TEACHER AND MOTHER INACCURATE BELIEFS: EXPLORING DIFFERENTIAL EFFECTS ON CHILD ACHIEVEMENT

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ABSTRACT
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Conceptual development and achievement are embedded in social relationships. Research on self-fulfilling prophecies in the classroom has shown teachers' inaccurate perceptions about a child's ability shape schoolchildren's intellectual development in the direction of the misperception (Jussim & Harber, 2005; Rosenthal & Jacobson, 1968; Sorhagen, 2013). This contrasts with prior research on the influences of parents' misperceptions, which has shown that parents with accurate perceptions of their child's abilities, compared to those with misperceptions, have children with advanced conceptual development and higher achievement (Hunt & Paraskevopoulos, 1980; S. A. Miller, Manhal, & Mee, 1991; Sorhagen, 2014a, 2014b). Taken together, the literature on adult misperceptions of child abilities paints discrepant pictures of how adults' inaccurate beliefs may influence children's achievement trajectories. There is evidence for conditional direct and indirect effects of misperceptions within both literatures. Perhaps if moderating conditions were the same at school and at home, the effects of teacher and parent misperceptions would be the same.

The present dissertation used prospective data to address the conflicting evidence on the effects of teachers' and mothers' misperceptions of abilities, focusing on differences in the magnitude and direction of adult misperceptions by the levels of environmental control (i.e. rigidly structured and intrusive versus autonomy-supporting). The results confirmed and extended the prior literature by showing that children's reading and math achievement in high school were differentially affected by the accuracy of

adults' perceptions of the children's abilities depending on whether the adult is a teacher or mother. Children's high school performance benefited most when their teachers overestimated their abilities and when their mothers' accurately estimated their abilities in in third-grade. Furthermore, there was evidence for mediation through adults' differential treatment in the reading models. Evidence for moderation was also seen in the reading models, but only for the influence of teachers' misperceptions on teacher attention, which indirectly led to differences in child achievement (i.e. conditional indirect effects). The effects of teachers' misperceptions were more profound at low levels of environmental control compared to highly controlled classrooms. Thus environmental control did not lead to similar influences of teacher and mother misperceptions. This supports the notion that there are different consequences of teacher and mother misperceptions on child achievement.

The results of additional analyses found child characteristics (i.e. child birth order, gender, ethnicity, family SES, child social competencies, and prior abilities), as well as teacher's self-efficacy predicted the degree of accuracy of the adults' perceptions of children's reading and math abilities. Furthermore, the results showed that teachers' and mothers' perceptions were often accurate, but when one adult was inaccurate, it was likely that the other adult's perception was similar. As we become increasingly aware of the importance of social influences on cognition, the results of the present dissertation suggest that it is important to consider differences between socializing agents.

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CHAPTER 1

INTRODUCTION

Relationships between adults and children influence the development of many types of abilities – including conceptual development and achievement (Birch & Ladd, 1996; Pianta & Harbers, 1996; Pianta, La Paro, Payne, Cox, & Bradley, 2002). The goal of this dissertation is to investigate one aspect of the complex cognitive and behavioral processes underlying these relationships – teachers' and mothers' beliefs about a child's academic ability. Specifically, how the degree of accuracy of adult perceptions affect children's conceptual development and achievement.

Merton (1948) called attention to situations in which one person's inaccurate expectations and perceptions about a second person leads the second person to act in ways that are similar to the first person's false beliefs, labeling them self-fulfilling prophecies. In their classic 1968 study P*ygmalion in the Classroom,* Rosenthal and Jacobson demonstrated that schoolchildren's intellectual development can be shaped by teachers' expectations. Students whose teachers underestimated their abilities achieved less in school than would be predicted on the basis of their test scores, whereas those students whose abilities are overestimated achieve more. The relation between a teacher's inaccurate expectations and a student's academic achievement has been replicated using both experimental and naturalistic methods (Alvidrez & Weinstein, 1999; Eccles et al., 1991; Gill & Reynolds, 2000; Hinnant, O'Brien, & Ghazarian, 2009; Jussim & Eccles, 1995; Jussim, Eccles, & Madon, 1996; Madon et al., 1998; Raudenbush, 1984; Rosenthal, 1994; Rosenthal & Rubin, 1978; Smith, 1980; Sorhagen, 2013; Weinstein, 2002). The effects of parents' inaccurate beliefs, however, are less understood. Many

researchers have linked parent under- and overestimation to poor child outcomes (Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Hunt & Paraskevopoulos, 1980; Korat & Haglili, 2007; D. Miller & Turnbull, 1986; S. A. Miller et al., 1991; Sattler, Feldman, & Bohanan, 1985; Sorhagen, 2014a, 2014b), but a few have presented evidence of self-fulfilling prophecies (Pomerantz & Dong, 2006; Scherr, Madon, Guyll, Willard, & Spoth, 2011).

A promising way to reconcile the seemingly differing effects between adults' misperceptions on child conceptual development and achievement is to examine the magnitude the effects of adults' inaccurate beliefs by moderating variables (Sorhagen, 2014c). Perhaps when moderating conditions are the same, the effects of adult misperceptions are also the same. The main goal of the present dissertation is to examine the magnitude of the direct and indirect effects of adults' inaccurate beliefs by the degree of control in the learning environment (Sorhagen, 2014c). In the next chapter, I introduce the conceptual framework for this hypothesis by reviewing and integrating research on teacher and parent inaccurate perceptions of a child's abilities. In reviewing the literature I will show that teacher overestimation and parental accurate estimations of children's abilities lead to higher child conceptual development and achievement. Building on this discussion I describe evidence suggesting that within highly controlled learning environments, the influences of adults' inaccurate perceptions of child abilities may be in the same direction.

The present study used prospective data to examine the long-term effects of teachers' and mothers' misperceptions of children's reading and math ability in third grade on that child's high school achievement. I particularly focus on whether effects of

adult misperceptions on child achievement are different based on the amount of control adults create in learning environments. In addition, I examine whether adults' differential treatment of the child is a mediating mechanism of the influence of adult misperceptions. Furthermore, I identify child and adult characteristics that predict misperceptions and explore whether the degree of accuracy of teachers' and mothers' perceptions tend to match.

Theoretical Framework

The two conceptual models that guide this dissertation are Bronfenbrenner's bioecological model of development (Bronfenbrenner & Morris, 2006) and Eccles and colleagues' expectancy-value theory (Eccles, 2009; Eccles-Parsons, Adler, & Kaczala, 1982).

One of the central tenants of bioecological theory is that proximal processes, or progressively more complex reciprocal interactions between an organism and the environment, are the primary mechanisms of development (Bronfenbrenner & Morris, 1998). The environment consists of other people, as well as objects and symbols. Often conceptual development emerges through interactions with a more knowledgeable person. According to Vygotsky (1978), new ways of thinking and acting can only occur if the expert meets the learner within the learner's zone of proximal development, or the 'space' between what he or she already knows and what could be known with assistance of the expert. Wood and colleagues (Wood, Bruner, & Ross, 1976; Wood & Middleton, 1975) conceptualized this process using the metaphor of "scaffolding." In scaffolding, the expert gradually releases responsibility for learning to the learner through the use of "contingent shifting," or altering behavior, based on the learner's task performance.

Scaffolding requires the more knowledgeable person to have accurate perceptions of the learner's abilities in order to effectively promote conceptual development.

A second tenant of bioecological theory is that proximal processes, such as the processes underlying conceptual development and achievement, interact with characteristics of the people involved, the setting or environment, the nature of the outcome, social continuities, and time. These interactions change the form, power, content, and direction of the way in which proximal processes affect development.

Eccles and colleagues' expectancy-value theory uses Bronfenbrenner's bioecological model of development to focus on the socialization of achievement-related choices and behaviors (Eccles, 2009; Eccles-Parsons et al., 1982; Wigfield & Eccles, 2000; Wigfield, Tonks, & Klauda, 2009). According to the theory, achievement-related choices, persistence, and performance are related to a person's expectations of success with and value placed on a specific task. These expectations of success and values are influenced by a person's beliefs, goals, and affective memories that are informed by the beliefs and expectations of socializers as well as differential aptitudes, past experiences, and the cultural milieu. The strength and the direction of these relations differ depending on the child's developmental age and the sociocultural context.

In this dissertation I considered one characteristic of the people involved in the proximal processes surrounding the development of reading and math abilities – the degree of accuracy of their beliefs about third-grade children's reading and math capabilities. Overestimation of abilities may set into motion a self-fulfilling prophecy, instilling lasting academic success, or they may lead to poor academic outcomes

depending on the socializing agent (teacher or mother) and the context (levels of environmental control).

With the theoretical groundwork set, next I review what is known about the effects of teachers' and parents' inaccurate beliefs on children's conceptual development and achievement.

Teacher Misperceptions of a Child's Abilities

In their classic 1968 study *Pygmalion in the Classroom,* Rosenthal and Jacobson (1968) demonstrated that schoolchildren's intellectual development can be shaped by teacher expectations. The experiment was conducted in one elementary school with three classrooms of each grade from first to sixth grade. At the beginning of the school year, the children completed Flanagan's Test of General Ability (TOGA; Flanagan, 1960), a nonverbal test of intelligence. The teachers were told that the test was called the "Harvard Test of Inflected Acquisition" and could predict intellectual blooming. Then, after being matched on ability, the experimenters randomly selected 20% of the students to be identified as "bloomers." Teachers were told that these "bloomers" scored high on the test and would show surprising gains in intellectual competence during the next 8 months. At the end of the school year, the children were given the TOGA again. The "bloomer" children showed greater gains than the other children. The difference in IQ scores between bloomers and other children was still present two years later. Rosenthal and Jacobson (1968) explained these findings using the notion of a self-fulfilling prophecy. The concept of self-fulfilling prophecies refers to situations in which one person's misperceptions about a second person lead the second person to act in ways that are similar to the first person's false beliefs (Merton, 1948). The concept of self-

fulfilling prophecies are an extension of confirmatory hypothesis testing (Fiske & Taylor, 2008). In confirmatory hypothesis testing, a perceiver's misperception about a target persists because the perceiver highlights and selectively favors information, as well as the target's presentation of particular attributes, consistent with the misperception. When confirmatory hypothesis testing succeeds in altering the target person's behavior in the direction of the hypothesis, a self-fulfilling prophecy is said to have occurred. Consider a teacher who thinks an average student is exceptional. The teacher may focus on the student's successes, ignore (or overlook) her mistakes, and interact positively with her. As a result, if this student performs better than would have been expected based on her abilities, a self-fulfilling prophecy has occurred. It is worth highlighting that self-fulfilling prophecies, by definition, start with an inaccurate belief, perception, or expectation about another person.

The Pygmalion experiment created heated debates among social scientists and educators (Jussim & Harber, 2005; Spitz, 1999; Weinstein, 2002). Researchers have raised questions concerning the validity of the self-fulfilling prophecy phenomenon and the mechanisms by which self-fulfilling prophecies unfold. To address these questions, I first review the literature relevant to the validity of self-fulfilling prophecies in the classroom, then I review evidence of conditions in which self-fulfilling prophecies are more profound, and then I discuss the mechanisms that may account for self-fulfilling prophecies in the classroom.

Meta-analytic studies have provided evidence that experimentally-induced positive expectations can increase student performance (Raudenbush, 1984; Rosenthal, 1994; Rosenthal & Rubin, 1978; Smith, 1980). Naturalistic studies have demonstrated

that students whose teachers underestimate their abilities achieve less in school than would be predicted on the basis of their test scores, while those students whose abilities are overestimated achieve more (Jussim & Eccles, 1995; Jussim, Robustelli, & Cain, 2009; Weinstein, 2002).

By and large, the magnitude of self-fulfilling prophecies in the classroom tends to be modest in experimental studies and even smaller in naturalistic studies (Jussim et al., 2009; Rosenthal & Rubin, 1978). Jussim and colleagues (Jussim, 1989, 2012; Jussim & Eccles, 1992) note the size of the effect in naturalistic settings may be limited in magnitude because in natural settings teachers' expectations are largely accurate. By definition, these expectations cannot lead to a self-fulfilling prophecy. That is, teachers' expectations often reflect actual differences in student ability. Jussim (2012) explains that the mean-level accuracy of teacher expectations can be found by subtracting the standardized self-fulfilling prophecy effects (i.e. standardized paths connecting teacher expectations to student achievement in a model that controls for prior achievement in some way) from the correlation between teacher expectations and achievement. Using this technique, it is possible to measure the accuracy of teacher expectations in published research, even if the authors did not. After performing these analyses for all five publications on teacher expectations that provided the necessary information, Jussim (2012) found that accuracy accounted for 65% to 100% of the relation between teacher expectations and child achievement.

Most teacher expectation researchers have not considered the fact that teachers change over the course of a child's educational career. Jussim and Harber (2005) argue that a study examining the accumulating effects of multiple teacher expectations is not

necessary because measuring the effect of one teacher's expectations will include the effects of other teachers' expectations because the expectations would be similar across teachers. This argument assumes that teacher expectations are related year to year, which has not been examined empirically.

Moderating Conditions of the Effect of Teacher Misperceptions

There is evidence that the effect of teacher misperceptions on child conceptual development and achievement is more substantial for certain groups of students, including students from low income families, minority students, low achieving students, students of high bias teachers, and students in low-autonomy supportive classrooms (Babad, Inbar, & Rosenthal, 1982; Brattesani, Weinstein, & Marshall, 1984; Eder, 1981; Hinnant et al., 2009; Jussim et al., 1996; Kuklinski & Weinstein, 2001; Madon, Jussim, & Eccles, 1997; McKown & Weinstein, 2008; Sorhagen, 2013; Trouilloud, Sarrazin, Bressoux, & Bois, 2006). The magnitude of the effect of teacher expectations on child conceptual development and achievement also varies by child age. In Rosenthal and Jacobson's (1968) original study the self-fulfilling effects were strongest in the younger students. But in a meta-analysis, Raudenbush (1984) found the strongest teacher expectation effects in first, second, and seventh grade. Because the ages are so spread out, it does not seem like there is a critical period for the effects of self-fulfilling prophecies in the classroom. One explanation may be that people new to a situation are less confident, making their self-perceptions and behaviors more vulnerable to the influences of others' beliefs (Jussim et al., 1996; Jussim & Harber, 2005). Evidence from a recent meta-analysis on self-fulfilling prophecies among adult populations bolsters this argument

because it found new military recruits were more susceptible to self-fulfilling effects than other groups (McNatt, 2000).

Mediating Mechanisms of Teacher Misperceptions

Many teacher expectation researchers have proposed their own models of self-fulfilling prophecies in the classroom (Brophy & Good, 1974; Cooper, 1979; Cooper & Good, 1983; Darley & Fazio, 1980; Harris & Rosenthal, 1985; Jussim, 1986; Rosenthal, 1973a). Although each model is slightly different from each other, all models include the following steps: 1) teachers develop inaccurate expectations; 2) inaccurate expectations cause teachers to treat overestimated and underestimated students differently; 3) students act in ways that are similar to the inaccurate expectations. I will discuss each step in more detail next.

Predictors of teacher expectations.

Without considering students' actual abilities, teacher expectation researchers have found that teachers' expectations vary by child ethnicity (Alexander, Entwisle, Blyth, & McAdoo, 1988; Dusek & Joseph, 1983), social class (Alexander et al., 1988; Dusek & Joseph, 1983; Rist, 1970), social skills (Alexander et al., 1988; Dusek & Joseph, 1983), and physical attractiveness (Dusek & Joseph, 1983). But because the researchers in these studies did not consider the children's actual performance or abilities, we cannot rule out the possibility that differences in teacher expectations reflect real differences in children's ability as a function of ethnicity, social class, social skills, or physical attractiveness. Jussim et al. (1996) found that differences in teachers' perceptions based on SES and ethnicity often reflected actual differences in performance on achievement tests, final grades, and student self-report of time spent on homework.

When students' actual abilities are taken into account, teacher expectations can be biased by gender-stereotyped attitudes. Teachers rate girls as hardworking and having high English abilities and rate boys as having high math abilities despite no differences in reports of effort or in standardized measures of English and Math achievement (Alvidrez & Weinstein, 1999; Eccles et al., 1991; Gill & Reynolds, 2000; Hinnant et al., 2009; Jussim et al., 1996; Madon et al., 1998; Sorhagen, 2013). In addition, teachers overestimate the math and reading abilities of students with high levels of social skills (Hinnant et al., 2009).

Differential treatment.

Do teachers treat students differently based on their expectations? Research using classroom observations suggest that they do (Brophy, 1983; Brophy & Good, 1974; Harris & Rosenthal, 1985; Rosenthal, 1994). Rosenthal (Rosenthal, 1973a, 1973b) proposed a "four-factor theory" of differential teacher treatment for high- and low-expectancy students, grouping the teacher behaviors affected by self-fulfilling prophecies into four categories: *climate*, *feedback input*, and *output*. *Climate* refers to the socioemotional climate of the teacher-student relationship. When a teacher has a high expectation for a student, the teacher's affect and nonverbal communications towards the targeted student will tend to be warmer and more positive compared to behavior toward low-expectancy students. *Feedback* refers to the tendency of teachers to give feedback that is high in quality and quantity to high-expectancy students. *Input* is comprised of a teacher's tendency to provide additional or more difficult information to high-expectancy students. Finally, *output* refers to the tendency of teachers to give high-expectancy students more opportunities to respond.

To test this four-factor model of differential teacher treatment, Harris and Rosenthal (1985) meta-analyzed 135 results from studies of mediation of interpersonal expectancy effects. The researchers classified 31 observed teacher behaviors into the four factor categories. For their *climate* category, the researchers identified positive climate, negative climate, and eye contact. Teacher praise, criticism, acceptance of student ideas, and ignoring the student were classified as *feedback*. The *input* category included situations in which teachers presented students with more or more difficult material than was presented to other students in the class. Finally, *output* included two types of teacher behaviors: asking students questions and the frequency of teacher-student interactions. The results of the meta-analysis suggested that teacher interactions with high or low expectation students differed substantially across all four factors, with larger differences for climate and input categories than for feedback and output categories. Thus, the results supported Rosenthal's four-factor theory of mediation of teacher expectations by differential teacher treatment.

Student reaction to differential treatment.

Does differential teacher treatment lead to differences in students' conceptual development and achievement? In their meta-analysis, Harris and Rosenthal (1985) also considered whether differential teacher behavior, categorized using Rosenthal's four-factor model (i.e. climate, input, output, and feedback), affected student outcomes (i.e. grades, performance on achievement or IQ tests). Their results showed that climate, input, and output were substantially related to different student outcomes, and the effect of feedback was significant but small. That is, teachers with positive expectations of a student tend to create a warmer socioemotional climate, provide more input in terms of

the amount and difficulty of the information presented, use more positive feedback, and create more student output in terms of response opportunities and teacher-student interactions. In turn, these factors lead to better academic performance by the students.

Several researchers have considered whether student motivation and self-perceptions mediate the effect of teacher expectations on student conceptual development and achievement (Brattesani et al., 1984; Jussim, 1989; Kuklinski & Weinstein, 2001; Rubie-Davies, 2006). More specifically, researchers have examined the effects of student self-expectations for end-of-the-year reading performance and overall performance (Brattesani et al., 1984; Kuklinski & Weinstein, 2001), self-concept of ability (Jussim, 1989; Rubie-Davies, 2006), and self-perceptions of effort, cost, and value (Jussim, 1989). It appears that student motivation and self-perception are not particularly relevant here. All of these studies showed small or non-significant motivational mediating pathways between these variables and student outcome. Age, however, may be a moderating factor of motivational mediation. Kuklinski and Weinstein (2001) found small indirect effects of teacher expectations through self-expectations in fifth grade, but no effect in first and third grade. This finding suggests that child age may moderate the indirect effect of student motivation and self-perceptions between effect of teacher expectations on student conceptual development and achievement.

In sum, self-fulfilling prophecies in classrooms have been demonstrated both naturalistically and experimentally. The influence of teacher expectations tends to be small, but the effects are more substantial in traditionally disadvantaged populations. One reason for small effects may be that a teacher's beliefs about his students tend to reflect students' actual abilities, which by definition cannot lead to a self-fulfilling prophecy.

There is some evidence of systematic bias of teacher beliefs by gender. Teachers' behaviors towards students mediated self-fulfilling prophecies in the classroom. Differential treatment influences student conceptual development and achievement directly, and, possibly, at least to a small degree, by way of changes in student motivation and self-conception.

