LANGUAGE IMPAIRMENT AND CHILD ADJUSTMENT IN HIGH-RISK, LOW-INCOME TODDLERS: MODERATING INFLUENCES OF PARENTING AND EMOTION REGULATION

by

Emily Pierce Moye Skuban

B.A., Yale University, 1999

M.S., University of Pittsburgh, 2006

Submitted to the Graduate Faculty of

Arts and Science in partial fulfillment

of the requirements for the degree of

Doctor of Philosophy

University of Pittsburgh

2010

UNIVERSITY OF PITTSBURGH

ARTS AND SCIENCES

This dissertation was presented

by

Emily Moye Skuban

It was defended on

January 14, 2010

and approved by

Daniel S. Shaw, Professor, Department of Psychology

Susan B. Campbell, Professor, Department of Psychology

JeeWon Cheong, Assistant Professor, Department of Psychology

Jana Iverson, Associate Professor, Department of Psychology

Kay D. Jennings, Retired Associate Professor, Department of Psychiatry

Dissertation Advisor: Daniel S. Shaw, Professor, Department of Psychology

LANGUAGE IMPAIRMENT AND CHILD ADJUSTMENT IN HIGH-RISK, LOW-INCOME TODDLERS: MODERATING INFLUENCES OF PARENTING AND EMOTION REGULATION

Emily Moye Skuban, PhD

University of Pittsburgh, 2010

Research has consistently documented the association between language deficits in childhood and later social-emotional adjustment, particularly behaviors associated with ADHD and impaired social competencies (Gallagher, 1999; Hummel & Prizant, 1993; Toppelberg & Shapiro, 2000). Despite extensive body of research demonstrating the co-occurrence of these two phenomena, far less research has explored the factors contributing to their association. Furthermore, there have been few prospective investigations of the development of these problems in young children. Based on the potential salience and relative dearth of longitudinal research on the linkage between language deficits and child adjustment, three primary goals were proposed. First, this study examined the development and stability of early language impairments in children ranging in age from two to four years. Second, it examined the covariation between the development of language impairments and two domains of child adjustment: social withdrawal and attention problems from ages 2 to 5 years. Third, based on research indicating the association maternal nurturance and children's emotion regulation strategies with language deficits and behavioral outcomes, the potential moderating role of parenting and emotion regulation on their co-occurrence was examined. Participants included a randomly selected subsample of 150 children in the control group of a multi-site intervention study (*N* = 731) aimed at preventing early-starting conduct problems. Results were mixed. Semi-parametric trajectory analyses identified patterns of language development that were suggestive of children with transient language delays, lasting language deficits and typical language development that the literature has previously described. Follow-up analyses also identified that the trajectory group characterized by more persistent language difficulties had lower scores on academic measures at age 5 compared to children in the typical language group. While modest associations between language measures and child adjustment were found, autoregressive structural equation modeling indicated few bidirectional pathways between language and child outcome. Finally, the moderating variables of emotion regulation and maternal nurturance were found to have direct associations with language and child outcome; however, there was very little evidence of these variables as moderators in the association of language and child outcome. Implications for future lines of research and clinical relevance are discussed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

Spoken language is a fundamental skill acquired during the first three years of life. However, it has been estimated that somewhere between 5 and 10 percent of preschool-aged children will experience deficits in their receptive and expressive language capabilities (American Psychiatric Association, 2000; Law, Boyle, Harris, Harkness, & Nye, 2000b). Furthermore, research has consistently indicated that delays in language acquisition are associated with a number of social, behavioral and academic outcomes (Aram, Ekelman, & Nation, 1984; Baker & Cantwell, 1982b; Beitchman et al., 2001; Brownlie et al., 2004; Fujiki, Brinton, & Todd, 1996; Rescorla, 2002). For children with language difficulties, the co-occurrence of behavior problems such as behavioral withdrawal, inattention, and increased externalizing symptoms (Cohen, Davine, Horodezky, Lipsett, & Et Al., 1993; La Paro, Justice, Skibbe, & Pianta, 2004) has been estimated to be as high as 40 to 50 percent (Davis, Sanger, & Morris-Friehe, 1991; King et al., 2005; Sanger, Moore-Brown, Magnuson, & Svoboda, 2001; Stevenson & Richman, 1978). Thus a substantial percentage of children who have language impairments demonstrate comorbid psychopathology, particularly attentional, conduct, and social problems.

Despite the frequency with which language and emotional and behavioral problems occur and tend to co-occur, relatively little research has been focused on how these two areas of problem behavior influence and are influenced by each another. For example, it is possible that early language deficits contribute to the development of future behavioral and emotional difficulties, as limited language abilities may lead children to feel frustrated or emotionally overwhelmed, and thus to withdraw from others; or alternatively, language difficulties may increase a toddler's or preschooler's chances of expressing him/herself in a physically aggressive or oppositional manner such that the child may come to rely on such methods for resolving conflicts. Alternatively, early behavioral problems could contribute to the exacerbation of continued language difficulties. For example, behavioral characteristics such as heightened distractibility, inattention, and hyperactivity may restrict a child's ability to learn language by reducing opportunities to interact with adults and peers in social contexts (Hester & Kaiser, 1998; Prizant, Audet, Burke, Hummel, & et al., 1990). A third pathway of co-occurrence might be that a similar set of underlying risk factors lead to both language and behavioral difficulties. For example, common risk factors, including gender and low SES, are associated with increased risk for both language and behavior problems (Beitchman, Peterson, & Clegg, 1988; Costello, Mustillo, Erkanli, Keeler, & Angold, 2003; Dale, Price, Bishop, & Plomin, 2003; Keenan, Shaw, Walsh, Delliquadri, & Et Al., 1997; King et al., 2005).

