third, mothers should provide praise in response to positive academic performance, and should provide encouragement in response to signs that children need improvement. All of these practices should foster success in math, and improve children's intrinsic motivations for performing well in school.

Past research suggests that cultural factors specific to Latino-American families may, in certain cases, foster children's academic motivation. For example, Mexican-American adolescents who have parents who frequently engaged with positive forms of cultural socialization (e.g., when parents encouraged children to read books about their heritage) demonstrated higher levels of intrinsic and extrinsic motivation in school (Huynh & Fuligni, 2008). Additional research has found that having a strong ethnic cultural identity coincides with greater academic motivation (Fuligni, Witkow, & Garcia, 2005) among minority students. Given these findings, steps should be taken to encourage a strong and positive ethnic identity in minority children.

Limitations

My results should be considered in light of the following limitations. First, I used maternal reports of child intrinsic and extrinsic interest in math rather than child reports. Only maternal reports were included as moderators, because child reports were, at some waves, not reliable (α = .60). Any null findings that emerged from these analyses would be impossible to interpret. Previous studies have not yet evaluated whether maternal or child perceptions of children's math interest are more strongly associated with objective math outcomes (e.g., grades, test scores), which are known to inform children's perceptions of math ability (Marsh et al., 2005). However, given that child and mother reports of intrinsic math interest were correlated moderately in strength (r = .23-.41), mother reports likely captured a fair portion of variance from child reports of math interest.

Second, it is unclear if the results of this study are generalizable to the broader population of Latino-American families. The sample investigated consisted of families residing in a small agricultural community in Northern California. Three-fourths of participating mothers originally emigrated from Mexico. Importantly, Latino-Americans are not a homogeneous ethnic group. The broader population of Latino-Americans vary in terms of their country of origin, cultural practices, number of generations living in the US, and their opinions about school. Future research is needed to determine if the results of the current study are replicated in other Latino-American populations.

Third, maternal homework involvement in the Spring of 5th grade was not missing completely at random. However, this should not be a major cause for concern for the current study's results. In the Spring of 5th grade only two mothers were missing data.

The same pattern of results were maintained after excluding these two families from analyses, suggesting that the potential for bias was minimal.

Summary

Previous studies have not agreed on the extent to which parental homework involvement predicts math-related outcomes, among adolescents in general (Cooper, 1989; Pomerantz et al., 2007), and among Latino-American adolescents specifically (Hill & Tyson, 2009). The present study adds to this debate by highlighting an important moderator: intrinsic interest in math. Parents were most influential when children were low in intrinsic interest in math. Particularly, child math outcomes worsened the most over the transition to middle school for children who were not intrinsic interested in math and whose parents were uninvolved in math homework. These findings illustrate the need for parents of intrinsically uninterested children to ensure adequate levels of involvement in children's math homework. Doing so will provide these at-risk children with the emotional or physical resources necessary to successfully navigate the entry into middle school, and successfully acquire the math skills needed to remain competitive later in life.

APPENDICES

Appendix A

Maternal homework involvement

1. I talk to my child about things related to math.
2. I do number activities with my child.
3. I work on math with my child.
4. I ask my child about what he/she is doing in math at school.

Response Format

1. Not at all
2. A little
3. About average
4. A fair bit
5. A lot

Appendix B

Maternal perceptions of the child's intrinsic interest in math

1. How much does your child like doing math?
2. How exciting is math to your child?
3. How interested is your child in the subject of math?

Response Format

1. Not at all
2. A little
3. About average
4. A fair bit
5. A lot

Appendix C

Maternal perceptions of the child's extrinsic interest in math

1. How useful is math for the things your child does outside of school?
2. How useful is learning math for what your child wants to do after he/she graduates and goes to work?
3. Compared to most of your child's other subjects, how useful is what he/she learns in math?
4. How useful will math be for your child later in life?

Response Format

1. Not at all useful
2. Marginally useful
3. Somewhat useful
4. Useful
5. Very useful

Appendix D

Child expectations of the child's math ability

1. How good at math are you? [a]
2. If you were to rank all of the students in your math class from the worse to the best in math, where would you put yourself? [b]
3. Compared to most of your other school subjects, how good are you at math? [c]

Response Format [a]

1. Not good at all
2. Somewhat not good
3. Average
4. Somewhat good
5. Very good

Response Format [b]

1. The worst
2. Somewhat lower than average
3. About average
4. Somewhat higher than average
5. The best

Response Format [c]

1. Very hard
2. Somewhat hard
3. Neither easy or hard
4. Somewhat easy
5. Very easy

Appendix E

Child expectations of the child's math difficulty

1. In general, how hard is math for you? [a]
2. Compared to other students your age, how much time do you have to spend working on your math assignments? [b]
3. Compared to most other school subjects you have taken or are taking, how hard is math for you? [c]

Response Format [a]

1. Very easy
2. Somewhat easy
3. Neither easy or hard
4. Somewhat hard
5. Very hard

Response Format [b]

1. Much less time
2. Somewhat less time
3. Neither more or less time
4. Somewhat more time
5. Much more time

Response Format [c]

1. My easiest subject
2. A somewhat easy subject
3. Neither easy or hard subject
4. A somewhat hard subject
5. My hardest subject

Appendix F

Child expectations of math success

1. How well do you think you will do in math this report card period? [a]
2. What grade in math do you expect to get this report card period? [b]
3. How successful do you think you will be in a career that required mathematical ability? [c]

Response Format [a]

1. Not at all well
2. Somewhat poorly
3. About average
4. Somewhat well
5. Very well

Response Format [b]

1. Fail (F)
2. Less than average (D)
3. Average (C)
4. Above average (B)
5. Highest grade (A)

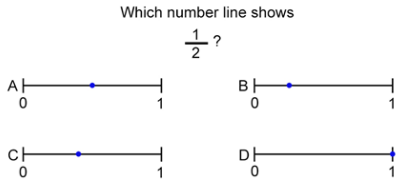
Response Format [c]

1. Not very successful
2. Somewhat unsuccessful
3. Neither unsuccessful or successful
4. Somewhat successful
5. Very successful

Appendix G

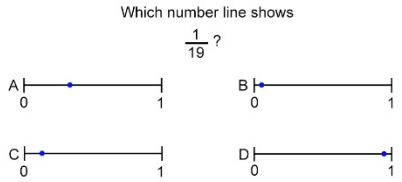
Child math assessment scores

1. Which number line shows 1/2?



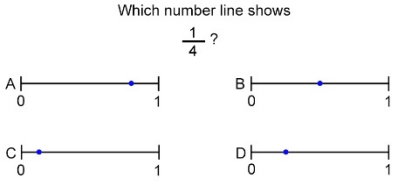
   a. 1/2
   b. 1/4
   c. 2/5
   d. 1

2. Which number line shows 1/19?



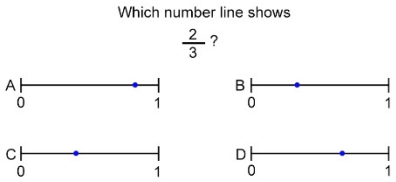
   a. 1/3
   b. 1/19
   c. 3/10
   d. 11/10

3. Which number line shows 1/4?



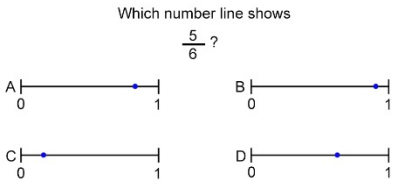
a. 4/5
b. 1/2
c. 1/8
d. 1/4

4. Which number line shows 2/3?



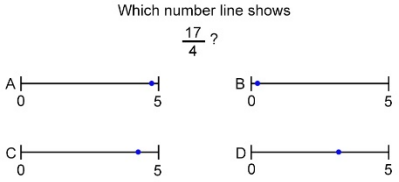
a. 5/6
b. 1/3
c. 2/5
d. 2/3

5. Which number line shows 5/6?



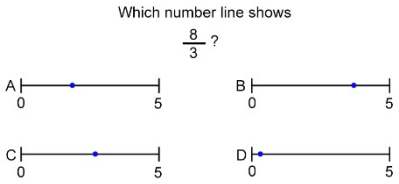
a. 5/6
b. 11/12
c. 1/6
d. 5/8

6. Which number line shows 17/4?



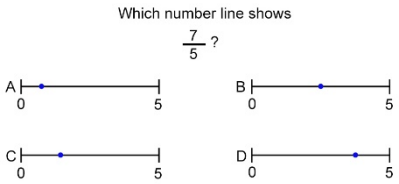
a. 4 3/4
b. 4/17
c. 4 1/4
d. 3 3/17

7. Which number line shows 8/3?



a. 1 7/8
b. 3 2/3
c. 2 2/3
d. 3/8

8. Which number line shows 7/5?



a. 5/7
b. 2 1/2
c. 1 2/5
d. 3 3/4

9. Which is true?

    a. 3/8 is less than 3/5.
    b. 3/8 is equal to 3/5.
    c. 3/8 is greater than 3/5.