Parent Misperceptions of a Child's Abilities

If teacher expectations, and more importantly, teacher inaccurate expectations or self-fulfilling prophecies, can affect child outcomes, do parental expectations have the same effects? Parental beliefs about their child became a popular topic of research in the late 1980's (S. A. Miller et al., 1991). At first, many researchers were interested in exploring the accuracy of parental beliefs, but this interest waned in the 1990's. Since the late 1990's, there has been much interest in parental expectations of their children's future educational attainment, and few researchers followed the scientific path that considers the effects of parents' inaccurate beliefs about their child's cognitive and academic abilities in the same way as the teacher literature has done. In fact, Eccles proposed a model of parental influence on child achievement, based on Eccles and colleagues' expectancy value theory, that makes a distinction between parents' perceptions of children's abilities and parents' expectations for children's future achievement (Eccles, 1993; Eccles-Parsons et al., 1982). This approach highlights a difference between what is known about teachers' and parents' beliefs and expectations about children's academic ability and how these beliefs and expectations might affect children's conceptual development and achievement. Most teacher expectation researchers have not asked teachers about their expectations of a student's *future*

educational attainment (i.e. “how far do you expect the child will go in school?”), perhaps because it is not of particular relevance to teachers as it is to parents. My review of and conclusions about the parental beliefs literature will be limited to inaccurate perceptions about children’s abilities.

Initial interest in the accuracy of parents’ beliefs stemmed from interest in Piaget’s (1929) construct of equilibrium and the relative importance of a ‘match’ between a child’s ability and environmental challenges in the home (i.e. Hunt & Paraskevopoulos, 1980). According to Piaget, the process of equilibration promotes progression towards increasingly complex thought. As people move from equilibrium to disequilibrium, the desire for balance forces people to construct new schemes or accommodate existing schemes, and thus, development occurs. If a situation is too far beyond a person’s understanding, then the person will not be able to construct new schemes or accommodate existing ones, constraining development. In this way, it is expected that the accuracy of parents’ and caretakers’ perceptions of their child’s abilities should be positively related to their child’s conceptual development, with more accurate estimations and expectations yielding more optimal child outcomes. In an early study, Hunt and Paraskevopoulos (1980) asked mothers to predict how their preschool-aged child would react to items taken from standardized tests of intelligence, verbal abilities, and reasoning. In support of Hunt and Paraskevopoulos’ (1980) predictions, the mothers who overestimated child performance tended to have children who performed poorly on the standardized tests of intelligence, verbal abilities, and reasoning. Maternal overestimation was negatively related to the children’s performance; maternal underestimation was not related to child performance.

Since Hunt and Paraskevopoulos's study, many researchers have found that parents who accurately assess their child's abilities, compared to parents who inaccurately assess their child's abilities, tend to have children with more advanced conceptual development, higher standardized achievement scores (Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Korat & Haglili, 2007; S. A. Miller, 1988; S. A. Miller et al., 1991; Sattler et al., 1985; Sorhagen, 2014a, 2014b), and higher grades in school (Alexander et al., 1988). In a similar matter, parents with accurate knowledge of developmental milestones tend to have children with higher levels of cognitive growth when they are young and higher levels of school achievement when they become teenagers (Goodnow, 1988; Hess, Kashiwagi, Azuma, Price, & Dickson, 1980; S. A. Miller, 1988).

These findings seem to be in contrast to the self-fulfilling findings related to teacher expectations. For teachers, overestimation of abilities seems to benefit children's conceptual development and achievement. For parents, on the other hand, overestimation of abilities is related to low levels of child conceptual development and achievement. Yet the literature is not unanimous on the effectiveness of parents' accurate perceptions of their child's abilities on child outcome. Two studies have reported self-fulfilling effects of mothers' beliefs on their children's educational attainment, grades at school, self-perceptions of competencies, attribution style, and mastery orientation (Pomerantz & Dong, 2006; Scherr et al., 2011). That is, children of mothers who *overestimated* their abilities tended to have more schooling, better grades, higher self-conceptions of abilities, a more positive attribution styles, and were highly mastery oriented, compared to those whose mothers underestimated abilities. Two other studies have reported no relation

between parents' accurate perceptions of abilities and their children's vocabulary and language abilities (Roman, 1980; Sattler et al., 1985).

One reason for conflicting findings on the effect of parent misperceptions of their child's abilities (i.e. overestimation and accurate estimation are both related to positive child outcomes) may be related to moderating variables. After controlling for the child's prior abilities, maternal education, and maternal depression, Pomerantz and colleagues (2006) found self-fulfilling effects only when mothers reported a strong or moderate endorsement of an entity theory of intelligence (i.e. she thinks ability is fixed and stable). When mothers reported low entity theories (i.e. mothers believe intelligence is changeable), there was no relation found between mothers' perceptions and children's academic functioning. In other words, self-fulfilling prophecies were only found in mother-child relationships when mothers believed ability is something that cannot be changed.

Another reason for inconsistencies could be methodological. Scherr and colleagues (2011) operationalized mothers' beliefs by creating a composite score of mothers' reports of their seventh-grader's typical GPA and the amount of education the mothers expected their child to complete. It is possible that combining perceptions of current abilities and future educational expectations distorts the measure of parent perception. In Eccles' (1993) model of parental influence on child achievement she distinguishes between parents' expectations of their child's achievement and parents' perceptions of their child's abilities. It is parental perceptions of their child's current abilities which are most likely to influence the parent's ability to structure the

environment around their child's zone of proximal development (Vygotsky, 1978) or to promote development through Piaget's (1960) equilibrium.

Parents' perceptions of their child's cognitive and academic abilities tend to be fairly accurate, with a tendency to slightly overestimate their child's abilities (Colter & Shoemaker, 1969; Furnham & Valgeirsson, 2007; Hunt & Paraskevopoulos, 1980; Louis & Lewis, 1992; S. A. Miller, 1988; S. A. Miller et al., 1991; Price & Gillingham, 1985). Higher SES parents (i.e. those who had more education and/or who had higher incomes) had more accurate perceptions than lower SES parents (Alexander, Entwisle, & Bedinger, 1994). Parents were also more accurate if the child had a severe impairment (Ewert & Green, 1957). The evidence on the effects of child gender and age on accuracy are mixed. Miller and colleagues (1991) found that the accuracy of parents' ratings of their children's cognitive abilities were independent of age of the child and sex of the parent and child (S. A. Miller et al., 1991), while Entwisle and Hayduk (1981) found accuracy increased with child age. Moreover, Eccles and colleagues' work (Eccles & Jacobs, 1986; Eccles-Parsons et al., 1982) has demonstrated that parents tend to overestimate both the difficulties their adolescent daughters have with math and the amount of effort required for daughters to do well in math; while parents underestimate adolescent sons' math-related difficulties and effort.

Mediating Mechanisms of Parental Misperceptions

In their classic study, Hunt and Paraskevopoulos' (1980) interest in parents' beliefs about their child's abilities was driven by the idea that "the damaging effect of overestimation of competence" was mediated through learning environments. Accurate perceptions of ability, they believed, would allow parents to provide more appropriate

support than those with inaccurate perceptions (Hunt & Paraskevopoulos, 1980). Many other researchers have discussed this type of reasoning without empirically testing it (Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Goodnow, 1988; Korat & Haglili, 2007; S. A. Miller, 1988; S. A. Miller & Davis, 1992; S. A. Miller et al., 1991; Sattler et al., 1985).

One exception is Korat and Haglili (2007) who found evidence for mediation by parenting practices only within high SES families, but not low SES families. For the high SES families, accurate maternal ratings predicted high quality interaction styles (using illustrations, paraphrasing, distancing, and discussing writing system) designed to fit the child's actual abilities during a book reading task. High quality interaction styles, in turn, predicted the child's emerging literacy abilities. For lower SES families, however, maternal evaluation of child abilities, the child's actual abilities, and maternal behaviors during the task were unrelated to each other (Korat & Haglili, 2007). Although Korat and Haglili (2007) did not speculate on why indirect effects of mothers' ratings of their child's ability would differ by SES, it could be that parents with more education are more aware of how to properly introduce book reading to a child than parents with less education. It is also likely that lower SES parents have fewer books at home due to financial constraints and experience higher levels of stress than high SES parents. Stress could make them unaware that their behaviors, their evaluations, and the child's actual abilities are not matching.

The results of Korat and Haglili's (2007) study suggest one explanation for the difficulty in identifying the mediating mechanisms by which the accuracy or inaccuracy of parents' beliefs affect children's developing cognitive abilities may be the existence of

conditional indirect effects. The concept of conditional indirect effects refers to situations where mediating processes vary depending on the value of a third moderating variable (Preacher, Rucker, & Hayes, 2007). Examination of moderating variables could further the understanding of the mediating effects of the accuracy of parental beliefs about their child's abilities on the child's conceptual development and achievement.

Scherr and colleagues (2011), the researchers who found self-fulfilling effects using a composite score that combined maternal perceptions of her child's current abilities and her future educational expectations for the child, found that the child's own educational aspirations mediated the effect of the composite maternal expectation score and child educational attainment. I think this finding should be interpreted with caution, however, because Eccles (1993) model of parents' influence on child achievement recommends that researchers consider expectations of future educational achievement and perceptions of child abilities separately.

In sum, most, but not all, of the research suggests that when parents' perceptions of their child's abilities *match* the child's actual abilities, the child does better than when a parent under- or overestimates the child's abilities. Many researchers have suggested that the relation between the accuracy of parents' beliefs about their child's abilities and their child's conceptual development and achievement is mediated by parental behaviors, but very little empirical evidence has been provided for this relation. This may be because it is critical to consider conditional indirect effects, as suggested by the findings of Korat and Haglili (2007), who found that mothers' behaviors mediated the relation between the accuracy of her beliefs and her child's emerging literacy abilities only in high SES families.

Simultaneous Effect of Parent and Teacher Misperceptions

So far I have shown evidence that children's conceptual development and achievement benefits from teachers' overestimation and parents' accurate estimations of their abilities. It is possible that differences in the effects of teachers' and parents' inaccurate perceptions seen in the past research is a function of the characteristics of the children in the samples. To address this concern, the findings of the very few studies that have considered the simultaneous effects of both parents' and teachers' beliefs and expectations are considered here.

Without considering the accuracy of teachers' and parents' perceptions of a child's abilities, researchers have found that children performed best when both parents' and teachers' opinions about the child's competence in reading and math matched in late elementary school (fourth grade), but a match did not matter for first-graders' school performance (Peet, Powell, & O'Donnel, 1997).

When the accuracy of teachers' and mothers' perceptions of children's abilities are considered, the results suggest differing consequences of teachers' and mothers' inaccurate perceptions of abilities. In exploratory studies (Sorhagen, 2014a, 2014b), I examined the effects of both teachers' and mothers' inaccurate perceptions of a child's ability by directly comparing mothers' and teachers' perceptions to a standardized (objective) measure of reading abilities when children were in third grade. I found that teachers' overestimation of children's reading abilities predicted higher reading achievement in fifth grade and high school, while mothers' overestimation of child abilities predicted *lower* fifth grade and high school reading achievement (Sorhagen,

2014a, 2014b). Furthermore, fifth grade achievement was highest when teachers' overestimation was in conjunction with mothers' accurate estimation (Sorhagen, 2014b).

Making Sense of Conflicting Findings

So far I have shown that teachers' under- and overestimation of their student's abilities leads to self-fulfilling prophecies, with students performing congruently with teachers' inaccurate perceptions. In contrast, most researchers have linked parental under and overestimation of child current abilities to poorer child outcomes, compared to accurate estimations of current abilities. Why would adults' misperceptions of a child's current abilities lead to different child outcomes when the adult is the child's parent or the child's teacher?

I suggest there may be factors that are typical within the home setting that cause the effect of parent misperceptions to be different from teacher misperceptions. That is, when moderating conditions are similar for school and home, the effect of adult misperceptions may be the same; when conditions are different the effects may be different. No one has considered the effects of teachers' and parents' misperceptions on child conceptual development and achievement within a particular context, but there is evidence that the magnitude of the effect of both teacher and parent misperceptions can differ by context. This evidence is reviewed next.

Evidence for moderation of the direct effects of adults' inaccurate perceptions of abilities can be found in both bodies of literature. Self-fulfilling prophecies in the classroom are stronger for students from low income families, as well as for minority students, low achieving students, students of high bias teachers, students who perceive differential treatment from teachers, and students in low-autonomy supportive classrooms

(Babad et al., 1982; Brattesani et al., 1984; Eder, 1981; Hinnant et al., 2009; Jussim et al., 1996; Kuklinski & Weinstein, 2001; Madon et al., 1997; McKown & Weinstein, 2008; Sorhagen, 2013; Trouilloud et al., 2006). In the home, the effect of inaccurate maternal beliefs are moderated by mothers' theories of competence (Pomerantz & Dong, 2006).

Although conditional indirect effects of adult inaccurate perceptions on child achievement have not been tested directly, suggestions of conditional indirect effects can be seen in both bodies of literature. For example, mediating mechanisms related to children's self-perceptions differ by child age. Kuklinski and Weinstein (2001) found that students' self-expectations mediated the relation between teacher expectations and child achievement in fifth grade but not in first and third grade. In the parent beliefs literature there is evidence that book reading interaction styles mediate the relation between mothers' beliefs and child literacy abilities among high SES families, but not low SES families (Korat & Haglili, 2007).

Based on the evidence of moderation of direct effects and indirect effects of both teacher and parent misperceptions, I suggest that the consideration of more conditional direct and indirect effects would further the understanding of the effects of adult misperceptions of a child's abilities. There are several factors that could potentially moderate the effects of adult misperceptions in a way that could lead to the effects of teacher and parent misperceptions operating in the same direction on child conceptual development and achievement (i.e. relationship climate or style, learning and teaching environment, peer relationships; see Sorhagen (2014c) and the discussion section of the present dissertation for more details). This dissertation will consider one such factor, the style and climate of the adult-child relationship.

Sensitive, warm, and responsive relationship style or climate seems beneficial for children's conceptual development and achievement both at school and at home (Baumrind, 1971; Birch & Ladd, 1998; Chen, Thompson, Kromrey, & Chang, 2011; Hamre & Pianta, 2010; McDonald Connor, Son, Hindman, & Morrison, 2005; Pianta, Steinberg, & Rollins, 1995; Steinberg, Lamborn, Dornbusch, & Darling, 1992; Wentzel, 2012). Within the parenting literature relationship climate (i.e. parenting style) is often theoretically modeled to *moderate* the effect of parenting behaviors on child outcomes (Darling & Steinberg, 1993; Eccles, 2006). Empirically, the effect of parenting practices on child achievement has been found to be stronger for authoritative parents (i.e. high responsiveness and demandingness) than for permissive parents (i.e. high in responsiveness and low demandingness) and authoritarian parents (i.e. low in responsiveness, but high in demandingness; Carr & Pike, 2012; Gauvain, Perez, & Beebe, 2013; Paulson, Marchant, & Rothlisberg, 1998; Pratt, Green, MacVicar, & Bountrogianni, 1992; Pratt, Kerig, Cowan, & Cowan, 1988; Steinberg, Lamborn, et al., 1992).

Although relationship climate is often modeled to *mediate* the effect of teacher expectations and behaviors on child outcomes (as described above in the *mediating mechanisms of teacher misperceptions* section), there is some evidence that high control and low autonomy support (typical of non-authoritative styles) increases the magnitude of and potential for self-fulfilling prophecies in the classroom. Stronger relations have been reported between teacher expectations and student perceptions of competence in low-autonomy supportive classrooms than in high-autonomy supportive classrooms (Trouilloud et al., 2006). Moreover, in a deception study, Babad and colleagues (1982)

told gym teachers that some of their students scored high on a measure that could identify students whose sport agility was probably about to improve. Teachers who were high in cognitive rigidity and dogmatism (i.e. more controlling, as found in authoritative parenting) were more likely to treat students differently based on the false information than less controlling teachers (Babad et al., 1982).

To date, no study has considered the relation between inaccurate perceptions of abilities and parenting style. The climate and style of the adult-child relationship may moderate the effects of adult misperception on child conceptual development and achievement in several ways. First, the encouragement of discussion and acknowledgment of child perspective typical of an authoritative style may increase that likelihood that inaccurate beliefs get corrected. Second, more controlling and less autonomy supportive adults might be more likely to treat children differently based on inaccurate belief (Babad et al., 1982). And third, there is evidence that support for autonomy and relatedness can lead to an intrinsic motivation orientation. Intrinsically motivated people perceive feedback as useful (Deci & Ryan, 2012), whereas those with an extrinsic motivation orientation are more sensitive and dependent on external approval, rewards, and expectations (Deci & Ryan, 2012).

Study Overview and Aims

In sum, previous researchers have shown that teachers' under- and overestimation of their student's abilities leads to self-fulfilling prophecies, with students performing congruently with teachers' inaccurate perceptions. But most researchers have linked parental under- and overestimation of child abilities to poorer child outcomes, compared to accurate estimations of abilities. Within both bodies of literature, there is evidence of

variation in the effects of adults' misperceptions of child conceptual development and achievement based on contextual factors. I suggest there may be contextual factors that cause the effect of teacher misperceptions to be different from mother misperceptions and when moderating conditions are similar, the effect of adult misperceptions may be the same. One likely moderating factor is the climate of style of the adult-child relationship.

The purpose of this dissertation was to further the understanding of the long-term effects of adults' misperceptions on child achievement. Figure 1 shows the conceptual model that guided my dissertation models. I anticipated that both teachers' and mothers' misperceptions would be mediated by adults' differential treatment. Evidence for mediation by differential treatment of teacher misperceptions would replicate the many other researchers who have found evidence for mediation by teachers' differential treatment. Evidence of mediation for mothers would be more noteworthy because, despite many researchers' speculations, there is very little empirical evidence. The conceptual model in Figure 1 plays out across time, so the paths of influence are likely reciprocal. The direction of influence in Figure 1 is based on theoretical models and findings of previous research on teachers' and parents' beliefs and expectations.

The main aim of this study was consider conditional direct and indirect effects of adult misperceptions. It may be that the magnitude of the effect of inaccurate perceptions differs depending on the adult-child relationship climate or style. Specifically, I considered the amount of control and autonomy support in the learning environment. I anticipated that within highly controlling environments both teacher and parent inaccurate beliefs would operate in a self-fulfilling way, with overestimation predicting higher achievement than would be expected based on the child's prior abilities.

The main research question and hypothesis is as follows:

Question 1: Does the climate of child-adult relationships (environmental control) moderate the direct and indirect effects (through adults' differential treatment) of adult misperceptions on child achievement?

Hypothesis 1: The direct effects of teacher and mother misperceptions on child achievement, as well as indirect effects through adults' differential treatment, will differ between teachers and mothers only when the environmental climate differs or is low. Within high environmental control the relation will be self-fulfilling.

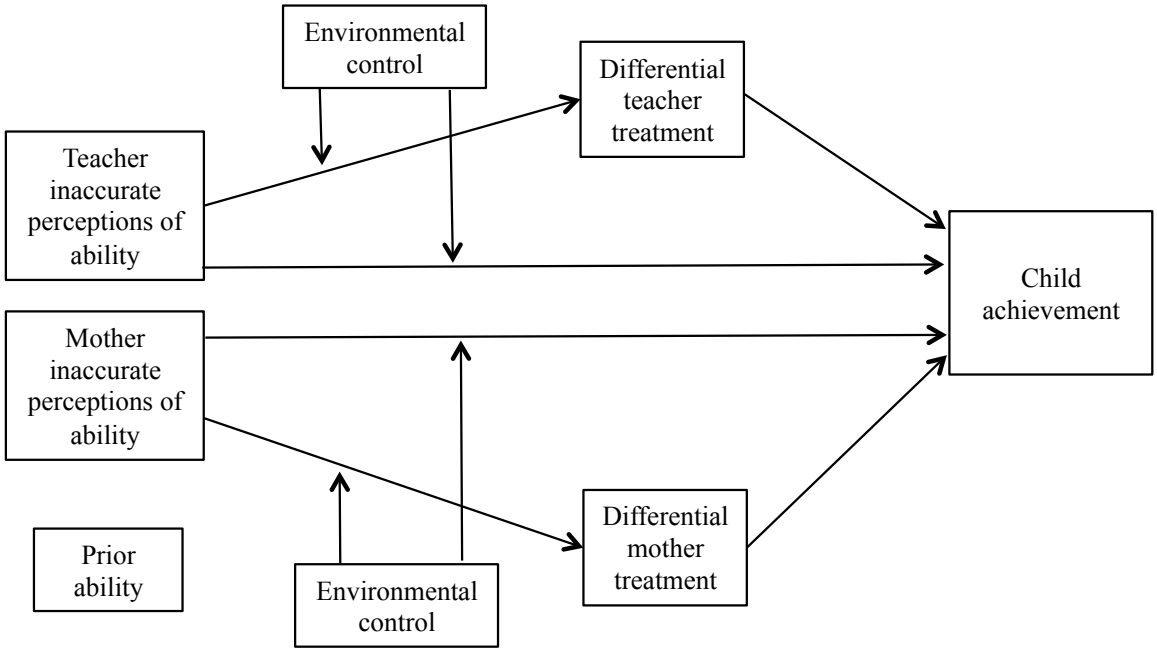

Figure 1. Conceptual model showing the adult behavior process mediators of adult misperceptions on child achievement moderated by controlling environment.