1.1 LANGUAGE IMPAIRMENT IN TODDLERS

Early language difficulties are one of the most commonly reported concerns by parents of toddler-aged children (Glascoe, 1991). While language disorders are typically diagnosed in preschool- and school-aged children, language problems characterized by limited vocabulary and the inability to combine words begin to emerge during the second and third year of life. Language problems may be recognized in the toddler period; however, few language impairments are identified prior to a child's second birthday because of the relatively high percentage of children who demonstrate transient lags in language development during the toddler period (Rescorla, Hadicke-Wiley, & Escarce, 1993). In fact, studies of the development of toddler-aged children with language deficits (Dale et al., 1998; Paul, 1993; Paul, Looney, & Dahm, 1991; Rescorla, 1991; Rescorla, Roberts, & Dahlsgaard, 1997) suggest that such language deficits reflect delays that frequently remit during the preschool and early school-aged years (Paul, 1993). Nevertheless, for a portion (i.e., 25 percent) of these children, early language difficulties represent the onset of lasting language impairments and disorders (Paul, 1996; Rescorla, 2002; Whitehurst & Fischel, 1994). Thus, the current state of the literature appears to point to early language problems being indicative of severe language impairments in later childhood for a relatively small subgroup of children.

Paul and colleagues (Paul, 1993; Paul et al., 1991; Paul, Murray, Clancy, & Andrews, 1997) followed a group of 30 children, who at their second birthdays were characterized as "late talkers," based on their use of fewer than 50 spoken words and no two-word utterances but later compensatory development. At two years, the children had age-appropriate receptive language, no hearing problems, and a developmental quotient in the average range of functioning. The sample and a demographically-matched control group were followed into middle childhood. At one- and two-year follow-up assessments (i.e., ages three and four), the majority of children identified with the early expressive language delay continued to show some language lags compared to the control group. At the two-year follow-up (i.e., at age four), approximately one third of the children had language abilities in the average range (Paul, 1993). Additionally, although the majority of the late talkers were boys, the girls who had expressive language problems at age two were less likely to show improvement at age four compared to the late-talking boys, suggesting that expressive language deficits in toddler-aged girls may be more likely to indicate lasting language problems than the same deficits in toddler-aged boys (Paul, 1993).

Using another longitudinal sample of toddlers with expressive language problems, Rescorla and colleagues (Rescorla, 2000; Rescorla et al., 1997; Rescorla & Schwartz, 1990) followed a small group of middle-class toddlers initially ranging in age from 24 to 31 months who were identified at a speech and language clinic as having expressive language delays. At one- and two-year follow-ups these children had continued linguistic impairments compared to a sample of their demographically matched peers (Rescorla & Schwartz, 1990). When these children were observed between the ages of 6 and 9, the late talking toddlers were achieving scores on measures of language abilities that were, on average, in the normal range; however, as a group, they scored significantly lower on reading measures compared to the control group (Rescorla, 2002). The authors again found that the majority of these late talking children were in the average range of functioning at age 13, but, as a group, the late talkers continued to have significant deficits in reading and language skills compared to the demographically matched controls (Rescorla, 2005). The results suggest that for this sample, early language deficits are not necessarily predictive of severe language impairments, but, rather, indicate a higher likelihood of lower scores on language measures compared to their peers (Rescorla, 2005).

Other researchers have followed groups of late talking two-year-olds and found results similar to those of the previously discussed studies. For example, a group of nine one-year-olds with low expressive language was found to be relatively evenly split between those with continuing deficits and children described as “late-bloomers,” who caught up to typically developing peers by their third birthday (Thal & Bates, 1988; Thal, Tobias, & Morrison, 1991). Using the Twin Early Development Study (TEDS), which included nearly 3000 twin pairs in the

United Kingdom, Bishop and colleagues (Bishop, Price, Dale, & Plomin, 2003; Dale et al., 2003) reported that measures of expressive vocabulary delay at age 2 were not necessarily good predictors of language problems at age 4, as some children at age 4 with significant language problems did not display deficits at age 2, and poorer performance at age 2 did not necessarily predict a child's language ability in the preschool period. Girolametto and colleagues (2001) found that a group of Canadian toddlers continued to demonstrate some linguistic deficits at school entry. Although the majority of the children scored in the average range on language tasks (Girolametto, Wiigs, Smyth, Weitzman, & Pearce, 2001), a subgroup had continued language problems, and the group as a whole scored worse on language measures than did their demographically-matched control group. Based on their findings, these researchers contend that late-talking children are at heightened risk for subtle linguistic delays compared to their peers (Girolametto et al., 2001).

1.2 ASSOCIATIONS BETWEEN LATE TALKING TODDLERS AND CHILD ADJUSTMENT

Similarly, a relatively small body of research has indicated the presence of social, emotional, and/or behavioral problems in late-talking toddlers (Carson, Klee, Perry, Muskina, & Donaghy, 1998; Caulfield, Fischel, Debaryshe, & Whitehurst, 1989; Irwin, Carter, & Briggs-Gowan, 2002; Paul, 1991; Paul & James, 1990; Paul et al., 1991). For example, the late-talking children in Paul and colleagues' (1991) sample scored significantly lower on a measure of socialization and had reports of higher conduct problems compared to the control group (Paul, 1991; Paul & James, 1990; Paul et al., 1991). Similarly, caregivers of the 14 late talkers in the Irwin et al.