10. Which is true?

    a. 2/9 is less than 3/5.
    b. 2/9 is equal to 3/5.
    c. 2/9 is greater than 3/5.

11. Which is true?

    a. 4/5 is less than 3/5.
    b. 4/5 is equal to 3/5.
    c. 4/5 is greater than 3/5.

12. Which is true?

    a. 4/7 is less than 3/5.
    b. 4/7 is equal to 3/5.
    c. 4/7 is greater than 3/5.

13. Which is true?

    a. 2/3 is less than 3/5.
    b. 2/3 is equal to 3/5.
    c. 2/3 is greater than 3/5.

14. 3/5 + 1/2 =

    a. 4/7
    b. 2/3
    c. 3/10
    d. 11/10

15. 3/5 + 2/5 =

a. 6/25
b. 1
c. 6/5
d. 5/10

16. 3/5 – 1/2 =

a. 4/7
b. 1/10
c. 2/3
d. 3/10

17. 3/5 – 2/5 =

a. 1
b. 1/10
c. 1/5
d. 1/0

18. 3/5 x 1/2 =

a. 3/10
b. 6/5
c. 3
d. 11/10

19. 3/5 x 2/5 =

a. 6/25
b. 6/5
c. 5/10
d. 1

20. 3/5 ÷ 1/2 =

a. 3/10
b. 6/5
c. 3/2
d. 1

21. 3/5 ÷ 2/5 =

a. 1/0
b. 1
c. 1/5
d. 15/10

You can get 5 bags of pet food for $40. The cost is the same for any number of bags.

22. What part of a bag of pet food costs 1 dollar?

Dollars	40	1
Bags	5	

a. 8
b. 1/4
c. 1
d. 1/8

23. How many bags of pet food can you get for $24?

Dollars	40	24
Bags	5	

a. 4
b. 3
c. 20
d. 6

24. How many dollars did 1 bag of pet food cost?

Dollars	40	
Bags	5	1

a. 1/8
b. 10
c. 8
d. 5

25. How many dollars does 20 bags of pet food cost?

Dollars	40	
Bags	5	20

a. 80
b. 4
c. 800
d. 160

12 cups of orange juice and 6 cups of lemonade are mixed in a large bowl.

26. You want to make a small bowl with the same ratio of orange juice to lemonade. What part of a cup of lemonade is needed for 1 cup of orange juice?

Orange Juice	12	1
Lemonade	6	

a. 1/2
b. 2
c. 1
d. 1/3

27. More juice is added to keep the same ratio of orange juice to lemonade. How many cups of lemonade are needed for 30 cups of orange juice?

Orange Juice	12	30
Lemonade	6	

a. 4
b. 5
c. 15
d. 20

28. You want to make a small bowl with the same ratio of orange juice to lemonade. How many cups of orange juice are needed for 4 cups of lemonade?

Orange Juice	12	
Lemonade	6	4

a. 24
b. 10
c. 2
d. 8

29. You want to make a small bowl with the same ratio of orange juice to lemonade. How many cups of orange juice are needed for 1 cup of lemonade?

Orange Juice	12	
Lemonade	6	1

a. 1
b. 6
c. 2
d. 1/2

30. This table shows different batches of fruit juice and water. How many cups of fruit for each cup of water?

Fruit Juice (cups)	24	12
Water (cups)	6	3

a. 1; no constant ratio
b. 3
c. 0.25
d. 1/2
e. 4

31. This table shows different batches of fruit juice and water. How many cups of fruit for each cup of water?

Fruit Juice (cups)	24	30
Water (cups)	8	12

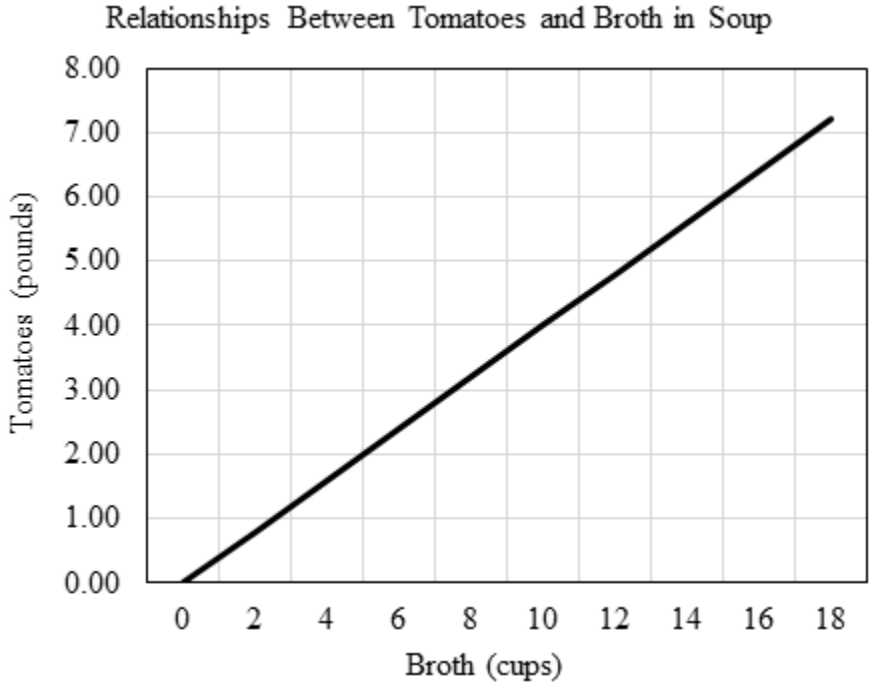
a. 3
b. 1/3
c. 2.5
d. No constant ratio

32. This table shows different batches of fruit juice and water. How many cups of fruit for each cup of water?

Fruit Juice (cups)	42	6
Water (cups)	56	8

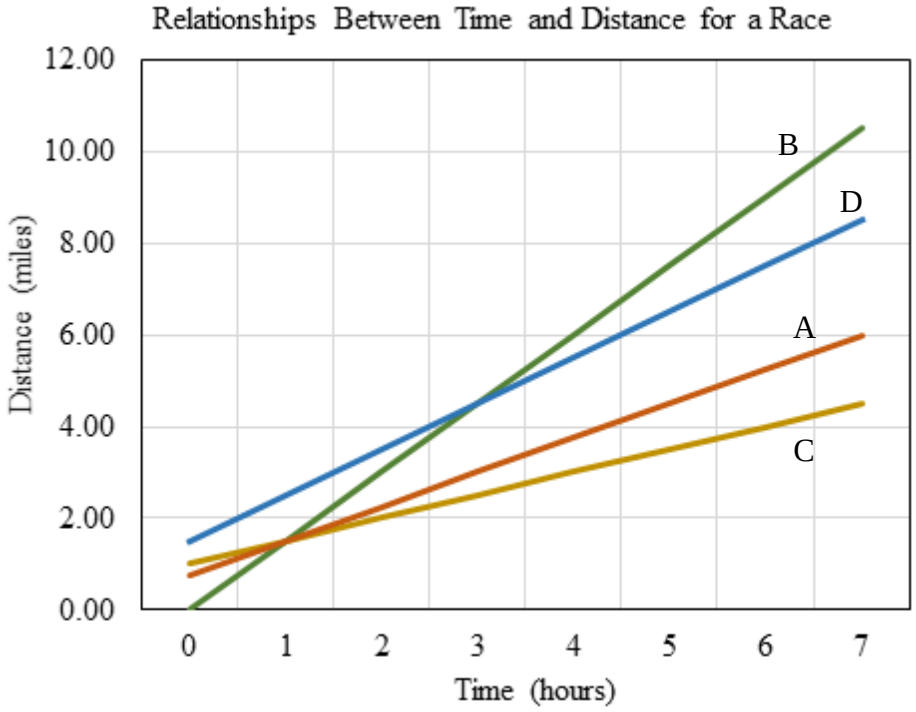
a. 7
b. 4
c. No constant ratio
d. 3/4
e. 1 & 1/3