I used data from the NICHD Study of Early Child Care and Youth Development (SECCYD) to examine this hypothesis. This sample is ideally suited for the examination

of the long-term effects of adult misperceptions because it tracked children's academic experiences from infancy through high school, considered a wide range of children's academic abilities, and collected both standardized achievement test scores and teacher assessments of students' abilities at multiple points in time.

I ran separate models for math and reading based on evidence that ability beliefs and expectations are distinct between the domains of reading and math in first grade through high school (Eccles, Wigfield, Harold, & Blumenfeld, 1993; Gniewosz, Eccles, & Noack, 2012), and based on previous evidence that self-fulfilling prophecies within the classroom differ by academic subject (Sorhagen, 2013).

Additional Analyses

In addition to testing the impact of climate on teacher and parent misperceptions on child achievement, I also investigated predictors of inaccurate perceptions of abilities and whether teachers and parents match in the accuracy of their perception of a child's abilities.

Although the primary goal of the present study focused on the long-term effects of teachers' and mothers' inaccurate perceptions of a child's ability on that child's academic achievement, the data can also have implications for the study of biased teacher and mother beliefs about a child. One issue is whether beliefs about ability are influenced by stereotypes. Previous research has found teachers tend to inaccurately rate girls as hardworking and having high English abilities and rate boys as having high math abilities despite no differences in child reports of effort or in standardized measures of English and math achievement (Alvidrez & Weinstein, 1999; Eccles et al., 1991; Gill & Reynolds, 2000; Hinnant et al., 2009; Jussim et al., 1996; Madon et al., 1998; Sorhagen,

2013). For parents, higher SES parents (i.e. those with more education and/or higher incomes) tend to be more accurate than lower SES parents (Alexander et al., 1994) and parents tend to underestimate daughters' math-related efforts and difficulties, while overestimating the same for sons (Eccles & Jacobs, 1986; Eccles-Parsons et al., 1982). I anticipated that adults' misperceptions may be biased by child gender, with overestimations of girls' reading abilities and boys' math abilities. Moreover, high SES mothers were anticipated to be more accurate than less affluent and educated mothers.

I also considered the influence of children's prior abilities and social competences based on evidence that teachers' misperceptions are influenced by children's prior capability and social skills (Dusek & Joseph, 1983; Hinnant et al., 2009; Madon et al., 1997; Sorhagen, 2013). Finally, I explored whether teacher misperceptions were affected by teacher characteristics (i.e. education, experience, and self-efficacy).

The existing literature suggests that both teachers' and parents' perceptions of abilities tend to be fairly accurate, though some findings suggest that parents have a tendency to overestimate their child's abilities (Colter & Shoemaker, 1969; Furnham & Valgeirsson, 2007; Hunt & Paraskevopoulos, 1980; Louis & Lewis, 1992; S. A. Miller, 1988; S. A. Miller et al., 1991; Price & Gillingham, 1985). But to compare between studies would be to compare between subjects, so we cannot rule out the possibility that the children in each sample differed in some way. The second additional analysis of the present study considered differences in the accuracy of teachers' and mothers' perception of child abilities. Based on this previous research, I anticipated adults' misperceptions of abilities would be generally accurate.

CHAPTER 2

METHODS

Participants

Participants included American children recruited at birth and followed through age 15 who were enrolled in the NICHD SECCYD. New mothers were recruited from 24 hospitals in 10 data collection sites in 1991 (Little Rock, Arkansas; Irvine, California; Lawrence, Kansas; Boston, Massachusetts; Philadelphia, Pennsylvania; Pittsburgh, Pennsylvania; Charlottesville, Virginia; Morganton, North Carolina; Seattle, Washington; and Madison, Wisconsin). A total of 8,986 mothers were screened for eligibility at the hospital within 48 hours after birth. Mother-infant dyads were excluded from the study if the mother was younger than 18 years old, could not speak English, was not healthy, or refused; if the infant had a serious medical condition; or if the family planned to move out of the area within a year, or lived in a neighborhood that police said was too dangerous to send two unescorted research assistants. Based on the criteria, the sample was reduced to 5,416 mother-infant dyads. A conditional random sampling plan was used to select 3,015 mother-infant dyads. Of that group, 1,364 families were successfully recruited and completed the 1-month interview (families were excluded if they refused, could not be contacted or if they planned to move from the area within the next 3 years; or if the infant was hospitalized for more than 7 days). Finally, 23 cases were excluded from the present study because an adult other than the child's mother completed the measure of perceptions of child abilities or the variables used to operationalize the mediating and moderating constructs. The final sample of the present study consisted of

1,341 children, as well as these children's third-grade teachers and mothers. Table 1 shows characteristics of the final sample used in the present dissertation.

The final sample was socioeconomically and ethnically diverse, including 24% ethnic-minority children, 10% mothers with less than a high school education, and 14% single parents. Although the sample is not nationally representative, it is one of the largest and richest longitudinal studies of American schoolchildren ever conducted. Assessments were conducted when the children were 6, 15, 24, 36 and 54 months old, while in 1st, 3rd, and 5th grades, and at age 15, with individual standardized tests, observations of families and school settings, and parent and teacher reports of behavior.

Within the final sample, 941 third-grade teachers participated in the study. Most teachers had one study child in their classroom (44 teachers had two study children, 6 teachers had three, 2 teachers had four, and 1 had five). The teachers were mostly female (93.7%) and white (92.1%). They had an average of 14.05 years (SD = 10.51) of overall teaching experience. The classrooms had an average of 21.62 students (SD = 4.54).

Most of the mothers were in their late 20's when the study child was born (M = 28.19; SD = 5.6) and were mostly white (82.6% white; 12.9% African American; 2.2% Asian; .6% American Indian; 1.8% other). Twenty-one percent had a high school diploma, 21% held a bachelor's degree, and 14.7% had more education than a bachelors. Finally, 34.2% of families had an income-to- needs ratio below 2.5, 36.5% had an income-to-needs ratio between 2.5 and 5, and 29.3% had a ratio over 5.

Table 1. *Composition of the sample used in present dissertation.*

Variable	N (%)	M	SD
Child characteristics			
Gender (female)	649 (48.4%)		
Ethnicity			
White	1079 (80.5%)		
African-American	173 (12.9%)		
American Indian	5 (.4%)		
Asian	22 (1.6%)		
Other	62 (4.6%)		
Birth order	1341	1.84	0.95
Family income-to-needs ratio@ 3rd grade	962	4.42	3.79
Inhibitory control@ 4.5 years	1045	4.67	0.78
Self-control@ 4.5 years	1038	12.99	3.01
Mother characteristics			
Education	1341	14.27	2.50
Age when study child was born	1341	28.19	5.60
Teacher characteristics			
Education			
High school diploma	4 (.4%)		
Bachelor's degree	507 (56.8%)		
Some graduate work	9 (1%)		
Master's degree	369 (41.3%)		
Doctorate	4 (.4 %)		
Age	871	42.5	11.08
Years taught	886	14.05	10.51
Self efficacy	891	132.04	19.52
Adult IPA scores			
Teacher IPA score - reading	911	-.01	.71
Mother IPA score - reading	979	.00	.72
Teacher IPA score - math	905	-.02	.69
Mother IPA score - math	980	-.02	.75
Child achievement			
WJ-R: letter-word@ 4.5 years	1037	369.55	21.37
WJ-R: Broad reading@ 3rd grade	990	494.77	15.57
WJ-R: Picture vocabulary@ 15 years	869	518.76	12.85
WJ-R: Verbal analogies@ 15 years	871	525.71	14.03
WJ-R: Passage comprehension@ 15 years	867	520.61	12.05
WJ-R: Applied problem@ 4.5 years	1034	424.90	19.21
WJ-R: Broad math@ 3rd grade	991	493.66	12.57
WJ-R: Applied problem@ 15 years	868	524.72	16.57
Mother report of child ability			
Reading	1007	4.23	0.92
Math	1007	4.20	0.86
Teacher report of child ability			
Reading	969	3.58	0.96
Math	961	3.43	0.86
Mediators			
Teacher attends to child	949	6.53	4.55
Maternal stimulate cognitive development	959	4.98	1.18
Maternal quality of assistance	959	4.55	1.37
Maternal supportive presence	959	5.00	1.06
Home literacy environment	997	10.32	3.57
Moderators			
Classroom over-control	949	2.58	1.37
Disrespect for autonomy	959	3.10	1.02

Measures

Here I describe the measures used to operationalize the constructs of interest in the present study. First I describe measures of adults' misperceptions of child abilities. Then I describe the variables anticipated to mediate the effects of adult misperceptions on child achievement. This is followed by a description of the moderating variables. Next I define child achievement. Finally I review the variables I used to explore the additional analyses.

Adult Inaccurate Perceptions of Child Abilities

I operationalized teachers' and mothers' under- and overestimation of each student's reading and math abilities by computing residual scores using each adult's report of child ability when the child was in third-grade and the third-grader's performance on standardized tests. Before going into more detail on the computation of the inaccurate perceptions of abilities (IPA) scores, I first describe the standardized assessment of achievement and adult ratings of abilities.

Standardized Assessment of Achievement

The children in the sample were administered the Woodcock-Johnson - Revised Test of Achievement (WJ-R ACH) and Test of Cognitive Abilities (WJ-R COG) multiple times throughout the study (Woodcock & Jonhnson, 1989). Study children's performance on the WJ-R were used in a number of different ways, including as indicators of academic achievement in third grade, to compute the IPA scores, as a control for previous academic ability, and as the outcome measures of high school achievement.

Based on normative data, the WJ-R has good reliability (Woodcock, 1997; Woodcock & Jonhnson, 1989). Internal consistency ranges from the high .80s to the .90s.

Test-retest reliability ranges from the .60s to the .80s. The WJ-R also has excellent predictive validity across the lifespan (Woodcock, 1997; Woodcock & Jonhnson, 1989) and is highly correlated with other tests of cognitive abilities and achievement (McGrew, Werder, & Woodcock, 1991). The W-scores of the WJ-R were used for the present analyses. W-scores are special transformations of the Rasch ability scale converted from the raw scores, leading to an equal interval scale. They are centered at a value of 500 and linked to age to allow for comparisons across standardized tests and ages, making it possible to assess individual development over time.

The *broad reading cluster*, which is a combination of the *letter-word identification* and *passage comprehension subscales* of the WJ-R, and the *broad math cluster*, a combination of the *calculation* and *applied problems subscales* of the WJ-R, administered in third grade served as indicators of academic achievement in that year. These scores were used to compute the IPA reading and math scores, respectively.

For reading achievement, *the letter-word identification subscale* measured basic reading abilities and required children to identify and pronounce isolated letters and words in lists. Example items are "cat" and "palm." The *passage comprehension subscale* measured advanced reading abilities and required children to silently read a short passage and identify a missing key word or to match a picture to a phrase. An example item is " The boy _____ off his bike." (correct: fell, jumped).

For math achievement, the *applied problems subscale* required children to analyze and solve practical word and story problems with math calculations. Early items include problems related to counting ability and number quantity. The word problems progressed in difficulty to items that require money recognition and time concepts,

followed by items involving advanced operations and extraneous information. An example of an early item is "point to the group with five dots" and an example of a late item is "Bill had $7.00. He bought a ball for $3.95 and a comb for $1.20. How much money did he have left?" The *calculations subscale* measured the ability to perform mathematical operations. Test items began with basic addition and subtraction and progressed in difficulty to complex equations. Example questions are: "3 + 6 = " and "3x + 3y = 15."

Teacher Rating of Student Ability

Third-grade teachers rated the study child's proficiency with specific academic skills compared to other children at the same grade level on a 5-point scale (1 = not yet, 5 = proficient) in two areas – language literacy and mathematics. The language literacy subscale consisted of 10 questions and asked teachers to rate students' skills related to listening, speaking, and early reading and writing behaviors. A sample question was "This child reads third grade books independently with comprehension, for example, reads most words from memory and uses strategies to identify remaining words; relates why something happened in a story, or identifies emotions of characters in a story, or anticipates what a character will do next based on story evidence." The mathematical thinking subscale had 13 items and asked teachers to rate students' abilities to perceive, understand, and use skills in solving math problems and math-related activities. A sample question was "Demonstrates money management skills, for example, makes change for a dollar using the largest available coins, or determines which 7 coins are needed to represent $.67, or demonstrates that $.25 = 1/4 of $1.00." Both measures had high

internal reliability (language literacy subscale Cronbach's alpha = .95; mathematical thinking subscale Cronbach's alpha =.91).

Mother Rating of Child Ability

When study children were in third grade, mothers rated their child's abilities in specific academic subjects (science, math, reading, and spelling) on a 5-point scale (1 = not at all good, 5 = very good). A sample question was "How good is your child at math?"

Inaccurate Perceptions of Ability (IPA) Scores

Teachers' and mothers' under- and overestimation of a student's abilities were operationalized by computing a residual score using adult report of child ability when the child was in third-grade and the third-grader's performance on standardized tests. The residual scores were computed by regressing adult perceptions of a child's ability on to the child's standardized abilities (Hinnant et al., 2009; Jussim & Harber, 2005; Madon et al., 1997; Sorhagen, 2013). Unstandardized residuals were used. I refer to these residual scores as inaccurate perceptions of ability (IPA) scores in the present study. Separate scores were created for teachers and mothers for reading and math. Thus, there were four IPA scores in total: teacher-reading, mother-reading, teacher-math, and mother-math.

Each IPA score provides an index of the extent to which each adult's perceptions of the child's ability vary from the child's observed performance; that is, they are a measure of the adult's rating of a child's ability with the child's standardized ability removed. A negative IPA score reflects underestimation, and a positive IPA score reflects overestimation. The closer an IPA score is to zero, the smaller the discrepancy between adult perception and actual performance.

Mediation

The teachers' and mothers' differential treatment towards the children were hypothesized to mediate the influence of teacher and mother inaccurate perceptions of child ability on child achievement.

Teacher Attends to Child

Teacher behavior towards the study child was operationalized using a variable from the Classroom Observation System for third grade (COS-3; NICHD ECCRN, 2005). The COS-3 used trained observers and time sampling to code child and teacher behaviors, activities, and setting conditions. Classrooms were observed for eight 25-minute cycles. During the middle 10 minutes observers coded specific child and teacher behaviors, activities, and settings using a 30-seconds-observe, 30-seconds-record time sampling technique. The behaviors, activities, and settings were summed across these time sampling cycles and scaled to 60 cycles for consistency. The COS-3 consistently predicts student academic and social functioning across childhood and adolescence (Hamre & Pianta, 2005; NICHD ECCRN, 2002, 2003, 2005).

Most of the 38 teacher behaviors and activities that the observers coded were classroom characteristics that all children in the class experienced as a whole. I chose the *teacher attends to child* variable to measure teacher's differential treatment of the study child (one of the only variables that measured teacher's differential treatment of the study students) based on Harris and Rosenthal's (1985) meta-analytic results, which found that teachers ignore low-expectancy students and interact more frequently with high-expectancy students. Inter-rater reliability was assessed using a second observer who

coded a subset of the sample. The inter-rater reliability for the *teacher attends to child* variable was high (r = .83).

Maternal Stimulation and Support

Maternal academic-related behaviors were operationalized using latent variables. Manifest variables comprised of variables from a shared problem solving activity and from a home literacy environment questionnaire.

When study children were in third grade, children and mothers were asked to complete a shared problem solving activity. The activity was an errand-planning task. Trained observers watched videotapes of the activity and rated certain aspects of the interactions on a 1 (very low) to 7 (very high) scale. In the present study, I used the *stimulation of cognitive development*, *quality of assistance*, and *supportive presence subscales* as indicators of the quality of maternal stimulation and support.

In the model to predict reading, but not in the model to predict math, the maternal stimulation and support latent variable included a measure of the home literacy environment. When the study children were in third grade, mothers completed a 9-item questionnaire based on Griffen and colleagues' (1997) *home literacy environment score.* Most of the questions assessed the type of reading material in the home and the amount of time children and their family read. One question asked about the number of hours study children watched television per week. Each item was scored on a scale of 0 to 2, with 2 indicating a positive home literacy environment, except one item on library card use, which was scored on a 0 to 1 scale. Thus, the home literacy environment score ranged from 0 to 17 points; it had acceptable reliability (Cronbach alpha = .71). There was no direct measure of the home math environment in the NICHD SECCYD database.

Moderation

Hypothesis 1 predicted that the environmental control of the adult-child relationships would moderate the direct and indirect effects (through differential treatment) of adult misperceptions on child achievement.

Classroom Over-control

Classroom climate was measured using the *classroom over-control* variable of the COS-3 (Hamre & Pianta, 2010; NICHD ECCRN, 2005; Pianta, Belsky, Vandergrift, Houts, & Morrison, 2008). Classrooms were observed for eight 25-minute cycles. The first 5 minutes and the last 10 minutes consisted of continuous observation of the child, teacher, and classroom environment at global and qualitative levels using a set of 7-point rating scales ranging from "uncharacteristic" to "highly characteristic." The qualitative variables were aggregated across the 8 cycles. These constructs reflect the global and qualitative classroom characteristics that all children in the class experienced. Classroom over-control was one of these qualitative variables. It measured the degree to which classrooms were rigidly structured, and marked by very little autonomy or choice and a high degree of teacher control.

Maternal Disrespect for Autonomy

I used the *respect of autonomy* subscale of the shared problem solving activity as the measure of the climate of mothers-child interactions during a learning task. Trained observers watched videotapes of the mother and child completing a shared problem solving activity and rated certain aspects of the interactions on a 1 (very low) to 7 (very high) scale. Mother's respect of her child's autonomy was one of these aspects. In the

present study, the rating scale was reversed to match classroom over-control (i.e. the moderating teacher variable).

Child Outcome

Because the goal of the present study was to examine the long-term influence of adult misperceptions of a child's reading and math abilities, the outcome variable used to test Hypothesis 1 was the study children's achievement in high school.

Standardized Assessment of Achievement at Age 15 years

The W-scores on the *passage comprehension*, *picture vocabulary*, *verbal analogies*, and *applied problems* WJ-R subscales administered at 15 years were used as measures of standardized achievement in high school. Performance on *passage comprehension*, *picture vocabulary*, and *verbal analogies* were used as indictors in a reading achievement latent variable, while the *applied problems* subscale was used to measure math ability.

The *passage comprehension subscale* measured advanced reading abilities and required children to read a short passage and identify a missing key word or to match a picture to a phrase. The *picture vocabulary subscale* measured language development and vocabulary comprehension and it required children to recognize or name pictures of objects. The *verbal analogies subscale* measured verbal reasoning and required children to complete phrases with appropriate analogies. The *applied problems subscale* measured math abilities and required children to analyze and solve practical word and story problems with math calculations.

Control: Prior Ability

Measures of study children's prior abilities (i.e. before schooling) were included in all models as a control variable because it allowed for the examination the effect of adult misperceptions on child achievement, as well as the mediating and moderating variables, above and beyond the child's prior reading and math abilities. The W-scores of the *letter-word identification* and *applied problems subscales* of the WJ-R administered at 4.5 years were included in the reading and math models, respectively. The *letter-word identification subscale* measured basic reading abilities.

Additional Analyses

In order to explore the formation of adult misperceptions, several additional analyses were performed. In one, I examined variables that predicted adult misperceptions. Possible predictor variables included demographic and socioemotional characteristics of the child, as well as characteristics of the teacher (education, teaching experience, self-efficacy for teaching). In another additional analysis I examined how frequent the teacher and mother perceptions matched, and I explored whether there were variables that differed between the small groups of children who were under or over estimated by both adults.

Demographic Characteristics

During home interviews when children were one month old, mothers reported demographic information including the child's birth order, gender, and ethnicity (African American, European American, Asian, American Indian, or other). Mothers also provided information on family income and education levels multiple times throughout the study. Family income-to-needs ratios were created by dividing the poverty threshold

for the household size by the reported family income. For example, a family with an income-to-needs ratio of 1 has income at the poverty line for that household size, while a family with an income-to-needs ratio of 2 has income double the poverty line. A SES composite score was created by averaging the z-scores of the maternal education and family income-to-needs ratio in early elementary school (i.e. first, third, and fourth grades).

Socioemotional Characteristics

Mothers completed the Children's Behavior Questionnaire (CBQ) when study children were 4.5 years old. The CBQ was designed to measure multiple aspects of child temperament on a 1 (extremely untrue) to 7 (extremely true) point scale. Inhibitory control (Cronbach's alpha = .75) was included in the present study as a potential predictor of teacher and parent under- or overestimation of children's abilities. High scores on inhibitory control indicate that the child is able to plan and suppress inappropriate responses in a variety of situations (Rothbart, Ahadi, & Hershey, 1994).