(2002) study reported lower levels of social competence, including lower rates of compliance, social engagement, and prosocial peer interaction, and higher rates of social withdrawal compared to demographically-matched controls. Another group of toddlers with expressive language problems was found to have more sleep difficulties and fearfulness and was rated as being more difficult by their mothers compared to age-matched controls (Caulfield et al., 1989). Higher rates of internalizing problems and more specifically, social withdrawal, were also reported to be associated with expressive language ability in a small sample of two-year-old boys (Carson et al., 1998). Rescorla did not examine the presence of behavioral difficulties in her sample of late talking toddlers, but she suggests that these children do not appear to be behaviorally different from typically developing controls (Rescorla, personal communication, 2006). However, the failure to find between-group differences may reflect the affluent nature of the Rescorla sample, as it was recruited from a suburban, upper-middle class population of predominantly European-American children.

In general, the association between late talking and child adjustment for younger children is somewhat more modest than is reported in samples of older children. Horwitz and colleagues (2003) reported that in a large, normative sample of one- to three-year-olds, children who were below the 20th percentile on the MacArthur Communicative Development Inventory (Fenson, Dale, Reznick, Bates, & Et Al., 1994) had poorer concurrent social functioning with peers, and children who were over 30 months of age had higher rates of parent-reported externalizing symptoms when compared to children who scored in the average or above average range on the MacArthur. None of the above mentioned studies examined the presence of clinical psychopathology in late talking children. In part, this may be due to the age restrictions of younger samples, making it difficult to determine whether differences in behavioral problems were clinically meaningful. Thus children with language deficits during the toddler period appear to demonstrate statistically higher rates of adjustment difficulties compared to children without language impairments, particularly in the domains of behavioral withdrawal, and fearfulness and social competence.

1.2.1 Limitations in Research on Late Talkers

Researchers who have studied the development of toddlers with expressive language deficits have typically used small samples of demographically matched, middle-SES children with narrowly defined language deficits who were carefully screened for the absence of other comorbid conditions (Ellis Weismer, Murray-Branch, & Miller, 1994; Irwin et al., 2002; Rescorla et al., 1997). Many of these studies with stringently controlled methods have reported that the majority of late talking toddlers have language problems that are likely to desist after toddlerhood (Paul, 1996; Whitehurst & Fischel, 1994). As previously discussed, both Rescorla and colleagues (Rescorla, 2002, 2005; Rescorla & Schwartz, 1990) and Paul and colleagues (Paul, 1993, 1996; Paul et al., 1997) found that while continuing deficits were present for some children, many children showed significant improvements as they entered school. These findings and similar results from other samples of late talking toddlers (Ellis Weismer et al., 1994; Thal et al., 1991) suggest that the majority of late talking toddlers show transient delays in language and appear to catch up to their typically developing peers by the end of the preschool-period, although this research has been conducted primarily with homogenous, middle-class samples. However, some research has suggested that linguistic difficulties may continue to be present, but are more subtle (Girolametto et al., 2001). The pattern of inconsistent findings suggests that children with language deficits observed prior to their third birthday represent a heterogeneous population. Unfortunately, little research has focused on differentiating late talkers who display persistent language problems from children who show dramatic improvement (Desmarais, Sylvestre, Meyer, Bairati, & Rouleau, 2008; Kelly, 1998). As resources for providing interventions for young children with language impairments are limited, it would be beneficial to identify factors that differentiate the course of toddler-age language impairments.

As noted above, most research on language impairments in toddler-aged children has been conducted on samples of predominantly middle- and upper-SES children. It is important to consider that toddlers with language problems in the context of few external risk factors (i.e., those toddlers living in relatively stable, middle-class homes) may be at significantly lower levels of risk for showing continuity in language problems compared to children living in environments with a host of risk factors. Rates of persistent language difficulties may be higher in low-income populations, as these children may be less likely to benefit from environmental support and resources that are present in middle-income homes. As low-income status increases a child's likelihood of being exposed to a number of additional risks (Evans & English, 2002) and has been linked to an increased vulnerability for early language problems (Arriaga, Fenson, Cronan, & Pethick, 1998; Hoff & Tian, 2005; King et al., 2005; Qi & Kaiser, 2004; Tomblin, Hardy, & Hein, 1991), it is important to determine whether early delays in language acquisition show a similar pattern of desistance for a similar percentage of children among low-income populations. Based on these limitations in our current understanding of early language delays in toddlers, research that follows low-income children's language development from the toddler period into the later preschool years and identifies different patterns of language acquisition during early childhood would be valuable for this field.

Research on late-talking toddlers has identified several common themes in regard to early language deficits. First, many of these studies have reported that the majority of late talking toddlers have language problems that are likely to desist after toddlerhood (Paul, 1996; Whitehurst & Fischel, 1994). The consensus appears to be that many late talking toddlers show only transient delays in language problems and appear to catch up to their typically developing peers. However, as a group, these children may have significantly poorer performance on language and reading tasks compared to their peers (Paul, 1993; Rescorla, 2002; Rescorla & Schwartz, 1990). Patterns of expressive language development may be viewed as delayed for the majority of late talkers and "deviant" for only a subgroup of these children. For a pictorial representation of these patterns of development, please see Figure 1. Thus one goal of this research is to identify groups of children who show persistent and remitting patterns of language deficits from the toddler period to kindergarten entry, expanding upon previous research by utilizing an ethnically-diverse sample of low-income children at risk for multiple types of school-age adjustment problems.

1.3 COMMON ADJUSTMENT DIFFICULTIES OBSERVED IN CHILDREN WITH LANGUAGE PROBLEMS

Previous research literature has firmly established the presence of an association between language impairments and child adjustment across childhood (Horwitz et al., 2003; Mccabe, 2005; Qi & Kaiser, 2004). Children who have language impairments during the school-age years are rated as having high rates of externalizing and internalizing symptoms by both parents and teachers (Botting & Conti-Ramsden, 2000; Fagan & Iglesias, 2000; Redmond & Rice, 1998).