33. This graph shows the relationship between pounds of tomatoes and cups of broth to make tomato soup. 6 pounds of tomatoes is combined with 15 cups of broth. Which point represents the unit rate or the number of tomatoes combined with one cup of broth?



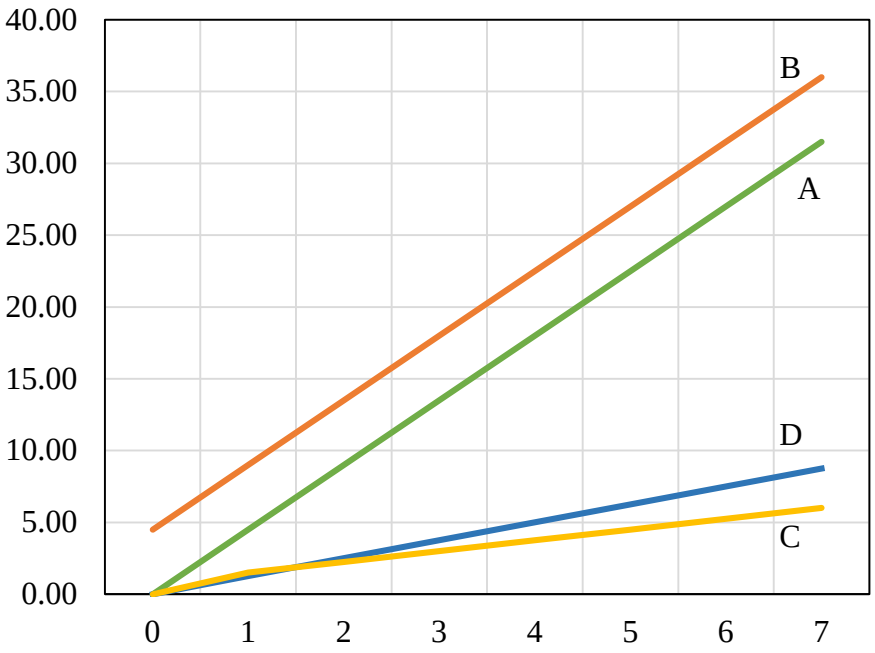
a. (5, 2)
b. (0, 0)
c. (1, 0.4)
d. (15, 6)

34. These lines shows the relationship between time and distance for four students who were walking for a fundraiser. Which student had a rate of 2/3 miles per hour?



a. A
b. B
c. C
d. D

35. Which line shows the equation y = 4.5x?



a. A
b. B
c. C
d. D

Appendix H

Child English Acculturation

1. I speak English.
2. I write in English.
3. I enjoy listening to music in English.
4. I enjoy watching TV in English.

Response Format

1. Not at all
2. A little
3. Somewhat often
4. Often
5. Very often

Child Anxiety

During the last month of school, did you…

1. become nervous when something didn't go the way you wanted?
2. have trouble falling asleep at night?
3. worry about what other people thought of you?
4. worry about what was going to happen?
5. worry when you went to bed at night?

Response Format

1. Never
2. Infrequently
3. Sometimes
4. Often
5. Very often

Child Conduct Problems

1. I get very angry and lose my temper.
2. I fight a lot.
3. Others accuse me of lying or cheating.
4. I usually don't do what I'm told.

Response Format

1. Never
2. Infrequently
3. Sometimes
4. Often
5. Very often

Child School Burnout

1. I feel a lack of motivation in my schoolwork and often think of giving up.
2. I feel that I am losing interest in my schoolwork.
3. I often wonder whether my schoolwork has any meaning.

Response Format

1. Completely disagree
2. Somewhat disagree
3. Neither agree or disagree
4. Somewhat agree
5. Completely agree

Appendix I

Maternal English Acculturation

1. I speak English.
2. I write in English.
3. I enjoy listening to music in English.
4. I enjoy watching TV in English.

Response Format

1. Not at all
2. A little
3. Somewhat often
4. Often
5. Very often

Maternal Autonomy Granting

1. I allow my child to make choices for him or herself whenever possible.
2. I am usually willing to consider my child's point of view.
3. When I want my child to do something, I explain why.
4. I trust my child to do what I expect without checking up on him or her.
5. I encourage my child to give his or her opinions when it comes to decisions about them.

Response Format

1. Never
2. Infrequently
3. Sometimes
4. Often
5. Very often

Maternal Psychological Control

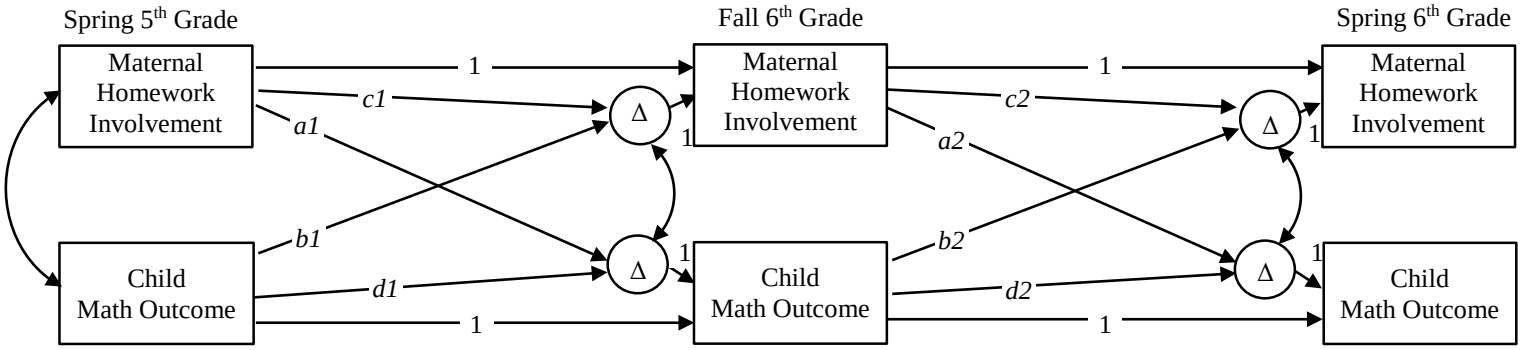
1. I let my child know that what I want him or her to do is the best for them and that they should not question it.
2. I tell my child about all the sacrifices I have made for him or her.
3. When I have an argument with my child, I say things like, “You’ll know better when you grow up.”
4. I act cold and unfriendly when my child does something I do not like.