Children's social competencies were measured multiple times throughout the study with the Social Skills Rating System (SSRS). The SSRS is a multi-rater assessment of social skills, problem behavior, and academic competence on a 0 (never) to 2 (very often) scale. I used the *peer competence* (Cronbach's alpha = .88) and *social skills* (Cronbach's alpha = .94) subscales of the SSRS, completed by the study children's second grade teacher as measures of children's social competencies. Using second grade teacher scores provided an independent rating of the child's social skills.

Teacher Characteristics

The children's third grade teachers self-reported their education and the number of years taught. The teachers also completed a 21-item questionnaire that measured their self-efficacy. The *total self-efficacy score* used in the present study consisted of instructional self-efficacy, disciplinary self-efficacy, and efficacy to create a positive school climate. All questions were rated on a 9-point scale with higher scores indicating more self-efficacy. The *total self-efficacy score* had high internal reliability (Cronbach's alpha = .91).

Analytic Plan

I used IBM SPSS Statistics for data management, chi-squares and OLS regression analyses. Data management followed the guidelines of Tabachnick and Fidell (2006) and Kline (2011). I used Mplus to perform confirmatory factor analysis (CFA), path analysis and structural equation modeling (SEM) because Mplus uses full information maximum likelihood estimation (FIML). FIML estimation is a modern data imputation technique that uses all information in parameters and standard error estimation (Little, 2013). This is important for the present analyses because many of the variables had missing data.

SEM model building techniques followed the guidelines of Kline (2011) and Little (2013). I used multiple types of model fit statistics to assess the CFA, path analysis, and SEM models, including chi-square test of model fit, the comparative fit index (CFI), the standardized root mean square residual (SRMR), and the root mean square error approximation (RMSEA). In addition, I inspected residual variances for Heywood cases.

The chi-square test of model fit uses the χ^2 distribution to assess the probability of the difference between the restricted covariance matrix and mean vectors (i.e. the implied model) and unrestricted covariance matrix and mean vectors (i.e. the observed data).

Degrees of freedom are calculated by subtracting the number of available pieces of information from the number of estimated model parameters. Non-significant values indicate acceptable model fit because they suggest that the hypothesized model represents a likely event (Little, 2013; Kline, 2012).

The CFI is an incremental index of model fit, which means it measures model fit by comparing the hypothesized model to the baseline model. The CFI ranges from 0 to 1, with values closer to 1 indicating a well fit model. The threshold for acceptable fit is greater than or equal to .95 (Byrne, 2012; Kline, 2011). The CFI can be influenced by misspecified factor loadings (Hu & Bentler, 1999). To account for this, the CFI is often paired with the SRMR (Byrne, 2012; Hu & Bentler, 1999). The SRMR is an absolute index of model fit. Absolute indices of model fit measure how well the hypothesized model is reproduced in the sample data (Byrne, 2012; Little, 2013). That is, they measure the amount of misfit in the model. The SRMR reflects the average standardized residuals after comparing the covariance and means of the hypothesized model to those of the sample. Some say the cut-off for a well-fit model should be .08 (Hu & Bentler, 1999; Kline, 2011), while others suggest it should be .05 (Byrne, 2012).

The RMSEA, also an absolute index of model fit, compares the hypothesized model to the degrees of freedom in the saturated model, after accounting for the sample size (Kline, 2011; Little, 2013). The RMSEA is based on the noncentral χ^2 distribution and, as a result, provides a confidence interval in addition to the point estimate of model fit (Byrne, 2012). Values less than .05 indicate good fit and values close to .08 indicate acceptable fit (Kline, 2011; Little, 2013).

Mplus also provides modification indices for all models. A modification index is the estimated change in the overall model χ^2 that would occur if a particular parameter is added to the model. I considered modification indices about the correlations between variables in each model that were over 3.84 (the $p = .05$ cut-off for a χ^2 distribution with one degree of freedom) and were theoretically justified.

CHAPTER 3

RESULTS

Part 1: Measurement Models

I ran three CFAs to examine the factor structure of the measurement models of the three latent variables that were used in the models of Hypothesis 1, namely, maternal stimulation and support for reading, maternal stimulation and support for math, and child outcomes in reading.

All latent variables must have at least one fixed parameter; that is, a parameter that is not allowed to be freely estimated (Kline, 2011). Little explains this concept by comparing a latent variable to a nebulous cloud, moving about with every measurement, "if, however, I take a tack… and pin it down somewhere (*doink*), I can then use the pinned-down point as my point of reference for all of my measurements of the information contained in the cloud." (Little, 2013, p. 79) . Fixing a parameter essentially "pins down" the latent variable so that its scale can be determined. Instead of the traditional way to do this, which constrains the first indicator to one, I used the fixed factor method of scaling in the CFA models of the present study because it allowed Mplus to estimate model fit of the measurement model. That is, I fixed the variance of the latent variable to one and constrained the residuals of two of the indicator variables to be equal. This also allows the factor loadings of all indicator variables to be estimated.

Maternal Stimulation and Support

The latent variables maternal stimulation and support included in the reading and math models were operationalized using three indicator variables. Figures 2 and 3 show the measurement or CFA models for reading and math, respectively. The rectangles

represent indicator variables and the circles represent latent variables. The values represent standardized parameter estimates of factor loadings and residual variances (the half-circles with double-headed arrows). The superscript * indicates that the factor variance was fixed to 1 in order to scale the metric of the latent variable. The subscales *stimulate cognitive development* and *quality of assistance* were included in both models. The third indicator in the reading model was the *home literacy environment* and the third indicator in the math model was *supportive presence* (the home math environment was not measured by the NICHD SECCYD). The fit indices suggested both were well-fit models (for the reading model: χ^2 (1) = 0.13, p = .72; CFI = 1; SRMR = .00; RMSEA = .00, $CI_{.90}$ = .00 to .06; for the math model: χ^2 (1) = 9.20, p < .05; CFI = .99; SRMR = .04; RMSEA = .09, $CI_{.90}$ = .05 to .15). All factor loadings were significant at p < .001. There were no modification indices above 3.84 for either model.

For the reading model, the standardized factor loadings suggested all factors were reliable indicators of maternal stimulation and support. However, the latent variable accounted for more of the variance in the *stimulate cognitive development* (R^2 = .48) and *quality of assistance* variables (R^2 = .61), relative to *the home literacy environment* variable (R^2 = .19). Despite this, the home literacy environment was maintained as an indicator because the standardized loading of the home literacy environment was greater than the traditional recommended cut-off of .32 (Tabachnick & Fidell, 2006) and a measure of home reading support adds to the conceptualizations of mothers' differential treatment as a mediating mechanism between maternal misperceptions of reading ability and child reading achievement. For the math model, standardized factor loadings

suggested that the subscales of the shared problem solving tasks were all strong and fairly equivalent measures of maternal stimulation and support.

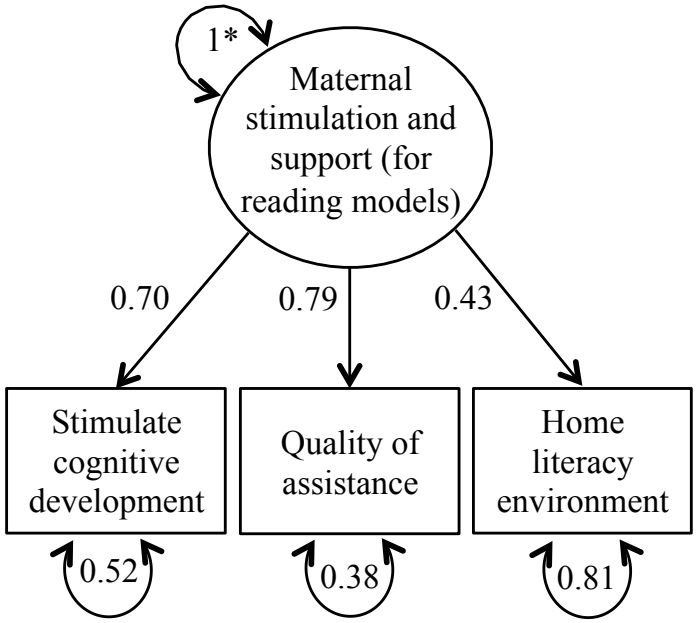

Figure 2. CFA model of the mother stimulation and support latent variable (reading)

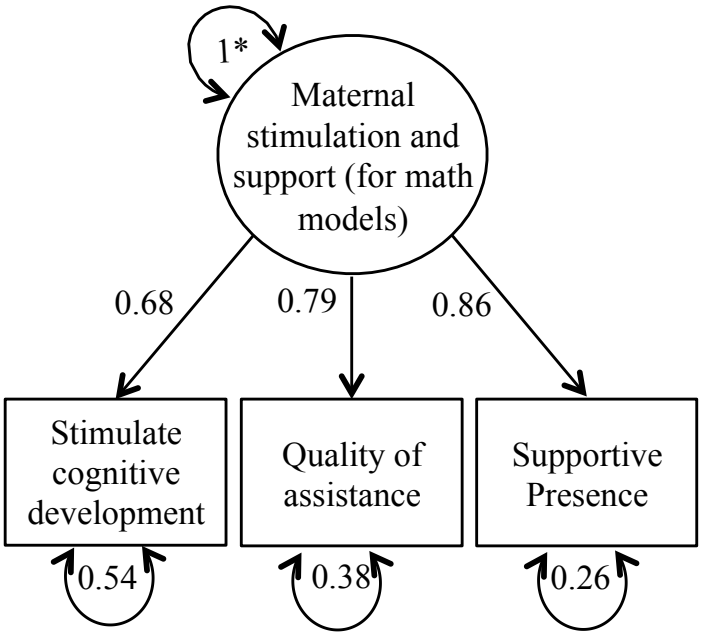

Figure 3. CFA model of the mother stimulation and support latent variable (math)

Child Outcome

The latent variable of children's high school reading achievement consisted of performance on the *picture vocabulary*, *verbal analogies*, and *passage comprehension* subscales of the WJ-R at 15 years. Figure 4 shows the CFA model. Model fit indices suggest a well-fit model (χ^2 (1) = 2.78, p = .10; CFI = 1.00; SRMR = .13; RMSEA = .05, $CI_{.90}$ = .00 to .11), except for a slightly high SRMR. A high SRMR suggests additional constraints are needed. The modification indices, however, showed no support for adding any additional correlations, so I retained the measurement model present in Figure 4. The standardized factor loadings were all significant at $p < .001$, fairly equivalent to each other, and were all strong measures of high school reading achievement.

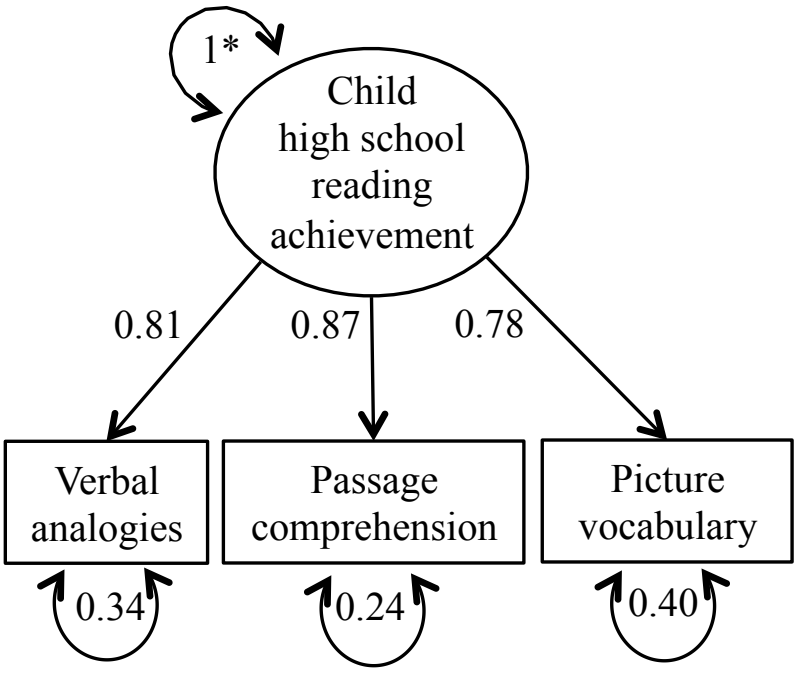

Figure 4. CFA model of the high school reading achievement latent variable

Part 2: SEM

Moderation of the direct effects of teacher and parent misperceptions on the children's achievement in high school, as well as indirect effects through adult behaviors or differential treatment, by the degree of control in the learning environment was tested using SEM in Mplus. The latent variables were estimated using the traditional method of scaling setting, which constrains the first indicator of each latent variable to 1 because there is no longer a need to preserve a degree a freedom for model fit indices.

Curvilinear effects of adult misperceptions were tested by including the quadratic or squared term of the adult IPA scores as predictors of adult differential treatment and child achievement variables (Judd, McClelland, & Ryan, 2011).

Indirect effects were tested with the Sobel test and bias-corrected bootstrap estimation. In the Sobel test of mediation, an indirect effect is computed by calculating the product of the standardized path coefficients and then testing its significance based on the normal distribution (Sobel, 1982). Recent evidence, however, suggests that the Sobel test is unreliable because the product of the direct effects is often not normally distributed (MacKinnon, 2008). MacKinnon and colleagues (MacKinnon, 2008; MacKinnon, Lockwood, & Williams, 2004) suggest using bias-corrected bootstrap methods to calculate and examine indirect effects. According to this method, an indirect effect is significant at the .05 level if the value of 0 is not part of the 95% bootstrap confidence interval around the indirect effect. I chose a large number of bootstraps (10,000) in order to ensure high precision.

Moderation was tested by including several interaction terms as predictors of children's high school achievement and adults' differential treatment (the mediating

mechanisms). I created four interaction terms: two testing the moderating effect of environmental control on the influence of teacher misperceptions (teacher IPA X classroom over-control and teacher IPA^2 X classroom over-control) and two testing the moderating effects of environmental control on the influence of mother misperceptions (mother IPA X maternal disrespect for autonomy and mother IPA^2 X maternal disrespect for autonomy). Classroom over-control and maternal disrespect for autonomy were centered on their sample means.

Data Management

In accordance to the guidelines of Tabachnick and Fidell (2006), all variables were screened for normality, as well as univariate and multivariate outliers. I found no issues with normality or univariate outliers. Using Mahalanobis distance, 15 multivariate outliers were identified (10 for the reading model and 5 for the math model). After determining that an outlier is part of the intended sample, Kline (2011) suggests replacing extreme scores with the most extreme score that is within three standard deviations from the mean – rather than deleting the entire case. For the reading model, 2 prior ability values were changed as such, as well as 6 reading high school achievement values, and 2 teacher attends to child values (4 cases had 2 values changed and 2 cases had 1 value changed). For the math model, the values of 4 prior ability cases and 1 teacher attends to child case were changed (across 5 different cases).

Hypothesized models

Reading model

Figure 5 illustrates the tested structural model of Hypothesis 1 for reading. Rectangles represent indicator or manifest variables and circles represent latent variables.

The lines with a single-headed arrow represent paths of hypothesized influence; the curved grey lines with double-headed arrows represent correlations; the half-circles with double-headed arrows represent residual variances. Adult IPA scores were hypothesized to predict children's reading achievement in high school directly and indirectly through differential treatment, controlling for prior abilities. The squared adult IPA terms allowed for curvilinear effects of adult IPA scores to be tested. Moderation by environmental control of the influence of adult IPA scores was tested by entering the interaction terms between each adult IPA score, as well as the squared adult IPA score, and a measure of the amount of control the adult exerts in the learning environment (i.e. the over-control variable for teachers and the disrespect for autonomy variable for mothers). Relations between adult IPA scores and interaction terms and their respective main effects were included a priori. I added the correlation between the subscales *stimulate cognitive development* and *home literacy environment*, as well as the correlation between *passage comprehension* and *verbal analogies* subscales of the WJ-R, based on the modification indices Mplus provided. Finally, the quadratic term of the teacher IPA score was not significant so I dropped it (and its corresponding interaction term) from the model so that the linear term would be interpretable.

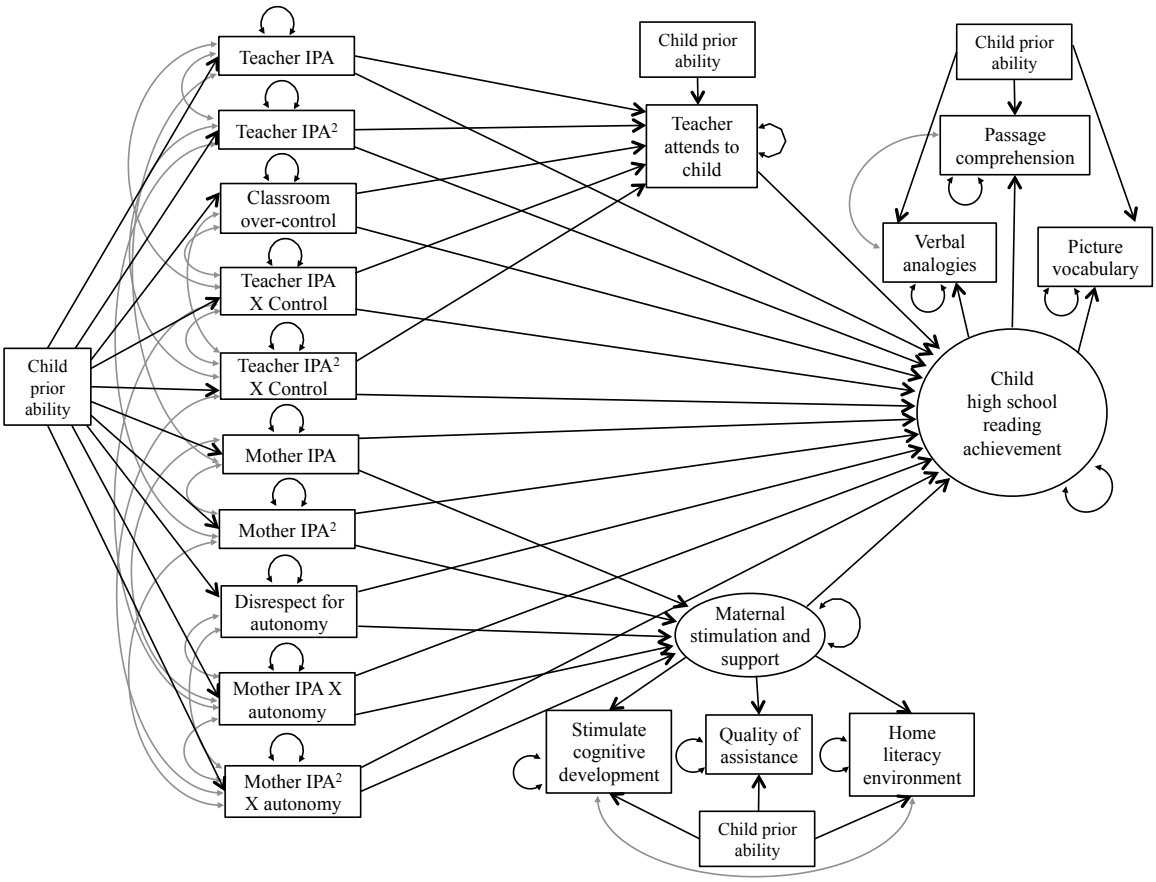

Figure 5. Tested structural model of Hypothesis 1 for reading.

The resulting model had a large and significant chi-square test (χ^2 (69) = 186.90, p < .001), but this would be expected given the large sample size. All other fit indices suggested a well-fit model (CFI = 0.97; SRMR = .05; RMSEA = .04, $CI_{.90}$ = .03 to .05). Figure 6 shows significant standardized parameter estimates of the model, as well as residual variances. Each aspect of the model will be discussed in turn next.