Furthermore, children of all ages seen in speech-language pathology clinics have been found to demonstrate higher rates of psychological disorders than typically developing peers (Baker & Cantwell, 1982b; Beitchman, Hood, Rochon, & Peterson, 1989; Beitchman, Nair, Clegg, & Ferguson, 1986), and, conversely, children being treated for psychological disorders have higher rates of language problems than their peers (Kim & Kaiser, 2000; Love & Thompson, 1988; Mack & Warr-Leeper, 1992; Sanger et al., 2001).

A variety of specific behavioral and social problems has been associated with language impairments, including social withdrawal, attention problems, and impaired social skills (Baker & Cantwell, 1992; Brinton & Fujiki, 1993; Fujiki et al., 1996; Irwin et al., 2002; Rescorla, Ross, & Mcclure, 2007). Similarly, increased rates of externalizing problems, such as inattention, hyperactivity, and aggression have also been found in children with language problems (Benner, Nelson, & Epstein, 2002; Brownlie et al., 2004; Cohen et al., 1993).

Among samples of toddler-aged children, a number of studies have found that social withdrawal, increased shyness, and limited social skills have been associated with language ability (Caulfield et al., 1989; Irwin et al., 2002; Rescorla et al., 2007). It has been theorized that these associations are the result of language problems that interfere with a child’s ability to engage socially with other children (Brinton & Fujiki, 2003), increase a child’s likelihood of clinging to caregivers for emotional and social support (Caulfield et al., 1989), and/or experience emotional distress in social situations requiring communication, all of which contribute to children’s isolation and withdrawal (Carson et al., 1998). A theory proposed by Craig (1993) regarding social withdrawal in older children with language disorders purports that a negative social cycle develops in children with language deficits, as these problems contribute to communication challenges with caregivers and peers. In turn, peers may identify these children as being odd and socially reject them, which may lead to social withdrawal in language-disordered children (Craig, 1993). It is possible that similar patterns of impaired social interaction, leading to rejection and ultimately social withdrawal, are observed in younger children.

Symptoms associated with Attention Deficit Hyperactive Disorder, or ADHD (American Psychiatric Association, 2000), have frequently been linked to language and reading problems in school-aged children (Cohen et al., 1993; Kim & Kaiser, 2000), as it has been suggested that distractibility and inattention may interfere with a child's language acquisition (Kim & Kaiser, 2000). Thus the aspects of child adjustment that have been linked to language impairments in early childhood include a myriad of symptoms ranging from "acting out" and attention problems to internalizing symptoms and social withdrawal.

Furthermore, understanding the association between emotional and behavioral problems and language impairments is clinically useful, as emotional and behavioral symptoms in early childhood may lead to later psychopathology. For example, externalizing symptoms characterized by hyperactivity, impulsivity, and aggression in early childhood are often predictive of more serious forms of antisocial behavior during middle childhood and adolescence (Aguilar, Sroufe, Egeland, & Carlson, 2000; Barkley, 1998; Moffitt, Caspi, Harrington, & Milne, 2002). Additionally, while fewer longitudinal studies have been carried out on early-starting internalizing symptoms (Bosquet & Egeland, 2006; Feng, Shaw, & Silk, 2008), such disorders as childhood-onset depression have been associated with a more chronic course of psychopathology compared to later-onset depression (Kovacs & Devlin, 1998). Thus a more thorough understanding of the development of the association between language delays and emotional and behavioral problems in early childhood is particularly important, as children with these early difficulties may be at heightened risk for later psychopathology and poor social adjustment.

While the association between language problems and behavior problems has been well researched, there are a number of methodological limitations to the extant literature. Some studies have been cross-sectional (Baker & Cantwell, 1987; Cohen et al., 2000; Willinger et al., 2003a), identifying older school-aged children after language and behavior problems have manifested, which makes it challenging to establish the temporal relationship between these two phenomena. Furthermore, the longitudinal studies that have been conducted with samples of children selected based on the presence of either an identified language disorder or behavior problem (Beitchman, Nair, Clegg, & Patel, 1986; Cohen & Lipsett, 1991), rather than children who display early risk factors for both types of behavior. These selection biases have greatly limited our ability to understand how these problems initially emerge and affect each other's development. Additionally, the majority of these longitudinal studies have included children from a wide age range, which limits the developmental sensitivity of the samples (Cantwell, Baker, & Mattison, 1980; Cohen & Lipsett, 1991; Mack & Warr-Leeper, 1992). Thus the field is in need of prospective research that identifies groups of same-aged children at risk for both language and behavioral problems.

1.4 POSSIBLE PATHWAYS OF ASSOCIATION

Although methodological limitations in the current research have made it difficult to fully understand the relationship between emotional and behavioral problems and language impairments, there have emerged a number of theories to explain the mechanisms by which language difficulties and children's adjustment are associated with one another. First, initial language difficulties may increase risk for later emotional and/or behavioral problems because of the challenges language-delayed children have in communicating with others (Redmond & Rice, 1998). When such children are feeling frustrated or overwhelmed by their lack of verbal fluency, they may withdraw from social interactions around them and appear less engaged and more dejected than same-aged peers with more sophisticated language abilities. Previous samples have found that children with lower levels of expressive language have higher rates of social withdrawal than same-aged peers (Irwin et al., 2002). Additionally, language impaired children may also experience high levels of peer rejection, which may contribute to their high rates of social withdrawal (Baker & Cantwell, 1987; Craig, 1993; Mccabe & Meller, 2004).