Response Format

1. Never
2. Infrequently
3. Sometimes
4. Often
5. Very often

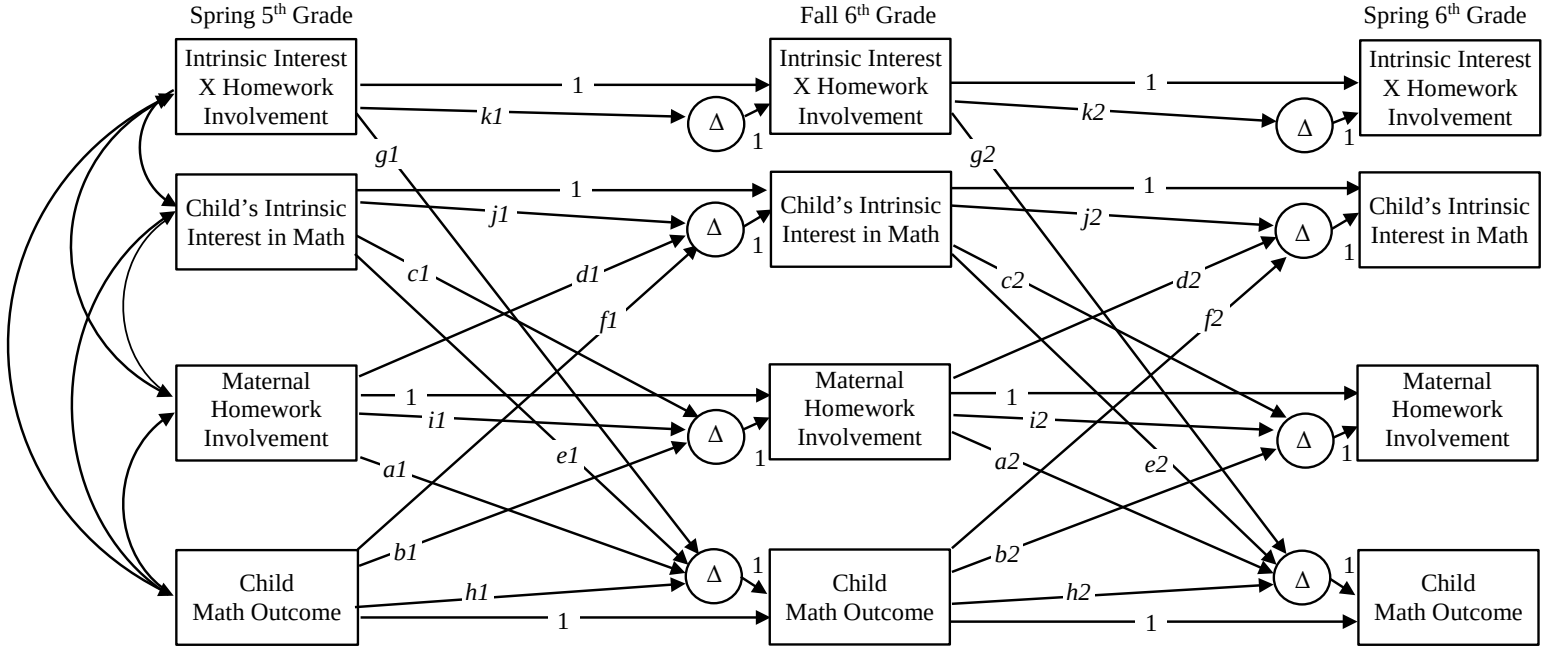
FIGURES & TABLES

Figure 1. *Over-time associations between maternal homework involvement and child math outcomes: Measurement model.*



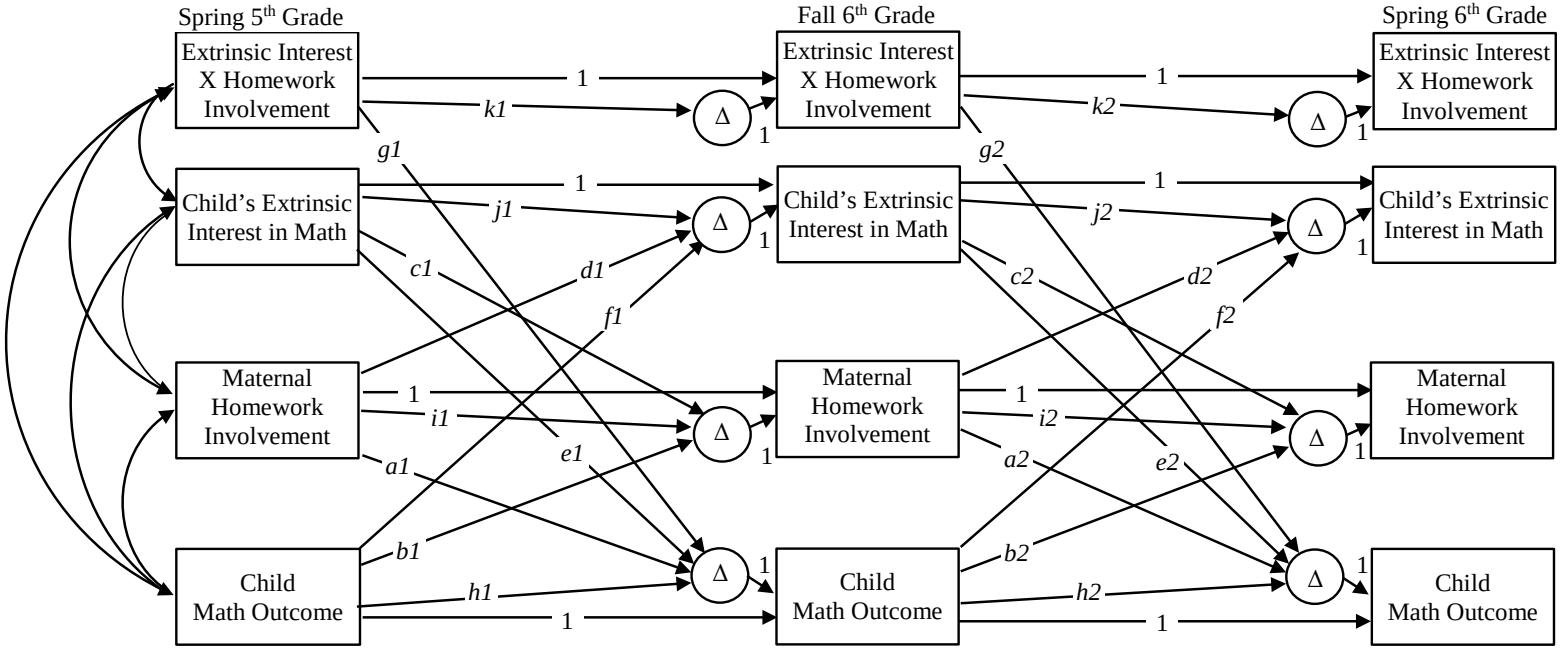
Note. Regressions from maternal involvement in math in the Spring of 5th grade to the change score for maternal involvement in math in the Spring of 6th grade, and from child math outcomes in the Spring of 5th grade to the change score for child math outcomes in the Spring of 6th grade are included in the model but not depicted. Identical labels reflect equality constraints. "Δ" represents the change score for a given variable over the following time interval. Separate analyses were conducted for each math outcome variable: Child perceptions of math ability, child perceptions of math difficulty, and child expectations of math success.

Figure 2. *Over-time associations between maternal homework involvement and child math outcomes, moderated by maternal perceptions of the child's intrinsic interest in math: Measurement model.*



Note. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. Concurrent error covariances at the Fall of 6th grade and the Spring of 6th grade are included in the model but not depicted. Identical labels reflect equality constraints. "Δ" represents the change score for a given variable over the following time interval. Intrinsic interest in math scores were residualized by regressing extrinsic interest in math scores onto intrinsic interest in math scores at each wave. Separate analyses were conducted for each math outcome variable: Child perceptions of math ability, child perceptions of math difficulty, and child expectations of math success.