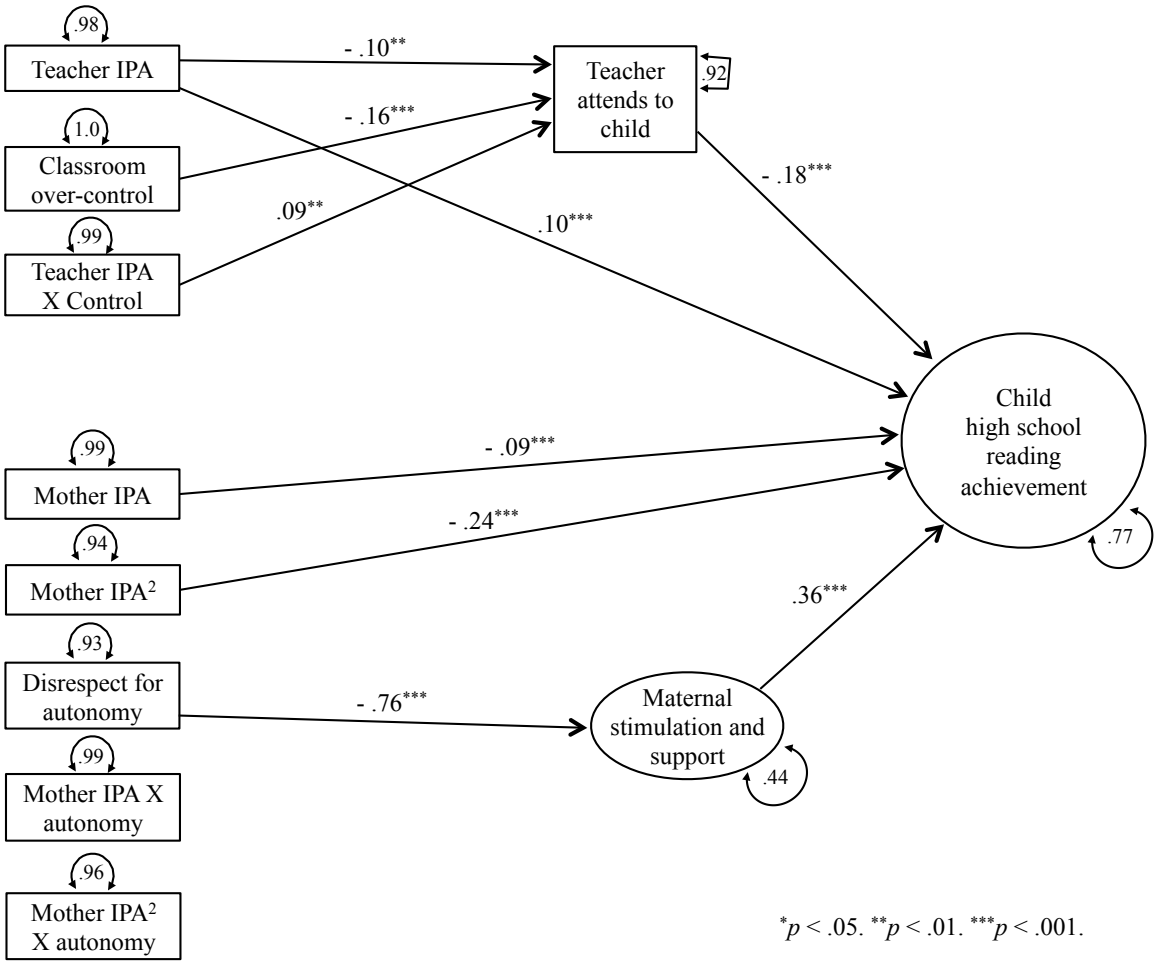

Figure 6. Standardized estimates of significant paths and residual variances of Hypothesis 1 for reading

Direct effect of adult misperceptions on reading achievement. Figure 6 shows that teacher IPA scores were positive predictors of high school reading achievement, controlling for the child's prior abilities and holding the mothers' misperceptions, the environmental control, and the interaction terms constant (β = .10. $p < .05$). That is, teachers' overestimation of their students' reading abilities were directly related to higher levels of reading achievement in high school. The mother IPA^2 score (i.e. the curvilinear effect) was a significant and negative predictor of high school reading achievement (β = -

.24, $p < .001$). A negative quadratic term indicates that the relation between variables is upside-down U-shaped, with an IPA score of zero (i.e. accurate perceptions) predicting higher high school reading achievement than negative or positive IPA scores. Mother IPA scores were also significant and negative predictors of high school reading achievement ($\beta = -.09$, $p < .05$). It is important to note that the linear term takes on a somewhat different interpretation in the context of a model that also includes the quadratic term. In such a model, the linear term represents the slope of the line tangent to x at the y-intercept, that is, the predicted slope of x when $x = 0$.

To illustrate the differences in the effect of teachers' and mothers' misperceptions, I plotted the effect of the teacher and mother IPA scores on the children's reading achievement in high school in Figure 7. Standardized coefficients were used. All covariates were set to their sample means. Reading achievement is a latent variable and all latent variables have a mean and intercept of zero in Mplus.

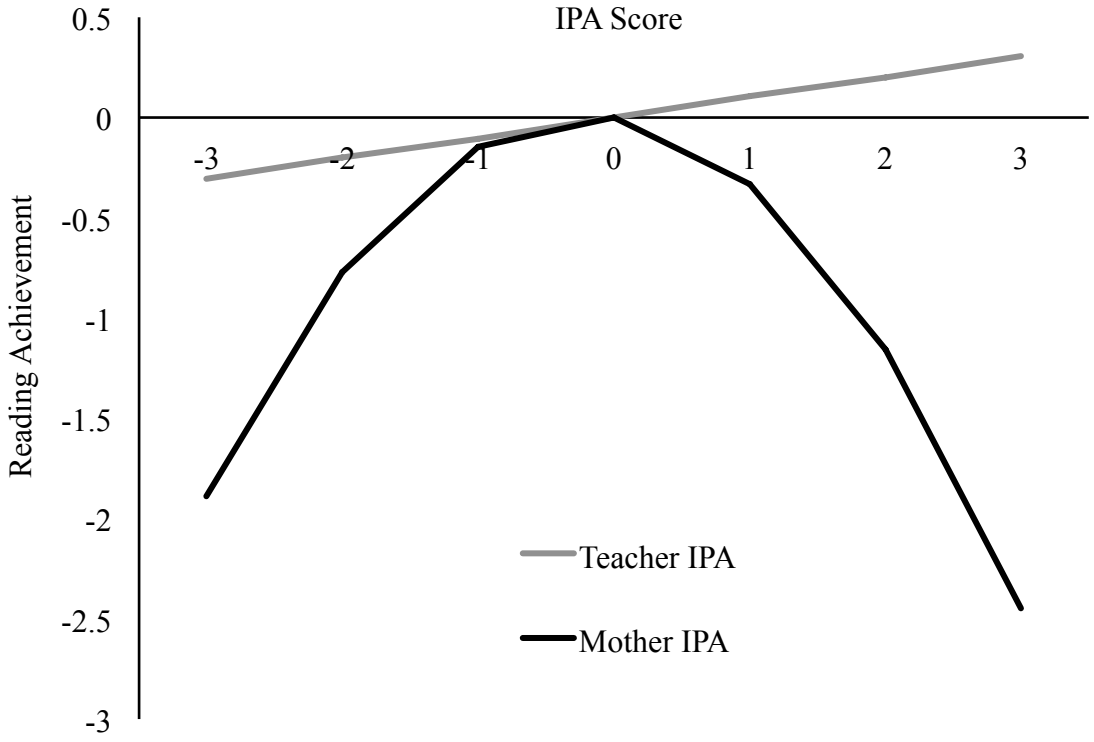

Figure 7. Adult IPA scores predicting child high school achievement

Mediation through adult differential treatment. Figure 6 also shows that the teacher IPA scores were negatively related to teacher attention, holding all other covariates constant ($\beta = -.09$, $p < .01$). The children whose abilities were underestimated by their teachers tended to receive more teacher attention than overestimated children. Teacher attention was, in turn, a negative predictor of high school reading achievement ($\beta = -.18$, $p < .001$); the children who received more attention from their third-grade teachers tended to perform worse on tests of reading achievement in high school than those who received less attention. Mother IPA scores and mother IPA^2 scores were not related to maternal stimulation and support.

Tests of mediation showed that teacher attention partially mediated the effect of the teacher IPA score on child achievement with a standardized indirect effect of .02

(Sobel's $z = 2.04$, $p < .05$; bias-corrected bootstrap $CI_{95\%}$ =.001 to .03). This means that the reading achievement latent variable increased by about .02 standard deviations for every increase in teacher IPA score of one standard deviation via its prior effect on teacher attention.

Moderation by environmental control. Figure 6 shows that there was no evidence that amount of environmental control moderated the effects of mothers' misperceptions because the mother IPA by maternal disrespect for autonomy and mother IPA^2 by maternal disrespect for autonomy interaction terms were not significant predictors of maternal stimulation and support or child achievement. The teacher IPA score by classroom over-control interaction term was a significant predictor of teacher attention ($\beta = .10$, $p < .05$), but not child achievement.

Figure 8 illustrates the interaction between teacher IPA scores and classroom over-control. The relation between teacher IPA scores and teacher attention were plotted separately for middle (mean), high (+ 1 *SD*), and low (- 1 *SD*) classroom over-control (Aiken & West, 1991). All covariates were set to their sample means.

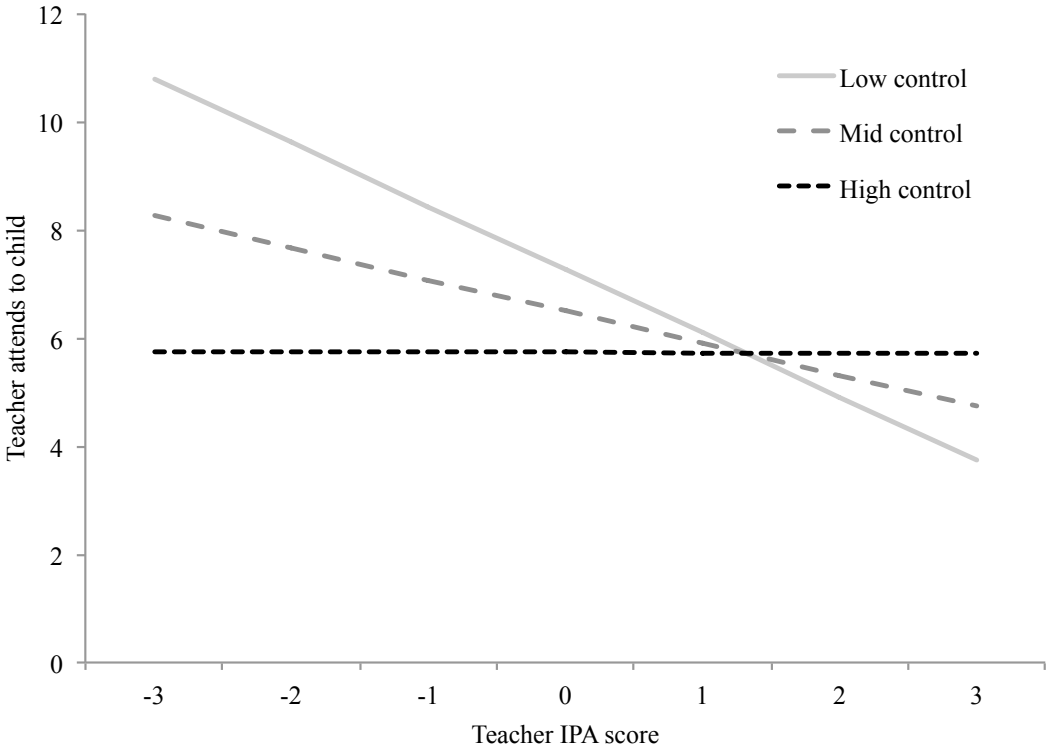

Figure 8. Environmental control moderated the effect of teachers' misperceptions of a child's ability on teacher attention

Simple slope tests were calculated to further interpret the interaction. When classroom over-control is high, levels of teacher attention and teacher IPA scores were not related (b = - 0.003, SE = 0.30, t = -0.01, p = .99). Within a low controlling environment, on the other hand, the teacher IPA scores negatively predicted teacher attention (b = - 1.17, SE = 0.31, t = -3.73, p < .001). Teachers who underestimated their student's abilities tended to pay more attention to that child than teachers who accurately estimated or overestimated their student's abilities. The teacher IPA scores were also negatively related to the teacher attends to child variable at moderate levels of classroom over-control (b = - 0.59, SE = 0.22, t = -2.66, p < .01).

Finally, I calculated the conditional indirect effects of teacher IPA scores on child achievement through teacher attention by middle (mean), high (+1 *SD*), and low (-1 *SD*) classroom over-control (Preacher et al., 2007). I found that among the highly controlled classrooms, teacher IPA scores show no indirect effect on child achievement through teacher attention (unstandardized estimate = 0.001, Sobel's $z = 0.01$, $p = .99$; bias-corrected bootstrap $CI_{95\%}$ = - 0.17 to 0.16). But when classroom over-control was moderate or low, teacher IPA scores positively predicted child achievement through teacher attention, with the largest indirect effect occurring within the low over control classrooms (for mid control: unstandardized estimate = 0.19, Sobel's $z = 2.04$, $p < .05$; bias-corrected bootstrap $CI_{95\%}$ = 0.05 to 0.41; for low control: unstandardized estimate = 0.37, Sobel's $z = 2.38$, $p < .05$; bias-corrected bootstrap $CI_{95\%}$ = 0.13 to 0.75).

Math model

Figure 9 illustrates the tested structural model of Hypothesis 1 for math. Adult IPA scores (both linear and curvilinear) predict children's math achievement – mediated by differential treatment and controlling for the child's prior math abilities. Moderation was tested by including the interaction terms between all adult IPA scores and environmental control. As in the reading model, relations between adult IPA scores and interaction terms and their respective main effects were included a priori. I added the correlation between *stimulate cognitive development* and *home literacy environment*, as well as the correlation between *stimulate cognitive development* and *supportive presence*, based on the modification indices Mplus provided.

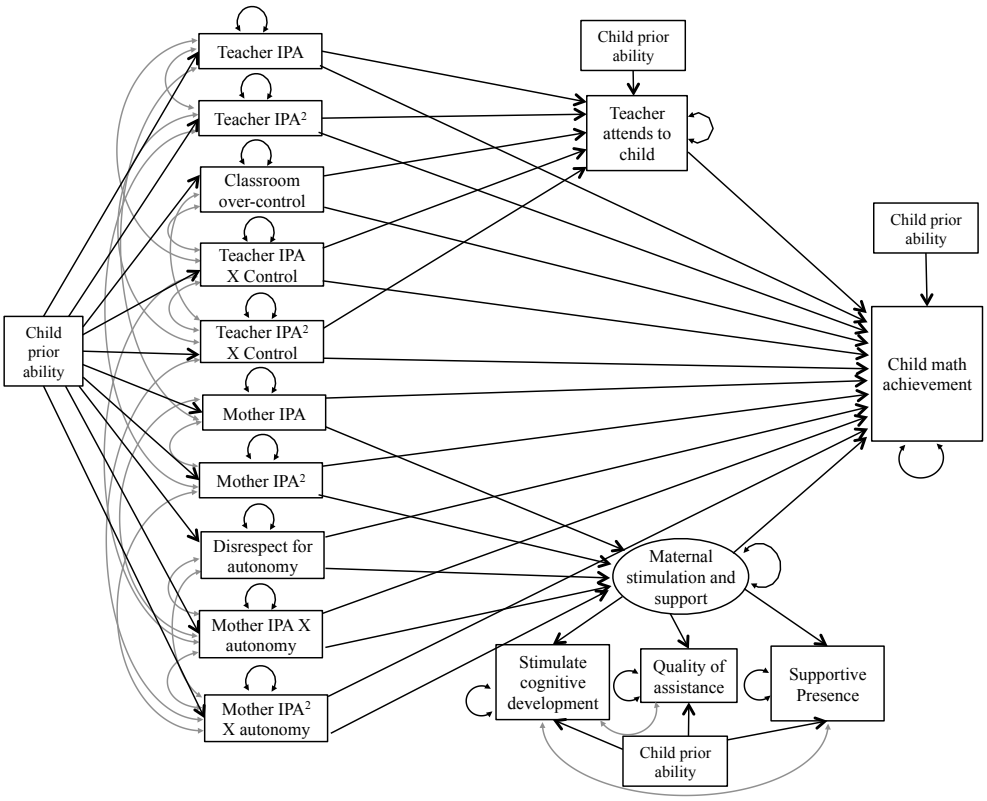

Figure 9. Tested structural model of Hypothesis 1 for math

Figure 10 illustrates significant standardized parameter estimates of the math model, as well as residual variances. The math model had a large and significant chi-square test (χ^2 (62) = 108.44, $p < .001$), but all other fit indices suggested a well-fit model (CFI = 0.99; SRMR = .03; RMSEA = .03, $CI_{.90}$ = .02 to .03). As in the reading model section above, each aspect of the model will be discussed in turn next.

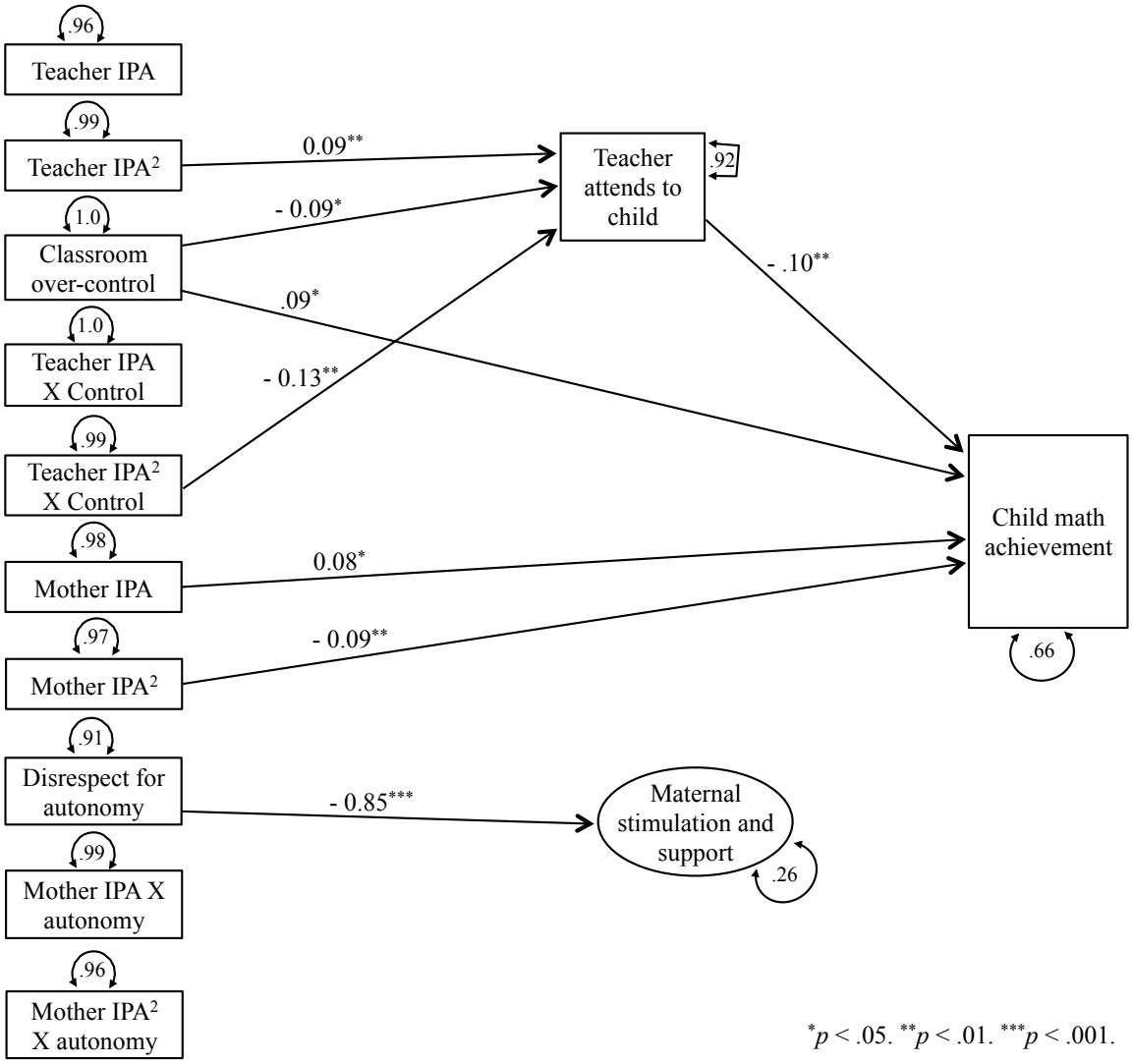

Figure 10. Standardized estimates of significant paths and residual variances of Hypothesis 1 for math

Direct effects of adult misperceptions on math achievement. Teachers' misperceptions of abilities were not directly related to high school math achievement, after controlling for prior abilities and holding mothers' misperceptions, environmental control, and the interactions between environmental control and adult misperceptions constant (see Figure 10). The mother IPA^2 scores were a negative predictor ($\beta = -.09$, $p <$

.01), similar to the reading model (see Figure 7). Since the quadratic mother IPA score was significant, I did not interpret the linear mother IPA scores because it only shows the slope when the linear IPA score is equal to 0.

Mediation through differential treatment. The results of the Sobel tests and bias-corrected bootstrap estimation showed there was no evidence that adult differential treatment (i.e. teacher attention and maternal stimulation and support) mediated the relation between adults' misperceptions of a child's math abilities and that child's later math achievement.

Moderation by environmental control. There was evidence for moderation (see Figure 10). The teacher IPA^2 by classroom over-control interaction term was a significant predictor of teacher attention ($\beta = .13$, $p < .01$), but not child achievement. The teacher IPA X classroom over-control interaction term did not predict teacher attention or child achievement. And there was no evidence for moderation of mothers' misperceptions (i.e. the mother IPA X maternal disrespect for autonomy and mother IPA^2 X maternal disrespect for autonomy interaction terms did not predict maternal stimulation and support or child achievement).