While there is some evidence to support this mechanism of association from language impairments to later child adjustment, including associations between language abilities and aggression, impulsivity, negativity, social withdrawal, and inattention (Dionne, Tremblay, Boivin, Laplante, & Perusse, 2003; Qi & Kaiser, 2004), most of these studies are cross-sectional in design, limiting the inferences that can be drawn about their directionality. Furthermore, with few exceptions (Fujiki, Brinton, & Clarke, 2002; Paul & Kellogg, 1997; Stansbury & Zimmermann, 1999), there is little research linking language impairment to more proximal measures of negative emotionality, such as measures of temperament and emotion regulation strategies. Thus while some evidence exists to support this pathway of transmission, more longitudinal research is needed, particularly studies that use more direct measurements of frustration tolerance and negative emotionality during early childhood.

Another possible mechanism for the co-occurrence of language impairments and child adjustment is that early emotional and behavioral problems lead to later language impairments.

Children with emotional and behavioral problems may be more distractible, less attentive, less socially engaged, and more hyperactive. Children learn language in a social context and through exposure and interaction with adults and peers (Hester & Kaiser, 1998; Prizant et al., 1990). Thus children who have difficulties attending to or engaging with others may develop impaired language. Furthermore, the field has consistently illustrated a connection between behavioral adjustment and low academic achievement in the classroom (Hinshaw, 1992). One explanation for this association is that children who engage in these behaviors have a more challenging time actively engaging with their teachers and learning, which has been linked to subsequent academic problems (Benner et al., 2002; Hinshaw, 1992). However, this theory of association also has its limitations, most notably that the majority of children, regardless of the social context in which they learn language, will not develop language impairments. Given these limitations, it seems highly unlikely that emotional and behavioral problems could be the sole cause of later language difficulties, although it is possible that emotional and behavioral problems could be a contributing risk factor for language impairments. Nonetheless, to date, few longitudinal studies have examined this hypothesis, particularly with samples of children with high levels of early emotional and behavioral problems and/or language impairments.

A third possible mechanism for the high co-occurrence between language impairments and child adjustment is the possibility that both result from similar shared risks. In fact, several child, family, and socioeconomic risk factors are associated with the development of language impairment *and* child adjustment (Campbell, Shaw, & Gilliom, 2000; Hammer, Tomblin, Zhang, & Weiss, 2001; Horwitz et al., 2003; Mcleod & Shanahan, 1993). These risk factors include sociodemographic characteristics, such as gender, parental education, and family income (Beitchman et al., 1988; Brooks Gunn & Duncan, 1997), and child factors, such as indices of executive functioning and emotion regulation (Barkley, 1997; Moffitt et al., 2002; Montgomery, 2002; Pennington & Ozonoff, 1996; Stansbury & Zimmermann, 1999; Weismer, Evans, & Hesketh, 1999; Williams, Stott, Goodyer, & Sahakian, 2000); prenatal exposure to alcohol, tobacco and other drugs (Fried, O'connell, & Watkinson, 1992; Olson et al., 1997; Wakschlag et al., 1997); and other prenatal and birth insults (Adams, Hillman, & Gaydos, 1994; Beck & Shaw, 2005; Fox, Dodd, & Howard, 2002; Stanton-Chapman, Chapman, Bainbridge, & Scott, 2002). Furthermore, family level characteristics in the form of parental sensitivity (Baumwell, Tamis-Lemonda, & Bornstein, 1997; Campbell et al., 2000; La Paro et al., 2004; Shaw, Bell, & Gilliom, 2000), discipline strategies (Campbell, Pierce, Moore, & Marakovitz, 1996; Hammer et al., 2001), and the level of parental involvement and cognitive stimulation (F. Gardner, Ward, Burton, & Wilson, 2003; Pan, Rowe, Singer, & Snow, 2005; Smith, Landry, & Swank, 2000) have been linked to both language development and child adjustment. Thus another manner in which language impairments and emotional and behavioral problems may come to be associated is indirect, with shared biological and familial risks putting children at risk for *both* language delay and child adjustment.

Finally, explaining the nature of this relationship may be more complex than any of these three models have hypothesized (Prizant et al., 1990). Rather than the relationship between language delays and behavior problems being unidirectional, the relationship may be transactional. Toddler language development may contribute to preschool children’s behavioral adjustment by hindering or helping children’s social interactions, while toddlers’ behavioral adjustment, such as inattention and distractibility, may interfere with the preschooler’s acquisition of language. These transactional patterns may continue to interact across time, so that early language delays may lead to heightened risk for later emotional and behavioral disturbances, which then promotes the persistence of early language impairments into later childhood. A second primary aim of this research is to study the co-occurrence and reciprocal influence of language and emotional and behavioral problems among a sample of same-age children who have sociodemographic risk factors for both early language and behavioral difficulties.

1.5 POTENTIAL MODERATING FACTORS IN THE ASSOCIATION BETWEEN LANGUAGE PROBLEMS AND CHILD ADJUSTMENT

As previously discussed, the association between language impairments and emotional and behavioral problems has been well established in the literature for more than three decades; however, there has been a dearth of research that explores the contexts in which these associations may be strengthened or attenuated. Thus relatively little is known about the contributing factors that may lead to these associations. Reviews have posited a number of factors and mechanisms that may contribute to associations between language impairments and different domains of child adjustment (Baker & Cantwell, 1987; Benner et al., 2002; Stevenson, 1996) and have called for further research examining the nature of these relationships (see, for example, Benner and colleagues, 2002). Despite the acknowledgement of the need for research into moderating influences on the relationships between language impairments and child adjustment outcomes, there is no known research directly examining factors that may attenuate these relationships.