Figure 3. *Over-time associations between maternal homework involvement and child math outcomes, moderated by maternal perceptions of the child's extrinsic interest in math: Measurement model.*



Note. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. Concurrent error covariances at the Fall of 6th grade and the Spring of 6th grade are included in the model but not depicted. Identical labels reflect equality constraints. "Δ" represents the change score for a given variable over the following time interval. Intrinsic interest in math scores were residualized by regressing intrinsic interest in math scores onto extrinsic interest in math scores at each wave. Separate analyses were conducted for each math outcome variable: Child perceptions of math ability, child perceptions of math difficulty, and child expectations of math success.

Table 1. *Means, Standard Deviations, and Correlations between Study Variables*

Variable	1	2	3	4	5	6	7	8	9	10	11	*M*	*SD*
Spring 5th Grade													
1. Maternal Homework Involvement	--											3.66	0.95
2. Child Perceptions of Math Ability	-.01	--										3.63	0.86
3. Child Perceptions of Math Difficulty	-.05	-.68**	--									2.65	0.96
4. Child Expectations of Math Success	-.02	.74**	-.63**	--								3.83	0.85
Fall 6th Grade													
5. Maternal Homework Involvement	.65**	-.01	-.03	.01	--							3.69	0.89
6. Child Perceptions of Math Ability	.11	.61**	-.50**	.54**	.06	--						3.61	0.80
7. Child Perceptions of Math Difficulty	-.13	-.56**	.57**	-.46**	-.08	-.75**	--					2.62	0.87
8. Child Expectations of Math Success	.11	.50**	-.43**	.61**	.02	.72**	-.67**	--				3.93	0.83
Spring 6th Grade													
9. Maternal Homework Involvement	.60**	.07	-.10	.06	.67**	.12	-.13*	.03	--			3.57	0.96
10. Child Perceptions of Math Ability	.02	.51**	-.45**	.46**	.04	.67**	-.57**	.59**	.10	--		3.57	0.90
11. Child Perceptions of Math Difficulty	.00	-.46**	.51**	-.39**	-.03	-.57**	.58**	-.53**	-.11	-.78**	--	2.58	0.92
12. Child Expectations of Math Success	.06	.45**	-.40**	.48**	.04	.58**	-.50**	.58**	.09	.69**	-.61**	3.94	0.96

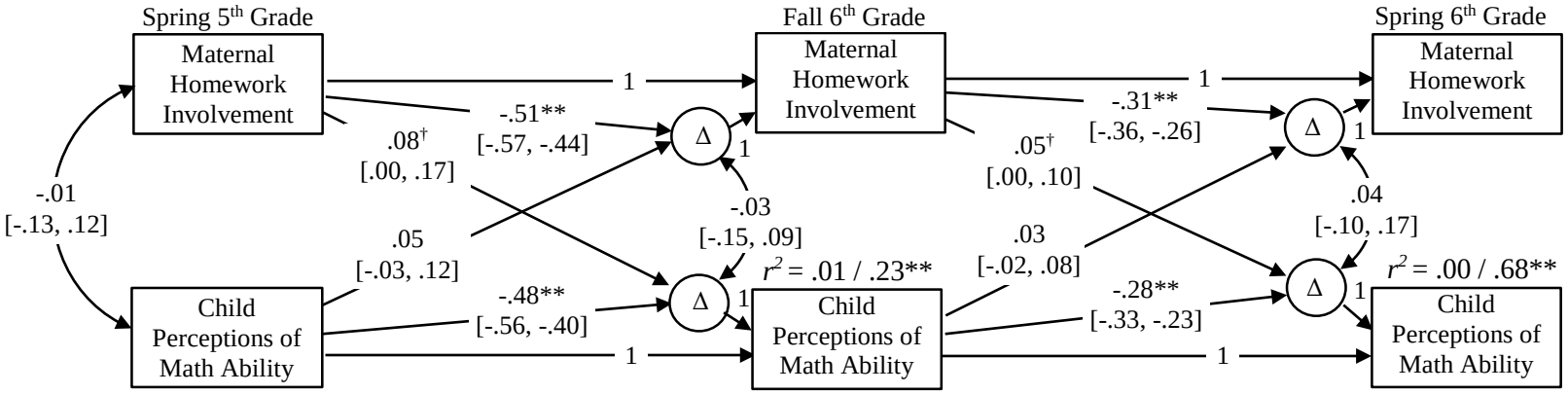
Note. $N = 251$. $^{*}p < .05$, $^{**}p < .01$.

Table 2. *Correlations between Study Variables and Moderator Variables*

Variable	Residualized Maternal Perceptions					
	Child Intrinsic Interest			Child Extrinsic Interest		
	Spr 5th	Fall 6th	Spr 6th	Spr 5th	Fall 6th	Spr 6th
Spring 5th Grade						
1. Maternal Homework Involvement	.23**	.16*	.19**	.20**	.19**	.12
2. Child Perceptions of Math Ability	.31**	.32**	.39**	-.03	-.04	-.05
3. Child Perceptions of Math Difficulty	-.34**	-.35**	-.34**	.01	-.01	-.02
4. Child Expectations of Math Success	.24**	.28**	.35**	-.05	-.03	-.08
Fall 6th Grade						
5. Maternal Homework Involvement	.14*	.15*	.21**	.11	.22**	.12
6. Child Perceptions of Math Ability	.25**	.40**	.39**	.04	-.06	.01
7. Child Perceptions of Math Difficulty	-.23**	-.35**	-.41**	-.03	.01	-.02
8. Child Expectations of Math Success	.24**	.38**	.40**	.06	-.04	-.03
Spring 6th Grade						
9. Maternal Homework Involvement	.08	.15*	.28**	.22**	.20**	.10
10. Child Perceptions of Math Ability	.18**	.28**	.30**	.07	.02	.09
11. Child Perceptions of Math Difficulty	-.07	-.29**	-.32**	-.18**	-.02	-.07
12. Child Expectations of Math Success	.24**	.33**	.35**	.10	.01	.03
Mean (SD)	4.00 (0.90)	3.93 (0.84)	3.97 (0.83)	4.58 (0.47)	4.63 (0.49)	4.64 (0.54)

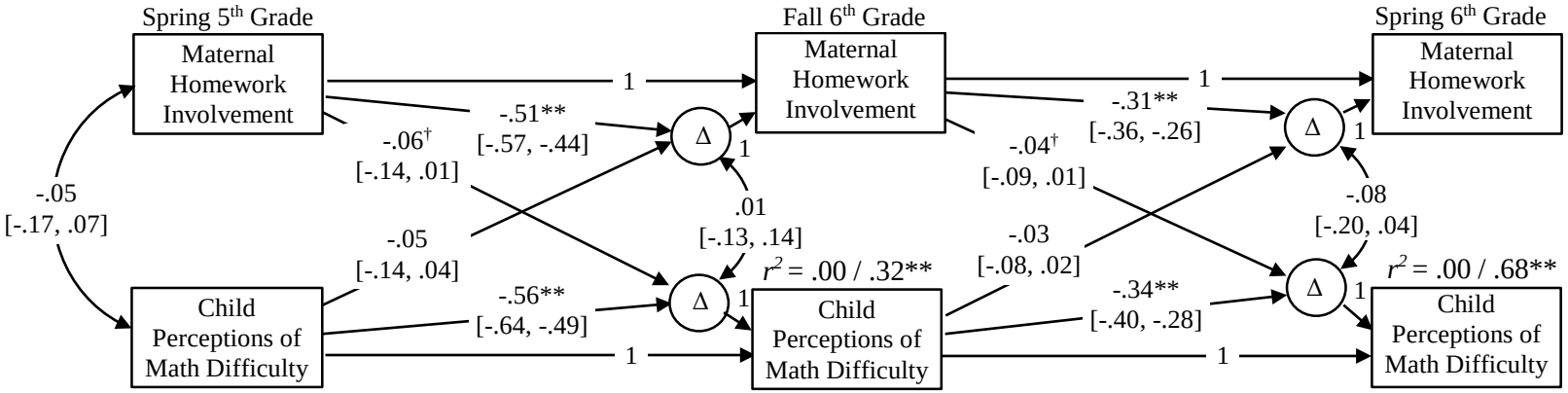
Note. $N = 251$. *$p < .05$, **$p < .01$.