Figure 11 illustrates the significant interaction between teacher IPA^2 scores and classroom over-control. The relation between teacher IPA^2 scores and teacher attention were plotted separately for the middle (mean), high (+1 *SD*), and low (-1 *SD*) classroom over-control (Aiken & West, 1991). All covariates were set to their sample means.

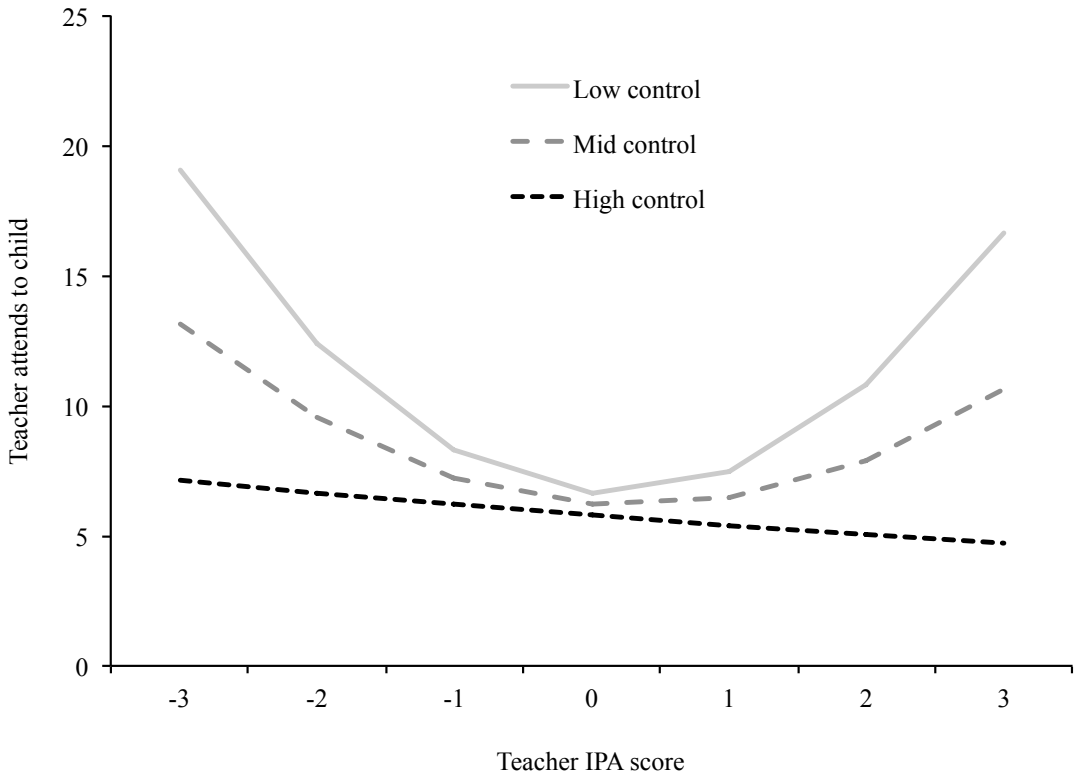

Figure 11. Environmental control moderated the curvilinear effect of teachers' misperceptions of a child's ability on teacher attention to the child

Simple slopes tests showed that when environmental control was low, there was a u-shaped curvilinear effect of teacher misperceptions ($b = 1.25$, $SE = 0.32$, $t = 3.91$, $p < .001$); teachers attended to children more often when they under- and overestimated children's ability compared to when they held accurate perceptions. This moderating effect was also seen at moderate levels of controlling environment, but was smaller in magnitude ($b = 0.63$, $SE = 0.23$, $t = 2.73$, $p < .01$). When classrooms were highly controlled, there were no differences in teacher attention depending on teacher misperceptions ($b = 0.02$, $SE = 0.29$, $t = 2.73$, $p = .95$).

There was no evidence for the conditional indirect effects of teacher IPA scores on child achievement through teacher attention by levels of differential teacher treatment.

Hypothesized Models without Moderation

Although the main focus of the present study was to examine the moderating effects of environmental control on the influences of adult misperceptions, aspects of the main models of the present study have implications for understanding the mediating processes of adult misperceptions. Therefore, I ran the reading and math models without the interaction terms in order to examine the extent to which adult behaviors or differential treatment mediated the effects of adult misperceptions on child achievement without controlling for the moderating variables and interaction terms (as were in the main models). This relation has been explored and found often within the teacher expectation literature. However, within the literature on the effects of mothers' misperceptions (or parents' misperceptions in general) there is little empirical evidence on mediating mechanisms. So finding evidence for mediation in the present study would bolster the assumption often found in the literature that the effects of mothers' misperceptions are mediated through their effects on mothers' behaviors.

Reading model

Figure 12 shows the tested structural reading model without moderation by environmental control. Adult IPA scores predict children's reading achievement in high school directly and indirectly through differential treatment, controlling for prior abilities. The squared adult IPA terms allowed for curvilinear effects of adult IPA scores to be tested. I included relations between IPA scores a priori. Based on the modification

indices, I added the correlation between *stimulate cognitive development* and *home literacy environment*, as well as the correlation between *passage comprehension* and *verbal analogies* subscales of the WJ-R.

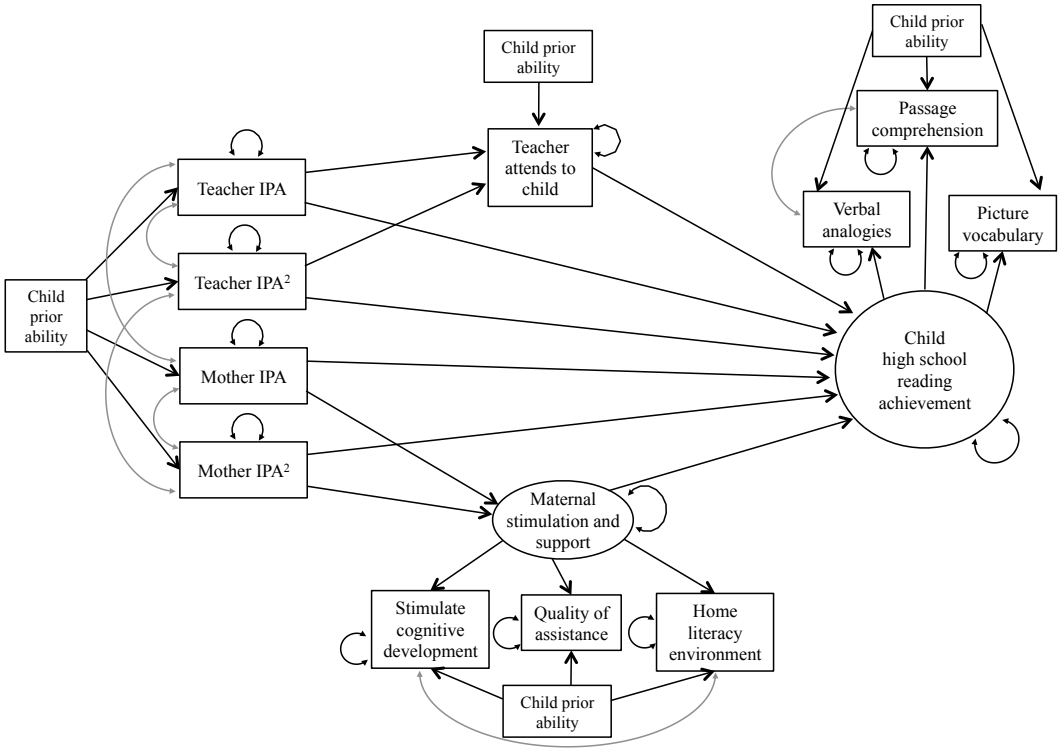

Figure 12. Tested structural model of the no moderation model for reading

The resulting model had a large and significant chi-square test (χ^2 (27) = 80.78, p < .001), but all other fit indices suggested a well-fit model (CFI = 0.98; SRMR = .04; RMSEA = .04, $CI_{.90}$ = .03 to .05). Significant standardized parameter estimates of the model and residual variances are illustrated in Figure 13.

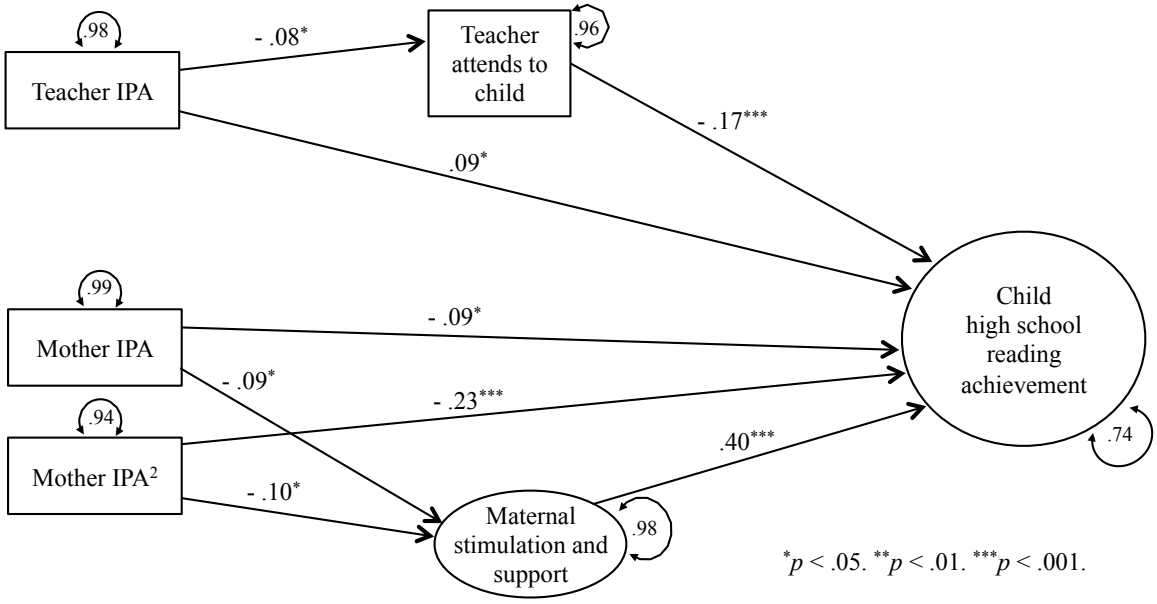

Figure 13. Standardized estimates of significant paths and residual variances of the no moderation model for reading

Direct effect of adult misperceptions on reading achievement. Similar to the reading model with moderation, teacher IPA was a positive predictor of high school reading achievement ($\beta = .09$, $p < .05$), controlling for the child's prior abilities and holding constant mother misperceptions (see Figure 13). As in the moderation model (see Figure 7), mothers' misperceptions were curvilinearly related to children's high school reading achievement such that accurate perceptions were related to higher achievement than inaccurate perceptions (mother IPA^2 score: $\beta = -.23$, $p < .001$).

Mediation through differential treatment. The tests of mediation found that the curvilinear effects of maternal misperceptions on child achievement were partially mediated by maternal stimulation and support. Figure 13 shows that the curvilinear effect of mother IPA scores were negatively related to maternal stimulation and support,

indicating an upside-down U-shaped effect (β = - .10, $p < .05$). Higher levels of maternal stimulation and support, in turn, led to higher levels of high school reading achievement (β = .40, $p < .001$). Thus this mediating mechanism had a standardized indirect effect of -.04 for the curvilinear effect of mother's misperceptions (mother IPA^2 score Sobel's z = -2.36, $p < .05$; bias-corrected bootstrap $CI_{95\%}$ = - .09 to - .01). This means the reading achievement latent variable is expected to decrease by about .04 standard deviations for every increase or decrease in the mother IPA scores (i.e. under- or overestimation).

For the teachers, there was no evidence for mediation by teacher attention when moderation by environmental control was excluded from the model. But the effect was trending (standardized estimate = .013, Sobel's z = 1.78, p = .075, bias-corrected bootstrap $CI_{95\%}$ = -.001 to .03).

Math Model

The tested structural model of the math model without moderation can be seen in Figure 14. Children's math achievement in high school is predicted by adult IPA scores directly and indirectly through differential treatment, controlling for prior abilities. I included relations between IPA scores a priori. Based on the modification indices, I added the correlation between *stimulate cognitive development* and *supportive presence.*

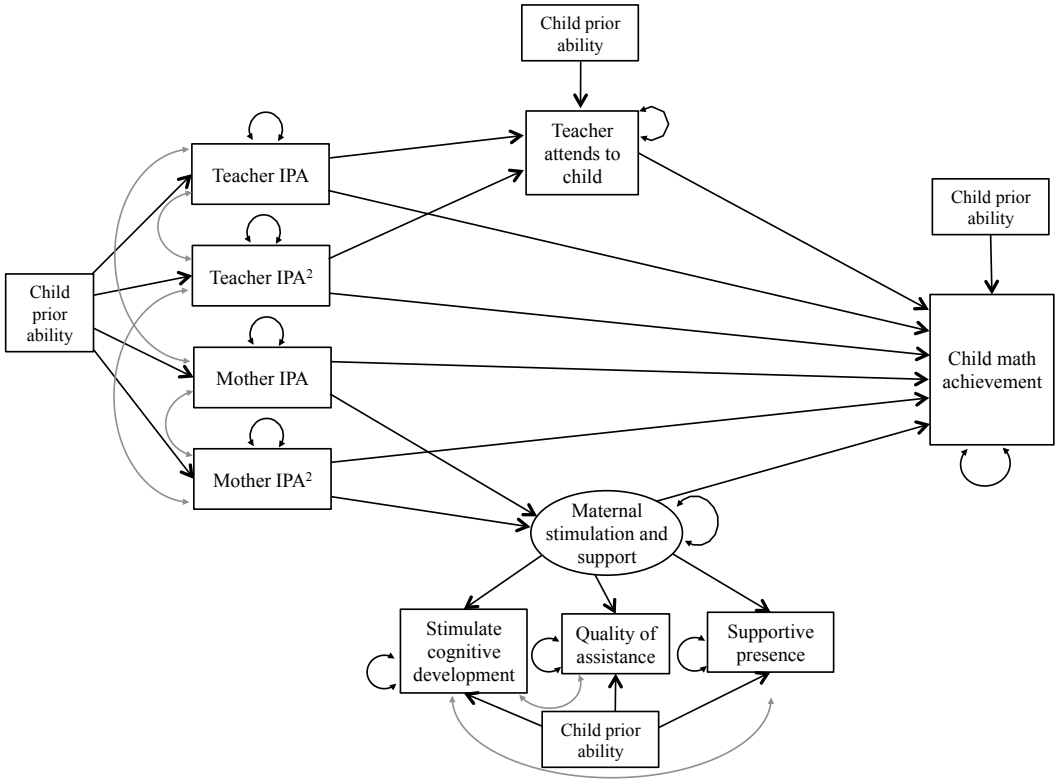

Figure 14. Tested structural model of the no moderation model for math

Fit indices suggest a well-fit model (χ^2 (17) = 27.13, p = .06; CFI = 0.99; SRMR = .02; RMSEA = .02, $CI_{.90}$ = .00 to .04). Significant standardized parameter estimates of the model and residual variances are illustrated in Figure 15.

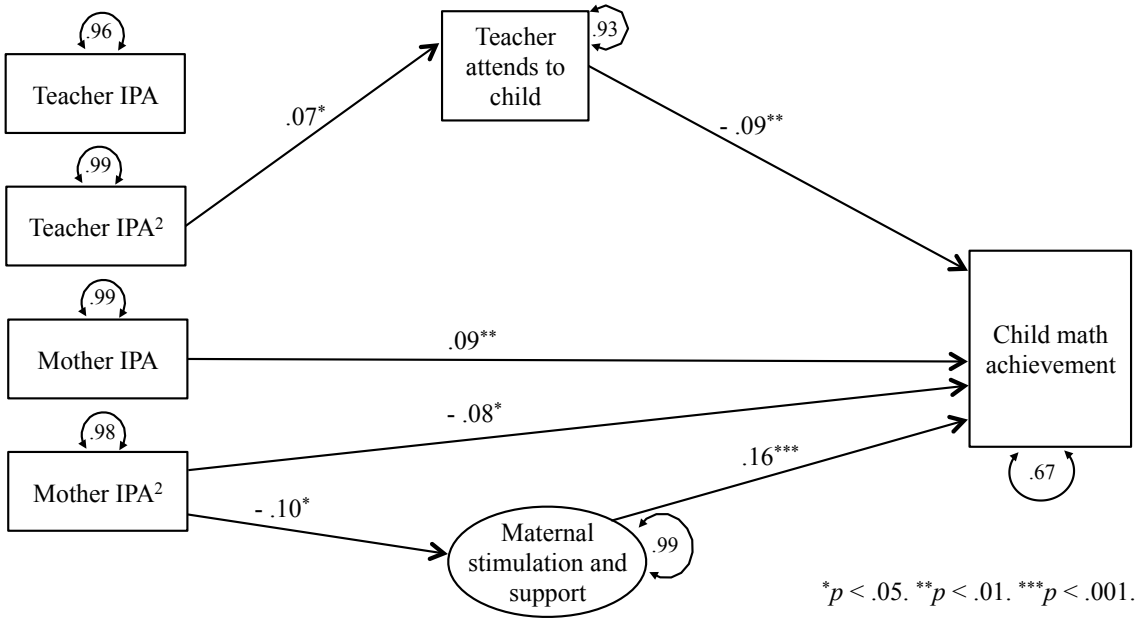

Figure 15. Standardized estimates of significant paths and residual variances of the no moderation model for math

Direct effect of adult misperceptions on reading achievement. Figure 15 shows that the direct effects of the math model without moderation by controlling environment were similar to those of the model with moderation. The quadratic mother IPA scores were negative predictors of high school math achievement, after controlling for prior abilities and holding teacher IPA scores constant ($\beta = -.08$, $p < .05$). Teachers' misperceptions of abilities were not directly related to high school math achievement.

Mediation through differential treatment. There was no evidence that adult differential treatment mediated the effects of adult IPA scores on math achievement in the models without moderation. However, the indirect effect of mother IPA^2 to math achievement through maternal stimulation and support was trending towards significance (Standardized indirect effect = - .02; Sobel's $z = -1.82$, $p = .067$; bias-corrected bootstrap $CI_{95\%}$ = - .03 to .001).

Part 3: Additional Analyses

So far I have found evidence that when adults hold inaccurate beliefs about a child's ability, the nature of the influences are different between teacher and mother. But what leads adults to develop inaccurate beliefs in the first place? Moreover, does the accuracy of teachers' and mothers' perceptions of a child's abilities tend to match?

Predictors of Adult Misperceptions

I considered whether adult misperceptions were predicted by child, family and teacher characteristics using a series of hierarchical multiple regression analyses. Four models were run in total: 2 predicting teachers' misperceptions (one for reading and one for math) and 2 predicting mothers' misperceptions (one for reading and one for math). For all of the models, I entered the children's prior ability into Step 1 (first grade performance on the letter-word identification subscale of the WJ-R for the reading models and the applied problems subscale for the math models). In Step 2 I entered measures of the children's social competence (peer competence and social skills subscales of the SSRS). Second grade teachers' ratings of children's social competencies were used because they offered an independent rating from the adults in the analyses of the present study. Step 3 included the following child and family demographic characteristics: birth order, gender, ethnicity, and family SES. Ethnicity was limited to comparing African-American to white children because the number of study children of other ethnicities was very small. For the teacher models only, Step 4 consisted of teacher characteristics, including self-efficacy for teaching, years taught, and teacher education.

Before running the prediction models, I screened all variables for normality and outliers (Tabachnick & Fidell, 2006). There were no issues with normality. I found and

deleted 7 univariate outliers (4 in the birth order variable, 3 in the years teacher taught variable). After these cases were deleted I used Mahalanobis distance to identify multivariate outliers; 10 cases were identified (4 for the teacher reading model, 3 for the teacher math model, 4 for the mother reading model, and 3 for the mother math model). I determined that they came from the intended population of study. There were a few extreme cases in the prior ability variables (i.e. scores on the *letter-word identification* and *applied problems* subscales of the WJ-R). I ran the prediction models two ways: one with the extreme values and another with the extreme values replaced with less extreme values that were within 3 standard deviations from the sample mean. There were no differences in any parameter estimates between them, so I maintained the original extreme values.

The results of the models predicting reading and math teacher IPA scores can be seen in Table 2. Step 1 of the regression analyses shows that children's prior abilities (i.e. letter-word identification and applied problems WJ-R scores in first grade) were positive predictors of reading and math teacher IPA scores ($\beta = .09$, $p < .05$ and $\beta = .28$, $p < .001$, respectively). Step 2 shows that, controlling for prior abilities, social competencies were related the reading teacher IPA scores, but not the math IPA scores. Teachers tended to overestimate the reading abilities of children with high levels of social skills ($\beta = .56$, $p < .001$) and, holding social skills constant, underestimate reading abilities of children with high levels of peer competence ($\beta = -.27$, $p < .01$). Children's prior abilities and social competencies accounted for 12% of the total variance in teacher IPA scores for reading and 10% of the total variance for math. Child and family demographic information were

not related to teacher IPA scores after controlling for prior abilities and social competencies.