1.5.1 Parenting Contributions to the Association between Language Impairment and Emotional and Behavioral Problems

As previously mentioned, language impairments and emotional and behavioral problems appear to share parenting as a potential etiological risk factor (Baumwell et al., 1997; Shaw, Winslow, & Flanagan, 1999; Skuban, Shaw, Gardner, Supplee, & Nichols, 2006), and several authors have suggested that the familial environment is more important for the development of both early language disorders and emotional and behavioral problems than other physiological or prenatal factors (Aguilar et al., 2000; Bee et al., 1982). Research suggests that mothers who are sensitive and attuned to their children have children who develop language faster than mothers who are less sensitive and less involved (Bornstein, Vibbert, Tal, & O'donnell, 1992; Fish & Pinkerman, 2003; La Paro et al., 2004; Nicely, Tamis-Lemonda, & Bornstein, 1999; Tamis-Lemonda, Bornstein, & Baumwell, 2001). Similarly, studies of typical patterns of language acquisition indicate that mothers who engage in higher levels of joint attention (Baumwell et al., 1997; Landry, Smith, Miller-Loncar, & Swank, 1997) and are more verbally responsive (Luster & Vandenbelt, 1999; Murray & Yingling, 2000) have children who develop language more quickly. Based on these findings, it is possible that both responsive parenting and parental scaffolding may protect a child from developing language problems (Hammer et al., 2001; Hoff & Tian, 2005; Tomasello & Farrar, 1986).

A vast literature has documented the relationship between parenting and the development of early childhood emotional and behavioral outcomes. Children who are securely attached to their parents during infancy and toddlerhood have lower rates of behavioral problems during childhood (Aguilar et al., 2000; Erickson, Sroufe, & Egeland, 1985; Renken, Egeland, Marvinney, Mangelsdorf, & Et Al., 1989), and a secure mother-child attachment has been associated with higher levels of maternal responsiveness (Ainsworth, Blehar, Waters, & Wall, 1978). High levels of responsive parenting have been associated with the development of more competent children and low rates of emotional and behavioral problems (F. E. M. Gardner, Sonuga-Barke, & Sayal, 1999; Pettit, Bates, & Dodge, 1997).

A parallel line of research has also linked similar responsive parenting to improved language abilities and low rates of language impairment. Using the sample from the NICHD study of Early Child Care, La Paro and colleagues (2004) attempted to identify factors that discriminated toddlers with persistent language problems from those with transient language difficulties. The authors found that toddlers with language problems at the age of 24 months had lower levels of responsive parenting as measured by both observed sensitivity and rates of responsiveness on the HOME inventory compared to the rest of the children in the sample. Furthermore, children who had persistent language problems had significantly lower levels of parental responsiveness compared to children whose language problems were identified as being "resolved" (La Paro et al., 2004). In a sample of higher-risk children, who were recruited on the basis of the presence of maternal substance use, history of maltreatment, or teenage pregnancy, children who were securely attached to their mothers at one year had higher scores on language assessments at the age of three (Morisset, Barnard, Greenberg, Booth, & Et Al., 1990). Other research has reported similar findings of a positive association between responsive parenting and children's language abilities (Fish & Pinkerman, 2003; Murray & Yingling, 2000; Nicely et al., 1999; Skuban et al., 2006). Thus it appears that children who experience more responsive parenting during the toddler and preschool period are less likely to have language problems.

There is a substantial line of research that has established the relationship between less responsive parenting and the development of emotional and behavioral problems in young children. Again, under the premise that securely attached children receive higher levels of responsive caregiving, several studies have shown that securely attached infants and preschoolers are less likely to have emotional and behavioral problems (Greenberg, Speltz, Deklyen, & Endriga, 1991; Vondra, Shaw, Swearingen, Cohen, & Owens, 2001). Similarly, ratings of observed parental responsiveness have also been linked to decreased ratings of later child behavior problems (Shaw, Keenan, & Vondra, 1994; Steelman, Assel, Swank, Smith, & Landry, 2002). Thus responsiveness in parents is also associated with the presence of fewer behavior problems in young children.

Despite similar findings on the role of parenting in the development of both language and behavior problems, to date, little research has examined the magnitude of the association between language impairment and emotional and behavioral problems in the context of varying levels of responsive parenting. However, given the commonalities in the research, it seems plausible to hypothesize that high levels of responsive parenting may attenuate the relationship between language impairments and emotional and behavioral problems. While responsive parenting may function as a protective factor in the development of language problems in toddlers and preschoolers, it may also serve to attenuate the relationship between language impairments and emotional and behavioral difficulties. Parents who are responsive and attuned to their children’s needs may be better able to notice their children’s language difficulties and provide alternative means of communicating or negotiating situations such that their children may have few social consequences of their language problems. Thus children with language problems who have responsive parents may have improved social-emotional functioning, decreasing the likelihood of emotional and behavioral problems.

1.5.2 The Moderating Role of Emotion Regulation

Emotion regulation (ER) is a child's ability to devise behavioral strategies for emotionally challenging situations, which allows the down-regulation of anxiety and stress (Kopp, 1989). Emotion regulation and physiological regulation appear to be connected, and children who are better able to regulate their emotional experiences also show better physiological regulation (Calkins, 1994). As children become more emotionally and cognitively sophisticated, they develop increasingly better means of managing stressful situations and negative emotions (Calkins, 1994; Kopp, 1989). The literature has consistently shown that children who are better able to devise active strategies for managing stressful or difficult situations are less likely to have behavior problems and more likely to display prosocial behaviors than children who display high levels of distress and use passive coping strategies (Calkins & Dedmon, 2000; Cole, Zahn-Waxler, Fox, Usher, & Welsh, 1996; Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). Similarly, children who have been identified as having behavioral problems frequently show deficits in emotion regulatory abilities (Cole et al., 1996).

Language skills may help children manage their emotions. As children develop their language skills, and become more adept at using narrative skills and accurately labeling their emotions, they may show improvements in their ER strategies (Fujiki et al., 2002; Gallagher, 1999). Furthermore, it is possible that ER may moderate the development of the association between language impairments and later emotional and behavioral problems in young children. It has been theorized that not having age-appropriate language can be stressful and frustrating for children, leading to the development of behavioral problems (Benner et al., 2002; Brinton & Fujiki, 1993); however, the presence of improved ER strategies, such as active and planful coping and lower levels of emotional negativity, may attenuate the association between language and behavioral problems.