Figure 4. *Over-time associations between maternal homework involvement and child perceptions of math ability.*



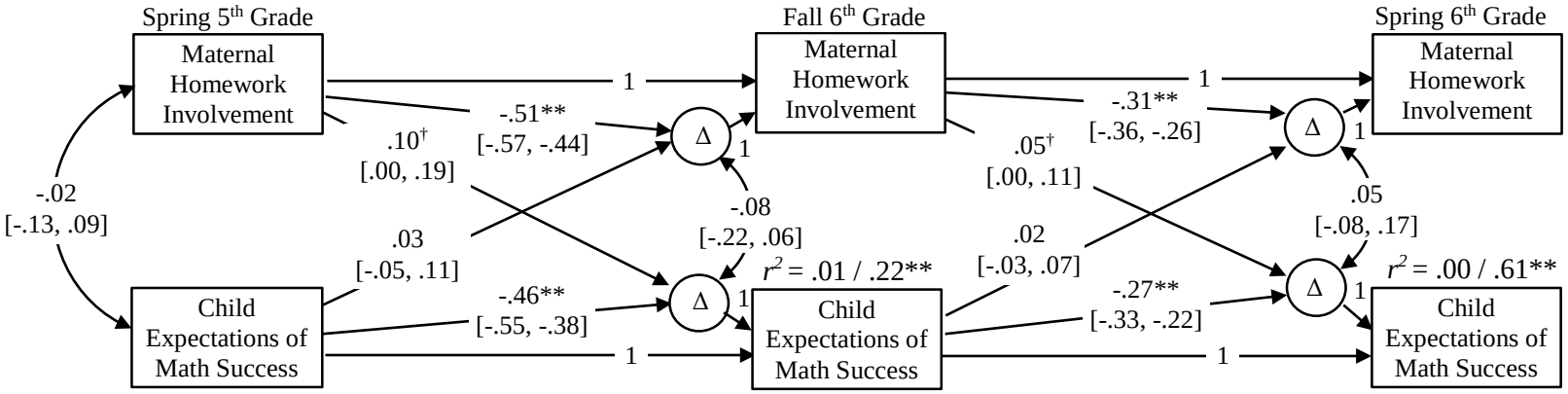
Note. $N = 251$. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. For change scores in child perceptions of math ability, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. $^{\dagger}p=.06$, $*p<.05$, $**p<.01$, two-tailed.

Figure 5. *Over-time associations between maternal homework involvement and child perceptions of math difficulty.*



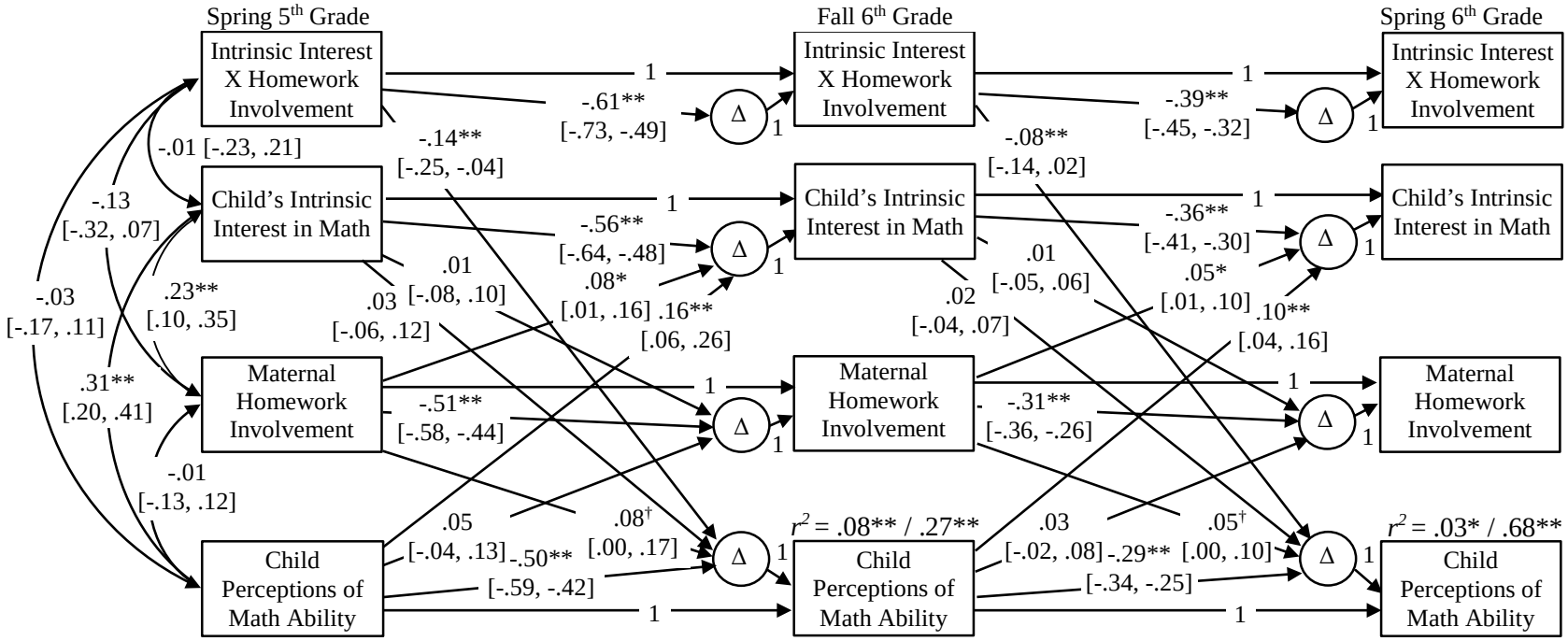
Note. N = 251. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. For change scores in child perceptions of math difficulty, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. †p=.10, *p<.05, **p<.01, two-tailed.

Figure 6. *Over-time associations between maternal homework involvement and child expectations of math success.*



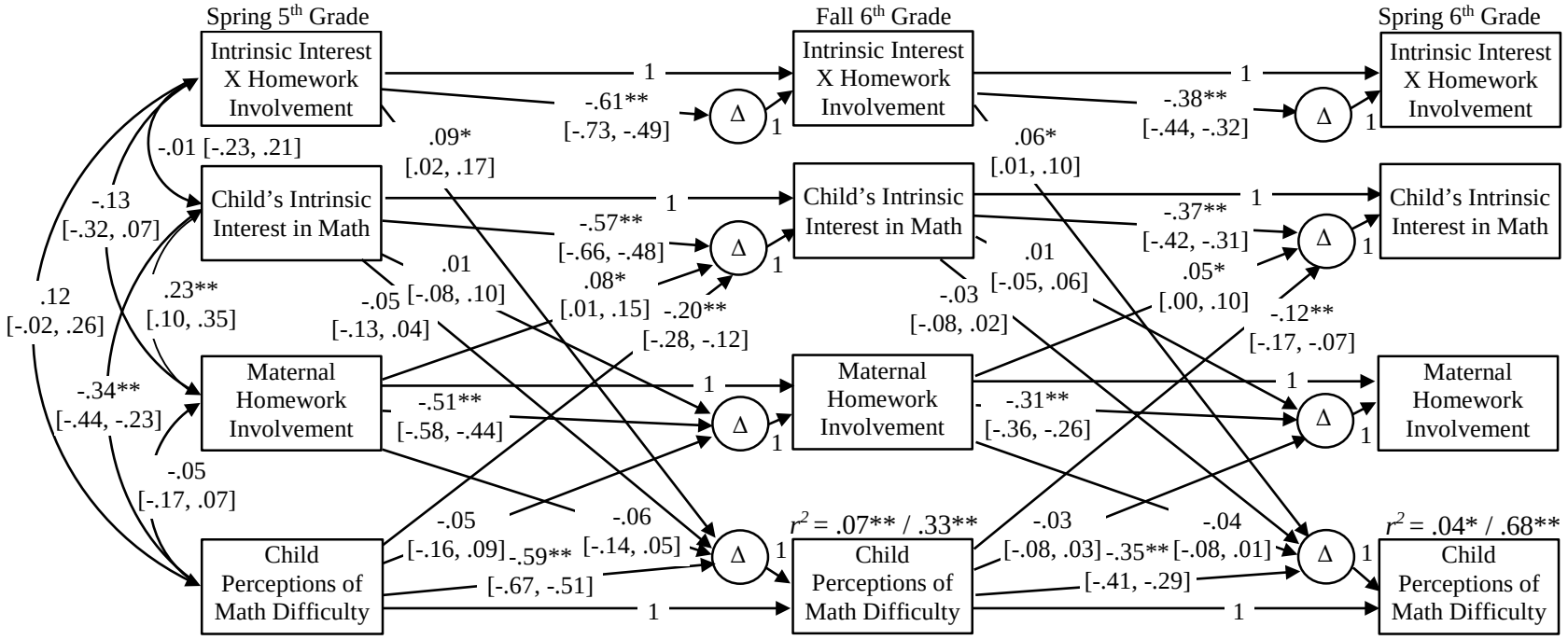
Note. $N = 251$. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. For change scores in child expectations of math success, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. $^{\dagger}p=.06$, $*p<.05$, $**p<.01$, two-tailed.