Finally, adding teacher characteristics in Step 4 accounted for 3% more of the variance in the teacher IPA scores for reading and math ($p < .001$ for both). Within this block, the teacher's self-efficacy coefficient was the only significant predictor of IPA scores for reading ($\beta = .18$, $p < .001$) and for math ($\beta = .18$, $p < .001$); teachers with high self-efficacy tended to have high IPA scores, while those with low self-efficacy had low IPA scores, controlling for children's prior abilities, demographic characteristics, and social competencies.

Table 2. *Regression models predicting teacher IPA scores for reading and math.*

	Teacher Reading IPA[a]				Teacher Math IPA[b]			
Predictors	B	SE	β	ΔR^2	B	SE	β	ΔR^2
Step 1				.01*				.08***
Prior ability	0.01	0.003	0.09*		0.01	0.002	.28***	
Step 2				.11***				.02***
Prior ability	0.002	0.003	.03		0.01	0.002	.24***	
Peer competence	-0.05	0.02	-.27**		-0.001	0.02	-.01	
Social skills	0.04	0.01	.56***		0.01	0.01	.15	
Step 3				.001				.000
Prior ability	0.002	0.003	.02		0.01	0.002	.24***	
Peer competence	-0.05	0.02	-.26**		-0.001	0.02	-.01	
Social skills	0.04	0.01	.55***		0.01	0.01	.15	
Birth order	-0.02	0.03	-.03		0.001	0.03	.001	
Gender (female)	-0.01	0.05	-.004		-0.0002	0.05	-.0001	
Child ethnicity (African-American)	0.001	0.07	.0003		0.04	0.07	.02	
SES	0.02	0.03	.02		0.01	0.03	.01	
Step 4				.03***				.03***
Prior ability	0.001	0.003	.01		0.01	0.002	.24***	
Peer competence	-0.05	0.02	-.27**		-0.001	0.02	-.007	
Social skills	0.04	0.01	.55***		0.01	0.01	.15	
Birth order	-0.03	0.03	-.03		0.001	0.03	.001	
Gender (female)	-0.00001	0.05	-.00001		-0.0002	0.05	-.0001	
Child ethnicity (African-American)	-0.005	0.07	-.002		0.04	0.07	.02	
SES	-0.01	0.03	-.01		0.01	0.03	.01	
Teacher self-efficacy	0.01	0.001	.18***		0.01	0.001	.18***	
Years teacher taught	-0.002	0.002	-.03		-0.002	0.002	-.03	
Teacher's education	0.03	0.02	.05		0.04	0.02	.05	

[a] $F(10, 762) = 13.46$, $p < .001$. [b] $F(10, 758) = 11.11$, $p < .001$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Next I describe the results of the models predicting mother IPA scores, which can be seen in Table 3. Step 1 shows that mother IPA scores were high for children with high prior math abilities (β = .20, $p < .001$) and slightly lower prior reading abilities (β = -.07, $p < .05$). Controlling for prior abilities, social competencies were related to the reading IPA scores, but not the math scores when they were entered in Step 2. Mothers tended to overestimate children with high levels of social skills (β = .36, $p < .001$) and, holding social skills constant, underestimate children with high levels of peer competence (β = -.26, $p < .01$). Children's prior abilities and social competencies accounted for 4% of the total variance in mother IPA scores for reading and math.

Adding child and family characteristics in Step 3 accounted for 3% more of the variance in the mother IPA scores for reading and 2% for math ($p < .001$ for both). Within this block many of the child and family demographic characteristics predicted mother IPA scores after controlling for prior abilities and social competencies. For reading, mothers tended to overestimate the abilities of later born children (β = - .12, $p < .001$) and African-American children (β = .09, $p < .05$). Higher-SES mothers were more likely to underestimate children's reading ability (β = -.09, $p < .05$). Mothers tended to underestimate daughters' ability in math. (β = -.12, $p < .001$).

Table 3. *Regression models predicting mother IPA scores for reading and math.*

	Mother Reading IPA[a]				Mother Math IPA[b]			
Predictors	B	SE	β	ΔR^2	B	SE	β	ΔR^2
Step 1				.01*				0.04***
Prior ability	-0.01	0.003	-.07*		0.01	0.002	.20***	
Step 2				.03***				.002
Prior ability	-0.01	0.003	-.10**		0.01	0.002	.19***	
Peer competence	-0.05	0.02	-.26**		-0.01	0.02	-.07	
Social skills	0.03	0.01	.36***		0.01	0.01	.10	
Step 3				.03***				0.02**
Prior ability	-0.01	0.003	-.08*		0.01	0.002	.18***	
Peer competence	-0.05	0.02	-.25**		-0.02	0.02	-.12	
Social skills	0.03	0.01	.38***		0.01	0.01	.18*	
Birth order	-0.09	0.03	-.12***		0.03	0.03	.03	
Gender (female)	0.07	0.05	.05		-0.19	0.05	-.13***	
Child ethnicity (African-American)	0.18	0.08	.09*		-0.06	0.08	-.03	
SES	-0.08	0.03	-.09*		-0.04	0.03	-.05	

[a] $F(7, 807) = 7.32$, $p < .001$. [b] $F(7, 808) = 7.46$, $p < .001$.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Matching Misperceptions

I used chi-square analyses that examined the relation between the teacher and mother IPA scores to explore matches between the accuracy of teacher and mother perceptions of a child's abilities. To do this, I created categorical variables from each of the four continuous adult IPA scores used in the present study. I categorized IPA scores less than one standard deviation below the mean as a low IPA and reflected underestimation. IPA scores greater than one standard deviation above the mean were considered a high IPA, reflecting overestimation. Scores within one standard deviation from the mean were considered accurate.

A significant relation between the teacher IPA categories and mother IPA categories were found for reading, X^2 (4, N = 903) = 16.06, $p < 0.01$, and for math, X^2 (4, N = 897) = 13.22, $p = 0.01$ (see Table 4, the estimated expected frequencies for hypothesis of independence are presented in parentheses). The results show that teachers and mothers both had accurate perceptions of many students' abilities (49.2% for reading

and 49.8% for math). Furthermore, when one adult held an inaccurate perception of a child's abilities (i.e. the adult's IPA score was low or high), the other adult's perceptions still tended to be accurate. For example, when teachers underestimated a child's reading abilities (N = 142), 65.5% of mothers accurately estimated that child's reading abilities, 12.7% of mothers overestimated reading abilities, and 21.8% also underestimated abilities. But the results also showed that there was a tendency for adult IPA categories to match more often than was expected. Keeping with the example of when teachers underestimated a child's reading abilities, the observed frequency of the low mother IPA category was greater than expected (31 observed compared to 22.3 expected), while the observed frequency of the accurate and high categories were lower than expected.

Table 4. *Cross classification of frequencies of mother IPA categories by teacher IPA categories*

Reading	Mother IPA categories			
	Low	Accurate	High	Total
Teacher IPA categories				
Low	31 (22.3)	93 (99.7)	18 (20.0)	142
Accurate	100 (98.0)	444 (437.4)	79 (87.6)	623
High	11 (21.7)	97 (96.9)	30 (19.4)	138
Total	142	634	127	903
Math	Mother IPA categories			
	Low	Accurate	High	Total
Teacher IPA categories				
Low	36 (22.5)	98 (110.0)	18 (19.5)	152
Accurate	84 (90.1)	447 (439.9)	77 (77.9)	608
High	13 (20.3)	104 (99.1)	20 (17.6)	137
Total	133	649	115	897

Observed frequency (estimated expected frequency for the hypothesis of independer

The results of the chi-square found that teacher and mother IPA categories tended to match. Perhaps there is something about these children that led both adults to under- or overestimate their reading and math abilities. In order to further understand this possibility I used independent sample t-tests with Bonferroni correction to compare the socioemotional characteristics of the children whose abilities were underestimated by both adults (i.e. those in the low teacher IPA and low mother IPA cell) to the children whose abilities were overestimated by both adults (i.e. those in the high teacher IPA and high mother IPA cell). Second grade teachers' ratings of children's social competencies were used here. In addition, children's temperament was measured using the inhibitory control subscale of the Children's Behavior Questionnaire (CBQ) completed by mothers when study children were 4.5 years old.

For reading, the children who were overestimated by both adults tended to have higher peer competence ($t(50) = 3.32$, $p < .01$, $d = 0.93$) and social skills ($t(50) = 4.30$, $p < .001$, $d = 1.21$) than children who were underestimated. There was no differences in levels of inhibitory control between the under and overestimated children.

For math, differences between groups were only found for social skills. The children who were overestimated by both adults tended to have higher levels of social skills ($t(41.56) = 3.04$ $p < .01$, $d = 0.87$) compared to children who were underestimated. No differences were found for peer competence or inhibitory control.

CHAPTER 4

DISCUSSION

Social scientists, educators, and parents have long questioned the most effective ways of fostering cognitive development and achievement. The results of the present dissertation and Sorhagen (2014b) indicate that the accuracy of adults' misperceptions of children's abilities in third grade has a small but lasting effect on children's achievement through high school. Moreover, the direction of this influence is different depending on whether the adult is a teacher or a parent.

For teachers, in the realm of reading, misperceptions of reading ability led to self-fulfilling prophecies. High school students whose third grade teachers underestimated their abilities performed significantly worse on standardized tests of reading comprehension, vocabulary knowledge and verbal reasoning than would have been predicted on the basis of their early test scores, their mothers' inaccurate perceptions, teacher attention, maternal stimulation and support, and environmental control at school and home. In contrast, those children whose abilities were overestimated performed better than would have been expected. These findings replicate previous findings, within the same sample, which have shown that first-grade teachers' misperceptions of reading abilities affect achievement in fifth grade (Hinnant et al., 2009; Sorhagen, 2014b) and in high school (Sorhagen, 2013).

Teacher misperceptions of math abilities did not affect later math achievement. This finding was surprising because it contradicts the evidence of previous work. Within the same sample, small but lasting self-fulfilling effects of first grade teachers' inaccurate perceptions of math abilities have been found through fifth-grade (Hinnant et al., 2009)

and high school (Sorhagen, 2013). Within a different sample, self-fulfilling effects of math abilities have also been found over shorter periods of time in sixth through seventh grade (Jussim & Eccles, 1992; Madon et al., 1997). Differences could be due to the fact that prior studies did not control for mothers' inaccurate perceptions, differential treatment, and environmental control.

Moving to the influence of mothers' misperceptions, children whose mothers held inaccurate perceptions (underestimation or overestimation) of their reading and math abilities when they were in third grade performed significantly worse on standardized tests of math, reading comprehension, vocabulary knowledge and verbal reasoning than would have been predicted on the basis of their early test scores and the other covariates. Those children whose abilities were accurately estimated performed better than expected. This finding is consistent with research showing that parents' accurate estimations are more beneficial to children's conceptual development and achievement than inaccurate ones (Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Korat & Haglili, 2007; S. A. Miller, 1988; S. A. Miller et al., 1991; Sattler et al., 1985; Sorhagen, 2014a, 2014b) and contradicts those who reported self-fulfilling effects of parents' misperceptions (Pomerantz & Dong, 2006; Scherr et al., 2011). The present findings within the realm of reading have been presented before (Sorhagen, 2014a) and extend the work of others who have found benefits of parents' accurate perceptions of younger children's reading abilities over a shorter amount of time (Korat & Haglili, 2007; Sattler et al., 1985; Sorhagen, 2014b). To the best of my knowledge, the present dissertation is the first study to demonstrate that a mother's accurate perceptions of her child's math abilities are more beneficial for her child's later math achievement compared to under- and overestimation.

Mediation Through Differential Treatment

Although the primary goal of the present dissertation was to examine environmental control as a moderating condition of the effects of adult misperceptions of a child's reading and math abilities, the findings provide information about the mediating mechanisms underlying these phenomena. Within both the teacher and mother beliefs and expectation literature, researchers posit that adults' differential treatment of the children is one mechanism by which misperceptions translate into child outcomes (Brophy, 1983; Brophy & Good, 1974; Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Goodnow, 1988; Harris & Rosenthal, 1985; Korat & Haglili, 2007; S. A. Miller, 1988; S. A. Miller & Davis, 1992; S. A. Miller et al., 1991; Rosenthal, 1973a, 1973b; Sattler et al., 1985).

For teachers, I based the operationalization of differential treatment on Harris and Rosenthal's (1985) meta-analytic results, which found that teachers ignore low-expectancy students and interact more frequently with high-expectancy students. I used the *teacher attends to child* variable of the COS-3 as the measure of teachers' differential treatment towards the study children. To my surprise, the teachers in the present study who overestimated the study child's reading abilities tended to pay *less* attention to the child than did the teachers who underestimated reading abilities. Teacher attention, in turn, was negatively related to children's performance on standardized tests of reading achievement in high school. Test of mediation showed that this indirect path was small but significant. These results indicate that teachers do not ignore low-expectancy students. Rather, they give these students higher levels of attention than other students. Given that teacher attention was negatively related to children's performance on standardized tests of reading achievement in high school, it is possible that the attention

was mostly negative or perhaps remedial to keep the student from performing even worse.

The effect of teacher misperceptions on teacher attention was curvilinear for math. A child received more attention from their teacher if the teacher's perceptions of his or her abilities were inaccurate – regardless of the type of inaccuracy – than if the teacher's perceptions were accurate. That is, teachers paid more attention to children at the extremes (under- or overestimation) of inaccurate perceptions of math abilities than to children for whom they accurately assessed abilities. Curvilinear effects have also been found for the effect of teacher misperceptions of children's abilities on children's high school GPA (Alvidrez & Weinstein, 1999) and middle school achievement (Madon et al., 1997). Tests of mediation showed no evidence for indirect effects onto high school math achievement.

The evidence that teacher attention mediates the influence of teachers' misperceptions of reading abilities on child achievement should be interpreted with caution because of the ambiguous nature of the *teacher attends to child* variable. This variable merely captured the number of times the teachers paid attention to the study children during the COS-3 observational period (about four hours). More information about the nature of the teachers' behaviors is needed. Rosenthal and colleagues' four-factor theory of differential treatment classifies teachers' behaviors into four categories: *climate* (e.g. positive climate, negative climate, and eye contact), *input* (e.g. amount and difficulty of material), *output* (e.g. asking students questions and the frequency of teacher-student interactions), and *feedback* (i.e. teacher praise, criticism, acceptance of student ideas, and ignoring the student; Harris & Rosenthal, 1985). It could be that the

teacher attends to child variable is insufficient in capturing teachers' differential treatment. For example, we do not know the degree to which teachers were criticizing students, praising them, or the content of the material.

For mothers, measures of differential treatment came from observer ratings of cognitive stimulation and quality of assistance during a problem solving activity, as well as a measure of the home literacy environment for the reading models. When environmental control was taken out of the reading model, there was evidence for mediation through maternal support and stimulation. This suggests that while environmental control is an important predictor of maternal stimulation and support, it is not involved in the effects of a mother's misperception of her child's abilities. In the present study mothers with accurate estimations of their child's reading abilities tended to have higher levels of support during a problem-solving task and more support for literacy at home. Higher levels of maternal support, in turn, were related to higher child achievement in high school. In contrast, there was no evidence that the effects of misperceptions of math abilities were mediated by maternal support and stimulation. This may be because the latent variable of maternal support and stimulation did not include a specific measure of home support for math understanding. Home support for math understanding was not measured in the NICHD SECCYD.

Evidence for partial mediation by maternal stimulation and support in the reading model adds to the understanding of the mechanisms that underlies the influences of mothers' misperceptions. Despite many social scientists having proposed the idea that the learning environment is a mechanism of the effects of parents' misperceptions of academic abilities (Colter & Shoemaker, 1969; Delgado-Hachet, 1984; Goodnow, 1988;

Korat & Haglili, 2007; S. A. Miller, 1988; S. A. Miller & Davis, 1992; S. A. Miller et al., 1991; Sattler et al., 1985), there has been very little empirical evidence on the topic. To the best of my knowledge this is the first study to show evidence for this mediating mechanism within a diverse sample. Korat and Hagili (2007) documented this process within high SES families, but not low SES families.

Before moving on, I would like to remind the reader that my conceptual model suggests that the nature of the relation between misperceptions and differential treatment is best thought of as reciprocal over time. It is likely that levels of adult differential treatment can influence adult misperceptions, which, in turn, can alter differential treatment in some sort of feedback loop. For example, the results of the present study showed that teachers' overestimation of students' reading abilities led to low levels of teacher attention. It is likely that low levels of teacher attention, in turn, lead to inaccurate perceptions of reading abilities because teachers are less familiar with the child. Inaccurate perceptions, in turn, affect the degree of teacher attention, as well as the student's school performance. The direction of influence chosen in the present models was selected based on theoretical models and findings of previous research on teachers' and parents' beliefs and expectations. Future research that uses time-series methodology and non-stationary multivariate modeling of adult-child interactions during a learning task would be needed to further the understanding of such reciprocal effects between adults' inaccurate beliefs and their behaviors, as well as child capabilities. Such research would also further the understanding of the relation between adults' accurate perceptions and scaffolding within the zone of proximal development.

Moderation by Environmental Control

The main purpose of this dissertation was to investigate conditional direct and indirect effects of adult misperceptions on child achievement at different levels of environmental control in an attempt to reconcile the evidence of distinctive influences of misperceptions between teachers and parents. The environmental control of the adult-child relationship was hypothesized to moderate the effects of adult misperception because of the 1) decreased likelihood that the inaccurate beliefs of highly controlling low autonomy supportive adults would get corrected; 2) increased likelihood to treat children differently based on inaccurate beliefs, based on evidence for such in the realm of self-fulfilling prophecies in gym class (Babad et al., 1982); 3) increased likelihood children will develop an extrinsic motivation orientation within environments that lack support for autonomy and relatedness, which creates an increased sensitivity and dependence on external approval, rewards, and expectations (Deci & Ryan, 2012). I anticipated that adults' misperceptions of children's abilities would be self-fulfilling within high controlling and low autonomy supportive environments.

I found that the degree of environmental control in the classroom moderated the effect of teachers' misperceptions of children's reading and math abilities on teacher attention. Counter to the hypothesis, the effects of teacher misperceptions of reading and math abilities on teacher attention were more powerful in classrooms with low levels of control. Within highly controlling classrooms, there was no relation between misperceptions and achievement. Furthermore, I found evidence for a conditional indirect effect. The magnitude of the self-fulfilling effects of teacher misperceptions on children's high school reading achievement through its effect on teacher attention differed based on

levels of environmental control. Within the low controlling classrooms, students whose abilities were overestimated by their teachers tended to receive less teacher attention. Less teacher attention, in turn, was related to high levels of high school reading achievement. This sequence was not seen in the highly controlled classrooms. There was no evidence that environmental control moderated the direct effect of teacher misperceptions on achievement.

The finding of stronger self-fulfilling effects within low controlled classrooms seems to contradict the findings of previous researchers whose results suggested that low autonomy support and high control would increase the magnitude of and potential for self-fulfilling prophecies in the classroom (Babad et al., 1982; Trouilloud et al., 2006). The results of the present study, however, suggest that more control decreased self-fulfilling effects in part because it led to less variability in teacher behavior based on teacher misperceptions (i.e. teacher attention was low at all levels of teacher misperceptions). It may be that within highly controlled classrooms there is less opportunity for teachers to treat children differently based on their beliefs. Within low controlled context, on the other hand, individual differences in children's behaviors can be expressed. Indeed this finding might speak more about the negative consequences of highly controlling classrooms than the moderating conditions of self-fulfilling prophecies in the classroom.

For mothers, environmental control was measured by the degree to which mothers disrespected their child's autonomy during a problem-solving task. Disrespect for autonomy did not influence the magnitude of the effects of maternal misperceptions on child high school achievement or maternal stimulation and support. To date, this is the

first study that has considered the relation between a parent's misperceptions of her child's abilities and aspects of parenting style. It may be that a more comprehensive measure of parenting style that captures both control and warmth is needed, or perhaps the nature of the relation between these variables is different from the way it was conceptualized in the present study (i.e. that style moderates the effect of adult misperceptions on child achievement). The later seems likely because, using the categorical maternal IPA scores (used in the matching analyses of the present dissertation), mothers with accurate perceptions of abilities were more respectful of autonomy than mothers with inaccurate perceptions ($F(2, 914) = 6.95$, $p = .001$, $\omega^2 = .01$ for reading and $F(2, 915) = 4.21$, $p < .05$, $\omega^2 = .01$ for math).