Unfortunately, while associations between language impairments, behavioral outcomes, and ER have been theorized, research on this topic has been scant. Furthermore, the research that is available is limited by methodological weaknesses, such as correlational, concurrent designs and small sample sizes. Stansbury and Zimmerman (1999) examined the relationship between language ability and children's ER strategies and reported that children with better language abilities used more adaptive strategies, such as distracting themselves and successfully coping with the distress. However, conclusions regarding the directionality of this relationship cannot be made as the study was cross-sectional in design. Fujiki and colleagues (Fujiki et al., 2002; Fujiki, Spackman, Brinton, & Hall, 2004) compared a sample of 41 school-aged children with language impairments to their peers. The language impaired children had higher rates of emotional lability and negativity compared to typically developing children (Fujiki et al., 2002). These authors also demonstrated that children's social withdrawal was associated with both language impairment and ER abilities (Fujiki et al., 2004); however, they did not examine any interactions between language impairment and ER abilities.

One study has examined the moderating influence of ER in the association between language development and child outcomes. In a sample of low-income, African-American children, ER functioning moderated the relationship between language and social competence. Children with more sophisticated ER skills, as characterized by greater flexibility and less emotional lability, were more socially competent with their peers (Mendez, Fantuzzo, & Cicchetti, 2002), suggesting that higher ER skills may help children with less-developed language abilities navigate social dynamics. These findings further support the theory that ER may moderate the association between language impairments and child outcomes.

Parental responsiveness and child emotion regulation appear to be potential moderating influences on the co-occurrence of language problems and child adjustment. However, the role of either of these factors has not yet been tested empirically. The third primary aim of the proposed research is to examine the moderating influence of responsive parenting and child emotion regulation in the association between language impairment and child outcomes.

1.6 USING LOW-INCOME SAMPLES

Much of the research on the co-occurrence of language problems and emotional and behavioral difficulties has studied children who are from either normative or middle-class populations. However, poverty and low-income status appear to be a common shared risk factor for both language problems and emotional and behavioral problems. As previously mentioned, children living in poverty are more likely to demonstrate higher rates of language problems. For example, in a sample of at-risk Hawaiian children, close to 50 percent of the preschool-aged children had some language problems, with 10 percent having severe language problems (King et al., 2005). Similarly, toddlers in a low-income rural Appalachian sample were also shown to have higher rates of language problems than is typically reported in lower-risk samples (Fish & Pinkerman, 2003).

Similarly, it is well established that poverty is a risk factor for the development of multiple forms of psychopathology in children (Evans & English, 2002; Owens & Shaw, 2003). Research examining the relationship between language and behavioral problems in low-income populations suggests higher prevalence rates, but similar rates of co-occurrence as compared to normative samples (Kaiser, Cai, Hancock, & Foster, 2002; Kaiser, Hancock, Cai, Foster, & Hester, 2000). Thus it seems likely that low-income status and the associated risks of poverty may provide an environment that strengthens the association between language problems and child adjustment. Using samples of low-income children may increase the likelihood of identifying children with both language and behavioral difficulties.

2.0 STATEMENT OF PURPOSE

Both the fields of psychology and speech-language pathology have found that there is a high level of co-occurrence between language impairments and emotional and behavioral problems in school-age children. While there is a sizable literature supporting this association, there has been little research on the course of development of the co-occurrence of language impairments and child adjustment. Language difficulties begin to emerge in the toddler period (Ellis Weismer et al., 1994; Paul, 1991; Rescorla, 1991), but relatively little research has focused on the co-occurrence of language problems and child outcomes in this period of development, a time when both language and behavioral problems begin to emerge in children. There is also evidence that young children with language problems may “grow out” of their language difficulties in late toddlerhood (Paul, 1993; Rescorla, 2000); however, this research has primarily utilized homogeneous, low-risk samples, so little is known of the early patterns of language delay in higher-risk populations. Finally, while parenting behaviors and child emotion regulation strategies have been linked to the presence of language problems and emotional and behavioral symptoms in children, there is no known research examining these factors as moderating forces in the association between language problems and child outcomes.

The primary goal of the proposed research is to explore the relationship between language delays and child adjustment in a sample of high-risk, low-income toddlers. The first goal is to follow the developmental course of early language in this sample, specifically examining patterns of persistent versus remittent language problems. Second, the association between language problems and emotional and behavioral outcomes will be explored in a number of ways to investigate the temporal relationship between language problems and behavioral outcomes. Finally, as there has been no work examining factors that might moderate pathways between language impairment and child adjustment, interactions between language impairment and both maternal nurturance and child emotion-regulation strategy-use will be tested as moderating factors in this co-occurrence.

3.0 HYPOTHESES

3.1 HYPOTHESIS 1: PATTERNS OF LANGUAGE IMPAIRMENT

3.1.1 Hypothesis 1a: Trajectories of Early Language Development

Based on previous research suggesting that toddler-aged language problems remit in the preschool period for many children but persist for a smaller subgroup of late talkers, it was expected that children's language development from the ages 2 to 4 would be characterized by an initially high-increasing language group (e.g., development seen in typically developing children), a persistent low language group (e.g., development seen in language impaired children), and a late-increasing language group (e.g., development seen in language delayed children). These hypothesized patterns of development are illustrated in Figure 1.