Figure 7. *Over-time associations between maternal homework involvement and child perceptions of math ability from the Spring of 5th grade to the Spring of 6th grade, moderated by maternal perceptions of the child's intrinsic interest in math.*



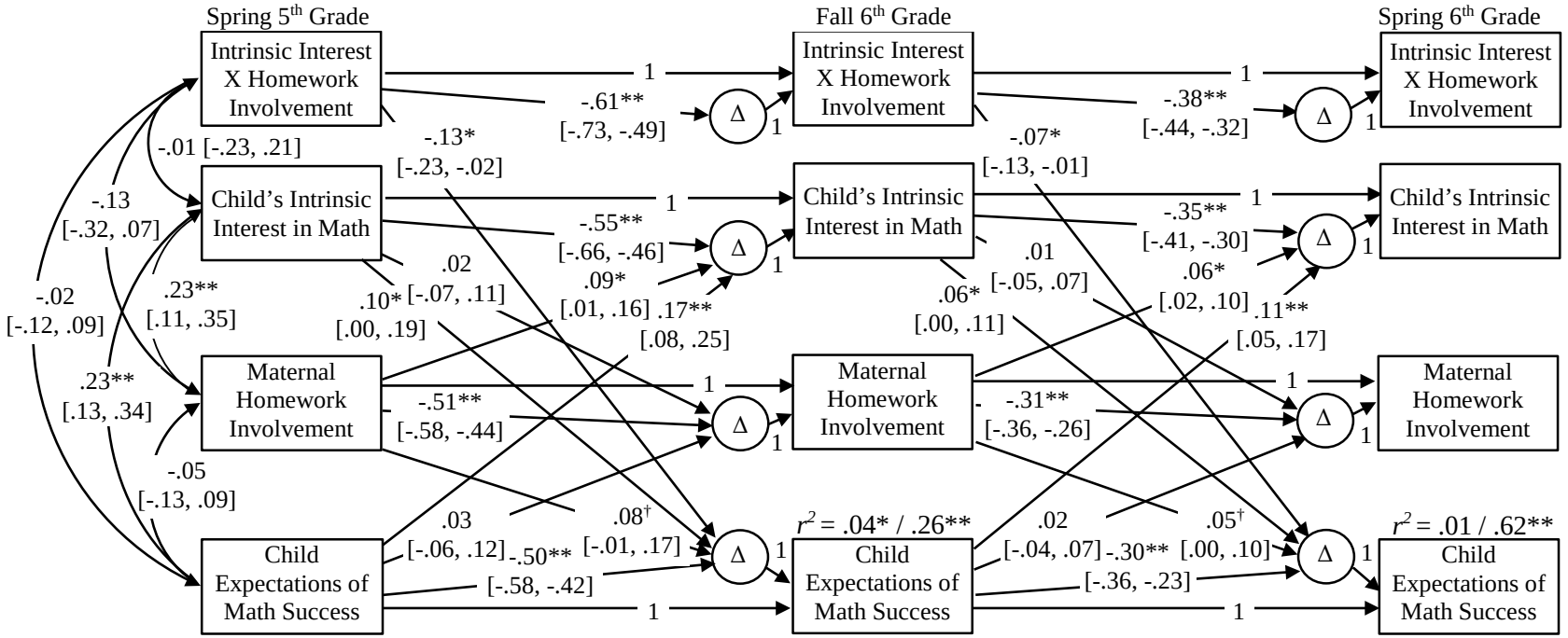
Note. *N* = 251. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. Concurrent error covariances at the Fall of 6th grade and the Spring of 6th grade are included in the model but not depicted. Intrinsic interest in math scores were residualized by regressing intrinsic interest in math scores onto extrinsic interest in math scores at each wave. For change scores in child perceptions of math ability, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. †p=.06, *p<.05, **p<.01, two-tailed.

Figure 8. *Over-time associations between maternal homework involvement and child perceptions of math difficulty from the Spring of 5th grade to the Spring of 6th grade, moderated by residualized maternal perceptions of the child's intrinsic interest in math.*



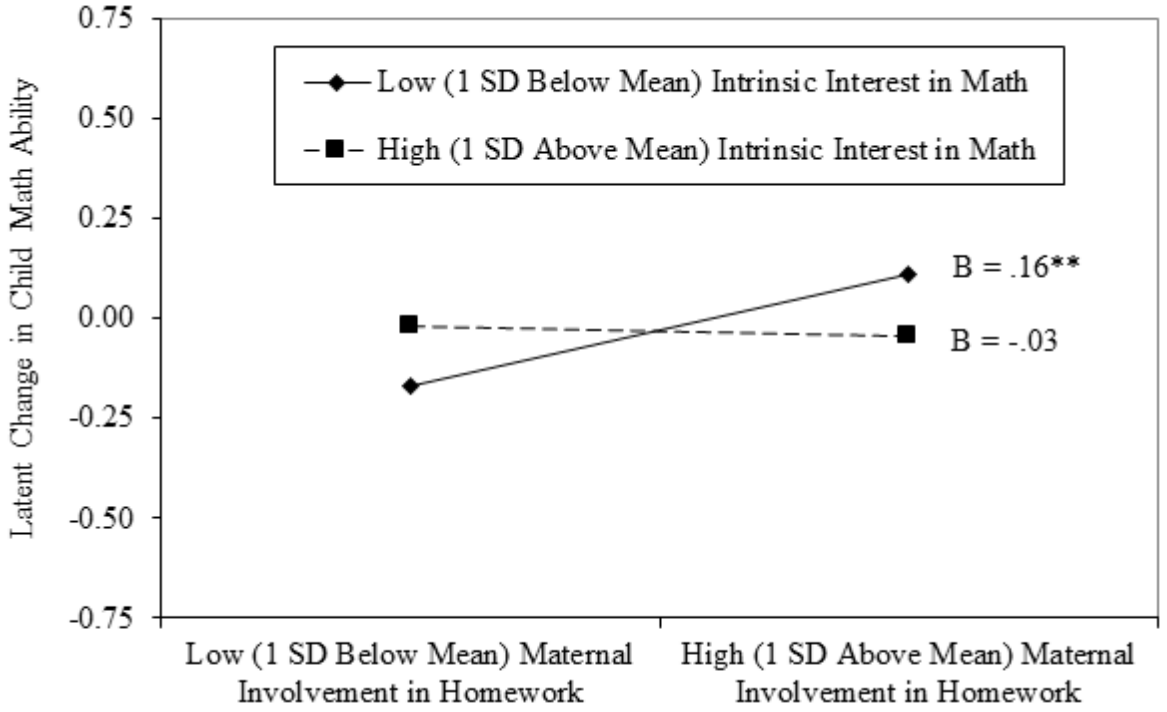
Note. $N = 251$. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. Concurrent error covariances at the Fall of 6th grade and the Spring of 6th grade are included in the model but not depicted. Intrinsic interest in math scores were residualized by regressing intrinsic interest in math scores onto extrinsic interest in math scores at each wave. For change scores in child perceptions of math difficulty, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. *p<.05, **p<.01, two-tailed.