It might be useful to consider parenting style as an antecedent of parents' inaccurate perceptions. Higher levels of parental responsiveness, or attunement (Baumrind, 1991), may help parents form more accurate perceptions of their children's abilities. Depending on the relation between misperceptions and other types of parental beliefs, such as goals and values, the reverse is also possible – misperceptions affect parenting style. Darling and Steinberg (1993) posit that parent goals and values affect parenting style, and parenting style, in turn, moderates the relation between parenting practices and adolescent outcome. Future longitudinal research is needed to illuminate the relations between misperceptions, other types of parental beliefs such as goals and values, and parenting style.

The main aim of the study, to identify a context in which the effects of teacher and mother misperceptions were similar, was not supported. Even when environmental

control was similar at home and at school, the effects of teacher and mother misperceptions were still different.

Before the results of the present dissertation are used to inform theory and policy, future research should consider alternative moderating conditions that could lead teacher and parent misperceptions to operate in the same direction. First, moderating conditions of adult misperceptions based on the adults' theories of intelligence should be considered. There is evidence for self-fulfilling effects between mothers' perceptions and children's academic functioning when mothers reported a strong or moderate endorsement of an entity theory of competencies, but not when mothers reported a low entity theory (Pomerantz & Dong, 2006). Within the teacher expectation literature, many researchers have discussed the possibility that teachers' theories of intelligence are involved in self-fulfilling prophecies in the classroom (Brophy, 1982; Dusek, 1985; Jussim, 1986). To the best of my knowledge, this has never been investigated empirically. Teachers' theories of intelligence may affect the rigidity of their beliefs; when teachers think ability is fixed and stable, they may be less likely to change an initially inaccurate belief despite contradictory evidence, instead continuing to treat children based on their false beliefs. However, when teachers believe intelligence is malleable the potential for self-fulfilling prophecies may be limited because of the anticipation to adjust perceptions as students' abilities change.

Another variable that could moderate the effects of adult misperceptions has to do with the fact that teachers and parents operate in very different teaching and learning environments. Since teachers have professional training on teaching methods, assessment, and content, teachers' assessment and interactions with their students and

curricular materials may be more structured and systematic than parents'; parents' interactions may be more idiosyncratic. Indeed, several researchers have compared teacher-child interactions to mother-child interactions during problem-solving activities and demonstrated that teachers are better at scaffolding than mothers (Hess, Dickson, Price, & Leong, 1979; Sun & Rao, 2012; Wertsch, Minick, & Arns, 1984). Overestimation could be more likely to lead to self-fulfilling prophecies within highly structured teaching and learning environments because the appropriate supports for learning are present. On the other hand, overestimation may not be self-fulfilling within low structured teaching and learning environments because it does not provide effective supports for advancing the child's conceptual development.

Finally, there may be differences in the consequences of teacher and parent inaccurate beliefs. At school, but not at home, teaching and assessment occurs in front of the child's peers. Teachers use social comparison increasingly with grades (Eccles & Midgley, 1989; Eccles, Midgley, & Adler, 1984). Children are aware of this increasing social comparison (Harter, 2012), and teachers' behaviors inform peers about how to treat a child (Harper & McCluskey, 2003). It may be that a teacher's inaccurate assessment is more likely to be self-fulfilling because of its effect on the child's peers' perceptions of the targeted child. This could lead to differences in the achievement orientation of the child's peer group, and ultimately, to differences in the child's own achievement – based on evidence that adolescent achievement is related to peer support for achievement (Ryan, 2001; Steinberg, Dornbusch, & Brown, 1992). Because parents have less contact with children's peers, and because there is no evidence that parental beliefs and behaviors

affect peer perceptions of a child, parental beliefs would not be expected to be related to peer group dynamics.

It is also possible that differences in the effects of misperceptions are due to inherent and fundamental factors that could never be consistent between teachers and mothers. One obvious difference between teacher-child and parent-child relationships is that parents usually share genes with their child but teachers do not share genes with their students. Another inherent difference between parents and teachers is that parents and children are in long-term relationships, while teacher-child relationships rarely last more than one school year. Similar genetic predispositions and a long relationship history could help parents anticipate the degree of difficulty a child may have with a particular task or subject, enabling them to provide more optimal learning environments and a better understanding about how to adjust their behaviors during interactions with their child, facilitating their child's development. Moreover, Harris (1993) who detailed a taxonomy of typical interpersonal expectation effects, posited that family members, compared to other interpersonal situations, are more likely to communicate expectations using affect due, in part, to the high levels of intimacy found within a family. While short relationship histories, typical of student-teacher relationships, could increase the likelihood of self-fulfilling prophecies because self-fulfilling prophecies are more likely to occur in new situations (Jussim et al., 1996; Raudenbush, 1984).

Somewhat related to Harris' (1993) hypothesis that interpersonal expectations within the family are communicated with more affect than in other situations is the possibility that differences in the effects of teacher and mother inaccurate beliefs are child-driven. For example, Alexander and colleagues (1988) found that parents' math

ability estimates (without accounting for the children's actual abilities) negatively predicted children's expectations of their own academic performance. The authors posited that child affect might be responsible for this negative relationship; children whose parents have high perceptions of abilities may become pessimistic or guarded with their own educational expectations or they may become disappointed because they have realized their parents' ineptitude at assessing academic capabilities. Further support for a child-driven component of interpersonal expectations comes from Madon and colleagues (2004) who found evidence for child-based self-fulfilling prophecies of hostile behaviors, but no evidence for mother-driven ones. The adolescent's inaccurate perceptions of his or her mother's hostility predicted the adolescent's hostile behavior towards his or her mother, which, in turn, predicted the mother's hostile behavior towards the adolescent (Madon, Guyll, Spoth, & Willard, 2004). In regards to inaccurate perceptions of reading and math abilities, one could speculate that children might react to maternal overestimation with anxiety and guilt because they know their capabilities do not match their mothers' perceptions. Anxiety and guilt could limit cognitive development (Pekrun, Elliot, & Maier, 2009; Weiner, 2007), undermining the self-fulfilling prophecy.

Finally, experimental research that manipulates, in a sensitive and ethical way, of course, parents' expectations would be informative for understanding if self-fulfilling prophecies operate in a similar manner as teacher expectations.

Predictors of Adult Misperceptions

A secondary aim of the present dissertation was to explore whether child, mother, and teacher characteristics influenced adult misperceptions. Teacher and mother

misperceptions of both reading and math abilities were predicted by the children's performance on standardized tests in first grade. This replicates the finding that teachers' misperceptions are based on children's prior abilities (Dusek & Joseph, 1983; Hinnant et al., 2009; Madon et al., 1997; Sorhagen, 2013) and extends it to mothers.

Controlling for prior abilities, social competencies were related to the teacher and mother misperceptions in reading, but not math. This suggests that adults view reading ability as a domain that is influenced by factors related to social competencies. Teachers and mothers tended to overestimate reading achievement among children with high levels of social skills. Other researchers have also found evidence that teachers' misperceptions are based on children's social skills (Hinnant et al., 2009). For mothers, this is a novel finding. The tendency of adults to overestimate the ability of children with high levels of social skills could be one way that social competencies lead to high achievement, above and beyond intelligence (Wentzel, 1991, 1993). One might speculate that socially competent children are likeable and easy to manage and adults mistakenly interpret this for academic competence, or that socially competent children are able to persuade adults to believe they are more academically competent than their actual skills.

Adults tended to underestimate the reading abilities of children who were more capable at factors related to peer competence, such as making friends easily and joining an ongoing activity without being told, when social skills are held constant. Perhaps adults mistakenly think that children who are highly engaged in peer relationships are aloof or disengaged academically. It is also possible that teachers and parents view some of the behaviors children use to pursue peer relationships (i.e. talking in class, messaging friends at home) as disruptive to academic function and adult-child relationships.

Beyond prior abilities and social competencies, the present study considered child and family characteristics that might influence adult misperceptions. This is important given the potential for inaccurate beliefs and self-fulfilling prophecies to contribute to societal inequalities (Gregory & Weinstein, 2004; Weinstein, 2002). The results revealed that the accuracy of teachers' estimations were not related to child and family demographic characteristics (i.e. birth order, child gender, child ethnicity, and family SES) after controlling for children's prior abilities and social competencies. While this is consistent with other research that has found that teachers' expectations are generally unrelated to students' demographic characteristics (Dusek & Joseph, 1983; Jussim et al., 1996; Madon et al., 1998), it is inconsistent with researchers who have found evidence that teacher expectations can be biased by gender-stereotyped beliefs (Alvidrez & Weinstein, 1999; Eccles et al., 1991; Gill & Reynolds, 2000; Jussim et al., 1996; Madon et al., 1998; Sorhagen, 2013).

In contrast, mothers' inaccurate perceptions of reading abilities were influenced by birth order, family SES, and child ethnicity. Mothers underestimated the reading abilities of later born children, confirming and extending previous research showing that, without considering children's actual skills, parents tend to rate first-born children's academic abilities as higher than later-born children (Baskett, 1985; Rothbart, 1971). Low SES mothers tended to slightly overestimate their children's reading ability compared to higher SES mothers. This is consistent with evidence that higher SES parents hold more accurate perceptions than lower SES parents (Alexander et al., 1994).

Finally, mothers of African-American children tended to slightly overestimate reading abilities. This last finding should be interpreted with special caution due to the

conflation of ethnicity and family economic characteristics in the sample. The average SES composite score of the African-American children's families (M = 1.99, SD = 1.65) was much lower than the white children's families (M = 4.73, SD = 3.76) in the present sample ($t(239.61) = 13.79$, $p < .001$, $d = 0.94$). It may be that the differences between ethnic groups are really a result of the SES influence on mothers' misperceptions. To address this issue I reran the regression model predicting mothers' under- and overestimation with a restricted sample of families with an income-to-needs ratio of 2.25 or below, following Burchinal and colleagues (2011) who used the NICHD SECCYD sample to explore the black-white achievement gap in America and restricted their sample to the children with family income-to-need ratios under 225% of the poverty threshold. In these models ethnicity was no longer a significant predictor of mothers' under- and overestimation (for reading $F(7, 530) = 5.118$, $\beta = .03$, $p = .45$; for math $F(7, 530) = 8.26$, $\beta = .01$, $p = .89$).

The mothers in the present study underestimated daughter's math abilities. This finding extends the work from Eccles' lab on parents' inaccurate perceptions of effort and task difficulty (Eccles & Jacobs, 1986; Eccles-Parsons et al., 1982) and their work on parents' gender stereotyped beliefs. Parents who ascribe to gender stereotypes tend to rate their child's abilities according to the stereotype, even after statistically holding constant the child's grades and teacher rating of child abilities (Bleeker & Jacobs, 2004; Frome & Eccles, 1998; Jacobs, 1991; Jacobs & Eccles, 1992, 2000). Much of Eccles' and her colleagues' work used samples of middle school and high school aged-children. One exception is Eccles and colleagues (1990) who, without considering accuracy, found gender differences in parents' ratings of kindergarten to third-graders' reading

competence, but not in math competence. The results of the present study show gender differences in the accuracy of mothers' ratings of their children's math abilities as early as third grade.

Future research is needed to further understand how children's demographic characteristics are involved in the influence of adult misperceptions within a more nationally representative sample. A logical next step is to examine whether adult misperceptions are a mediating mechanism of established influences of certain child demographic characteristics on child achievement. It would also be interesting to consider whether the processes identified in the present dissertation operate in meaningfully different ways for youth of different demographic groups. Future research should consider whether the direct and indirect effects of adults' misperceptions on child achievement are moderated by children's demographic characteristics using multiple group analysis. Results of research considering both how (mediation) and when (moderation) questions would be relevant to the study of achievement gaps within America between children from lower and higher income families, between white and non-white students, and between males and females.

In the teacher models, I also considered the effects of teacher characteristics on teacher misperceptions. Controlling for children's prior abilities, demographic characteristics, and social competencies, the teachers with high levels of self-efficacy for teaching tended to overestimate their students' reading and math abilities. This suggests teachers with high confidence in their ability to teach believe their students can do everything they have taught them – more so then they actually can do. The teachers'

years of teaching experience and educational levels were not related to teacher misperceptions.

One counter to the interpretation of the present findings is the possibility that teachers and mothers are better at predicting children's later achievement than are standardized tests alone because they are sensitive to aspects of children's motivation or competence that predict later achievement but that are not captured by standardized tests. If this were the case, then the present findings simply demonstrate the natural unfolding of reading and math competencies over time, rather than the impact of inaccurate perceptions. This seems unlikely for several reasons. First, the WJ–R is reliable, valid, and nationally normed (McGrew et al., 1991; Woodcock, 1997; Woodcock & Jonhnson, 1989). Second, if there are non-cognitive factors that influence WJ–R scores, the influence of these variables would have been taken into account by the use of pre-elementary school WJ–R scores as covariates in the analyses. Although a possibility, it seems unlikely that adults are able to pick up on something that would influence later performance on the WJ–R that would not also have influenced the child's earlier performance on the same test.

Third, the influences of teachers' misperceptions on child achievement using a similar operationalization of inaccurate beliefs as the present study have been used in other studies within the NICHD SECCYD sample and with different samples, all with consistent self-fulfilling results (Hinnant et al., 2009; Jussim & Harber, 2005; Madon et al., 1997; Sorhagen, 2013). These studies reported evidence that teachers' expectations influence later achievement for certain groups of children (i.e. children from low SES families, low achieving children) more than others. Therefore any unidentified variable

that accurately influences adults' misperceptions would have to operate differentially within certain groups of children. A likely candidate is stereotype threat. Children of certain groups may under perform on the WJ-R because they are concerned about confirming a stereotype, which limits performance (Steele, 1997). It seems unlikely that stereotype threat would only affect third grade performance and not performance in pre-elementary school and high school.

Matching Misperceptions

The present findings shed light on the question of whether teachers and mothers differ in the accuracy of their perceptions of child abilities. Despite the fact that teachers and parents have different points of reference (teachers compare students to a large number of same-aged students in their current and previous classrooms; parents likely compare their child to siblings, cousins, and other children they know, few of whom might be of the same age as the target child), I found that both parents and teachers tended to accurately assess children's math and reading abilities (i.e. most were within one standard deviation from zero – with zero representing accuracy). Moreover, when one adult's perceptions were inaccurate, the other adult was more likely to hold the same inaccurate perception than was expected by chance. For example, if a child's mother overestimated his or her math ability, then the child's teacher also tended to overestimate his or her math ability. The overestimated children tended to be more socially competent than the underestimated ones. In line with previously discussed findings of the present dissertation, this finding serves as a reminder of the importance of studying a child-driven component of the effects of adult misperceptions and academic achievement.

Limitations

The present dissertation used remote measures of proximal processes. The processes underlying conceptual development, as well as those underlying self-fulfilling prophecies, unfold through everyday interactions between children and adults that are dynamic and reciprocal in nature. The measures I used in this study were distant snapshots of these processes. Remote measures have the potential to create issues related to validity. Several examples of this validity problem have already been discussed in the context of interpreting specific findings, including the ambiguous nature of the teacher attention variable, the lack of a measure of support for math at home, and the possibility that adults are better at assessing abilities than the WJ-R.

Another limitation of the present dissertation is that the measures of adult perceptions were slightly different for teachers and mothers. The teachers' perceptions of the child's reading and math ability were assessed with a multiple-item questionnaire, while the mothers' perceptions were assessed with one question. It is possible that this could influence the measures of inaccurate perceptions of ability. To explore this possibility, I standardized the teachers' and mothers' perceptions of abilities. Standardized scores (i.e. z-scores) allow us to compare across different measures. I created the IPA scores using the standardized measures of perceptions of abilities and then I reran all of the present analyses. The results were essentially the same as those presented in the results section of the present dissertation. Despite this, it is still possible that the teacher and mother measures of inaccurate beliefs were not comparable reflections of their perceptions of the study child's abilities.

The size of the effects found here, as measured by the standardized parameter estimates, standardized coefficient, the changes in R^2, and Cohen's *d* are small to moderate by traditional standards (Cohen, Cohen, West, & Aiken, 2013). Nevertheless, the results of this study should not be dismissed as practically unimportant on the basis of traditional measures of effect sizes, for several reasons. First, academic achievement is best thought of as a multiply-determined factor, making above-moderate effects for any one coefficient rare (Ahadi & Diener, 1989). Second, the size of effects of the present study are comparable to other studies on the effects of teachers' and parents' beliefs and expectations over 5 to 10 years (Alvidrez & Weinstein, 1999; Bleeker & Jacobs, 2004; McCartney & Rosenthal, 2000). Finally, readers should remember that effects that are dismissed as small in psychology are often larger than effects in the medical fields that are taken very seriously by both medical researchers and the general public (Rosenthal, 1990).

In light of these limitations, replication of the present findings using secondary data analysis of other large longitudinal datasets would greatly bolster the validity of the findings of the present dissertation and further the understanding of the effects of naturally occurring adult misperceptions. Furthermore, growth curve models would be useful to determine if misperceptions lead to an initial difference in achievement, if the growth of achievement is affected, or both. I also think it is important that future research use time-series methodology and non-stationary multivariate modeling to measure the effect of adults' misperceptions on child learning during a single adult-child interaction.

Implications

Despite these limitations, the present dissertation has many strengths. Although the sample is not nationally representative, it derives from one of the largest and richest longitudinal studies of American schoolchildren ever conducted. Children's abilities were measured with standardized achievement test scores at multiple points in time, allowing me to take children's prior abilities into consideration, in addition to a wide range of children's social and emotional abilities. Another strength is that adults' differential treatment and environmental control were measured using independent observer ratings. After the differences in the direct and indirect effects of teachers' and parents' beliefs and expectations have been replicated in different contexts, different samples and using different empirical techniques, the finding that the nature of the influence of teachers' and mothers' inaccurate perceptions of a child's abilities are different have important theoretical and practical implications.

In theoretical terms, the results add to the emerging body of work that points to the importance of considering the environment in theory and when constructing interventions (Bronfenbrenner & Morris, 2006). It is imperative that future models of achievement consider influences of multiple socializers. Social scientists must be careful not to assume that influences of socializing agents will be the same across different contexts.

The present findings also have practical implications. Teachers should be mindful about whether their beliefs about their students match the students' performance and should be encouraged to hold high beliefs about all students' abilities. Parents, on the other hand, should be encouraged to familiarize themselves with techniques of accurately

assessing their child's capabilities, as well as typical developmental milestones throughout childhood and adolescences, so that they can better support their child's future achievements.

Conclusion

This dissertation answered recent calls to integrate theories and findings in child development with theories and findings in educational psychology (Eccles, 2007; Hamre & Pianta, 2010) by considering the consequences of teachers' and mothers' inaccurate perceptions of children's reading and math abilities. Using a large diverse sample, prospective data, and controlling for prior abilities, I found small and enduring effects of both teachers' and mothers' misperceptions of a third-grade child's abilities onto children' achievement seven years later. For reading, children's high school achievement benefitted from teachers' overestimation and mothers' accurate estimation. For math, only mothers' misperceptions influenced children's high school performance, with mother's accurate perceptions predicting higher performance on standardized test of math achievement. Third-grade teachers' misperceptions of math abilities had no effect on math achievement in high school.

I found evidence that adults' differential treatment is one of the mechanisms through which misperceptions lead to differences in child achievement. The influence of teachers' inaccurate perceptions of reading abilities was, in part, due to its negative influence on levels of teacher attention. Teacher attention in turn, was negatively related to child achievement. In other words, when your third-grade teacher overestimates your reading abilities, you will likely receive less attention from him or her, and this low level

of attention is related to better performance on standardized tests of reading achievement in high school than would have been expected based on your prior abilities, the amount of control in your third grade classroom and factors related to your mother's misperceptions, control, and support related to reading. Evidence of the mediating mechanisms of mothers' inaccurate perceptions was only found when environmental control was excluded from the model. Then, the results showed that one of the processes through which mothers' misperceptions affected high school reading achievement was through its effect on maternal support and stimulation. For mothers, misperceptions of abilities were curvilinearly related to maternal support and stimulation, with accurate perceptions predicting higher levels of maternal stimulation and support. Higher levels of maternal stimulation and support, in turn, resulted in higher high school reading achievement, above and beyond prior abilities and factors related to teacher misperceptions and treatment.

I found evidence that the magnitude of the influence of teachers' inaccurate beliefs on children's high school achievement was contingent on the level of classroom control only indirectly through teacher attention and only for reading. At low levels of classroom control there was a self-fulfilling influence of teachers' misperceptions on achievement indirectly through teacher attention, but not in highly controlled classrooms. The fact that environmental control did not lead to similar effects of the accuracy of adult perceptions supports the idea that there truly are different consequences of teacher and mother misperceptions on child achievement.

Finally, results of additional analyses showed that the degree of accuracy of the adults' perceptions of children's reading and math abilities were influenced by child

characteristics (i.e. child birth order, gender, ethnicity, family SES, social competencies, and prior abilities), as well as teacher's self-efficacy. Teachers' and mothers' perceptions were often accurate, but when one adult was inaccurate, it was likely that the other adult's perceptions were similarly inaccurate.

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