Figure 9. *Over-time associations between maternal homework involvement and child expectations of math success from the Spring of 5th grade to the Spring of 6th grade, moderated by residualized maternal perceptions of the child's intrinsic interest in math.*



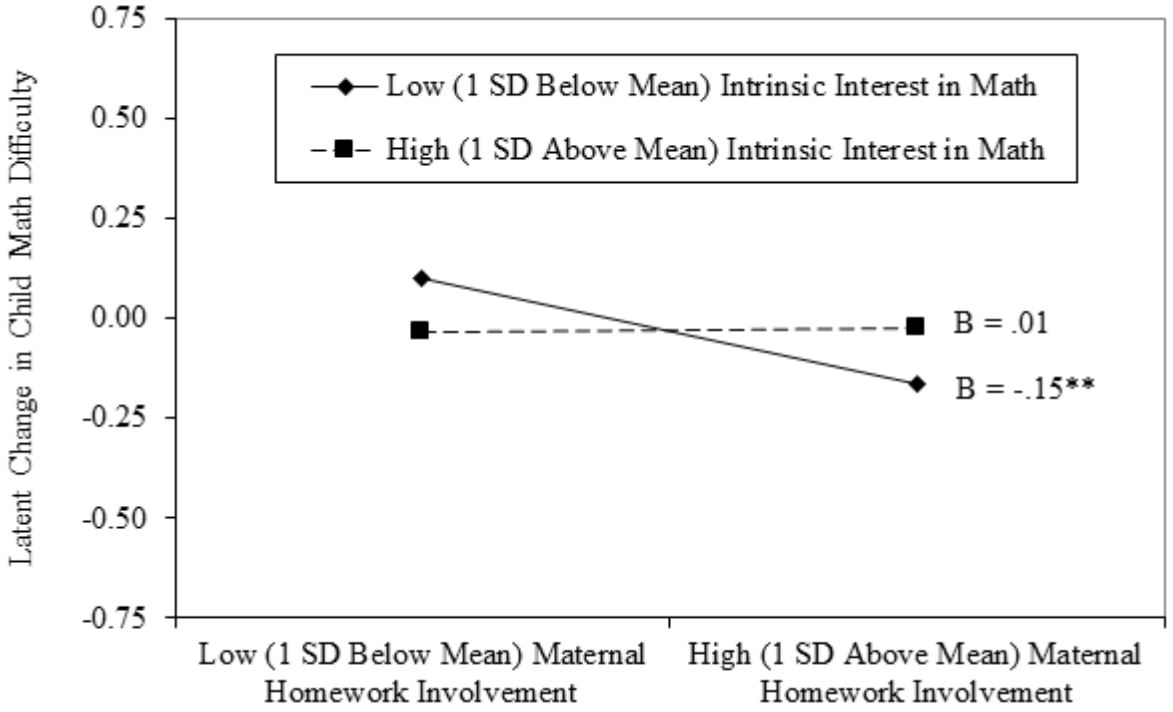
Note. $N = 251$. Stability paths were set to 1 to force change variance into the latent factors. Otherwise, standardized estimates are reported. 95% confidence intervals are presented in brackets. Stability paths for each variable from the Spring of 5th grade to the Spring of 6th grade are included in the model but not depicted. Concurrent error covariances at the Fall of 6th grade and the Spring of 6th grade are included in the model but not depicted. Intrinsic interest in math scores were residualized by regressing intrinsic interest in math scores onto extrinsic interest in math scores at each wave. For change scores in child expectations of math success, variance explained (r^2) without stability or concurrent associations is reported to the left of the slash and total variance explained is reported to the right of the slash. $^{\dagger}p=.07$, $*p<.05$, $**p<.01$, two-tailed.

Figure 10. *Mothers' perceptions of the child intrinsic interest in math moderates associations between maternal homework involvement and changes in child perceptions of child math ability.*



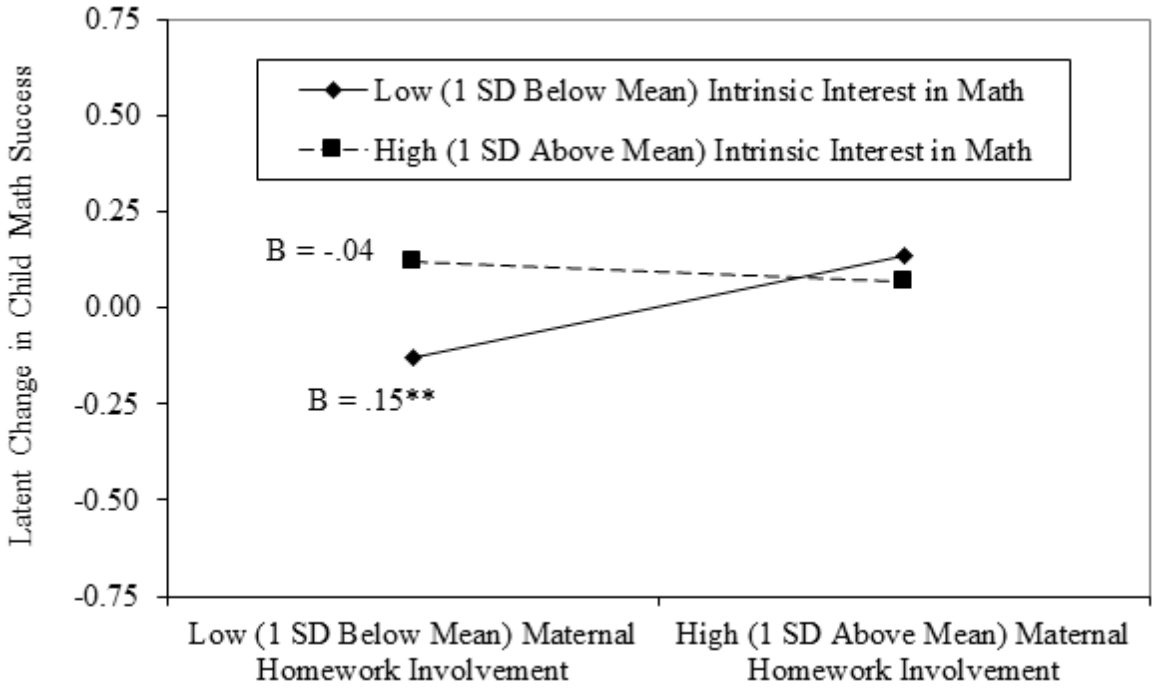
Note: Change scores for the lag from the Spring of 5th grade to the Fall of 6th grade, and for the lag from the Fall of 6th grade to the Spring of 6th grade were identical. *p<.05, **p<.01, two-tailed.

Figure 11. *Mothers' perceptions of the child intrinsic interest in math moderates associations between maternal homework involvement and changes in child perceptions of child math difficulty.*



Note: Change scores for the lag from the Spring of 5th grade to the Fall of 6th grade, and for the lag from the Fall of 6th grade to the Spring of 6th grade were identical. *p<.05, **p<.01, two-tailed.

Figure 12. *Mothers' perceptions of the child intrinsic interest in math moderates associations between maternal homework involvement and changes in child expectations of math success.*



Note: Change scores for the lag from the Spring of 5th grade to the Fall of 6th grade, and for the lag from the Fall of 6th grade to the Spring of 6th grade were identical. **p*<.05, ***p*<.01, two-tailed.

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