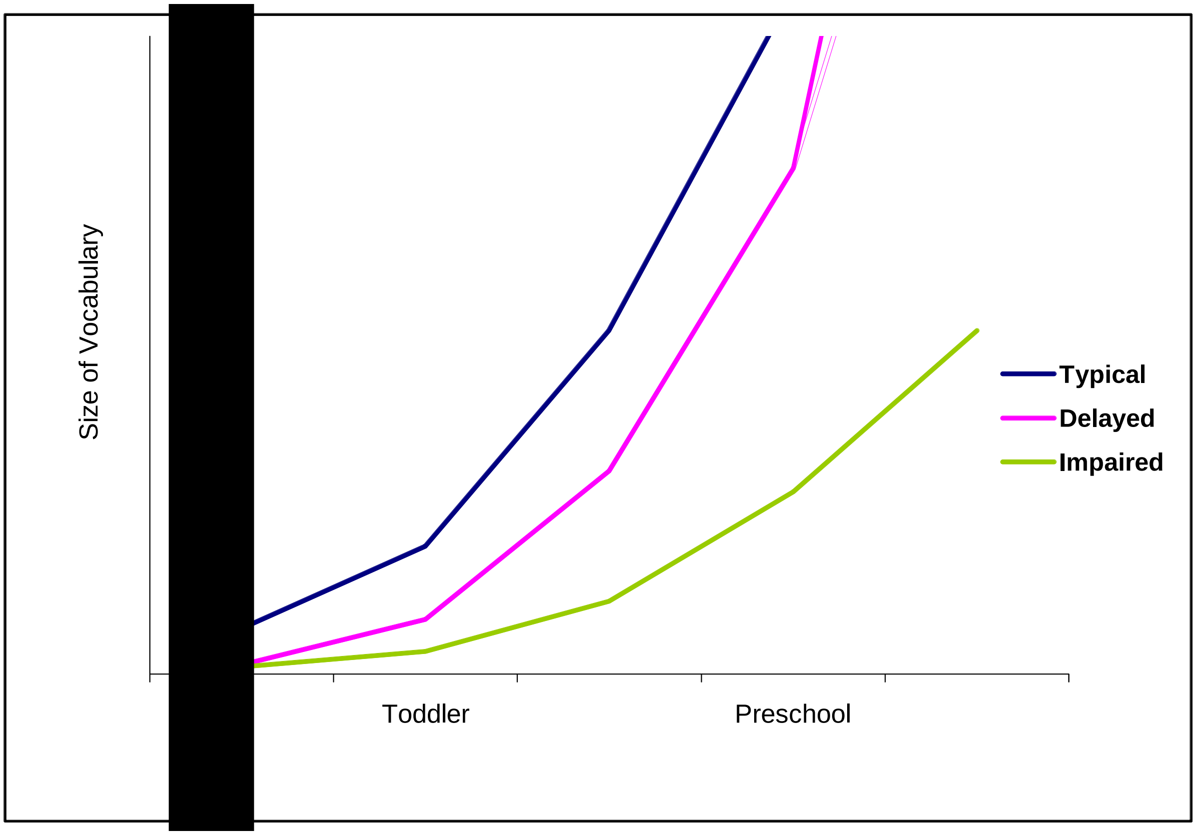


Figure 1. Hypothesized Patterns of Vocabulary Development for Typical, Delayed and Impaired Children

3.1.2 Hypothesis 1b: Continued Deficits in Verbal Abilities in Late Talkers by Age Five

Based on the existing literature suggesting that late talkers continue to show linguistic difficulties despite general improvement in language abilities (Paul, 1993; Rescorla, 2000), it was expected that both groups of late-talking toddlers would perform significantly lower on verbally-based school achievement at age 5 compared to children who were not identified as having language problems. Similarly, it was expected that children who have been identified as having patterns of persistent language difficulties would have lower continuous scores on verbally-based school achievement measures at age 5 compared to late-talking children who showed remittance in language problems. However, despite expected differences in continuous scores of verbal functioning on achievement measures at age 5 between normally-developing and late-talking children, based on previous research (Paul, 1993; Rescorla, 2002) it was hypothesized that the two theorized groups of children with language deficits would not differ from the typically developing group in the percentage of children who are at least in the average range of functioning (e.g., at or above a standard score of 90).

3.2 HYPOTHESIS 2: ASSOCIATION BETWEEN LANGUAGE IMPAIRMENT AND CHILD ADJUSTMENT

3.2.1 Hypothesis 2a: Direct Associations Between Language Problems and Childhood Adjustment

Based on the well-established association between language difficulties and later behavior and emotional problems (Baker & Cantwell, 1982a; Beitchman, Hood, & Inglis, 1990; Carson et al., 1998; Horwitz et al., 2003), it was hypothesized that children with lower observed verbal abilities at ages 2, 3, and 4 would have significantly higher rates of emotional and behavioral symptoms later at ages 3, 4, and 5.

Additionally, based on evidence from psychiatric and clinical settings indicating that school-aged children with emotional and behavioral problems have higher rates of language impairment than do typically developing populations (Kotsopoulos & Boodoosingh, 1987; Love

& Thompson, 1988), it was hypothesized that children with higher levels of symptomatology at ages 2 and 3 would have lower verbal abilities later at ages 3 and 4.

3.2.2 Hypothesis 2b: Reciprocal Relationship between Language Problems and Child Adjustment

Based on the literature that suggests bidirectionality in the relationship between language impairment and child adjustment (Baker & Cantwell, 1982b, 1987; Beitchman, Nair, Clegg, Ferguson, & Et Al., 1986; Cohen et al., 1993; Kotsopoulos & Boodoosingh, 1987), it was hypothesized that language impairments would be consistently associated with later child adjustment and that child adjustment would be consistently associated with later language impairments from ages 2 to 3, 3 to 4, and 4 to 5. Thus it was hypothesized that the relationship between language and child adjustment would be transactional in nature as is shown in Figure 2.

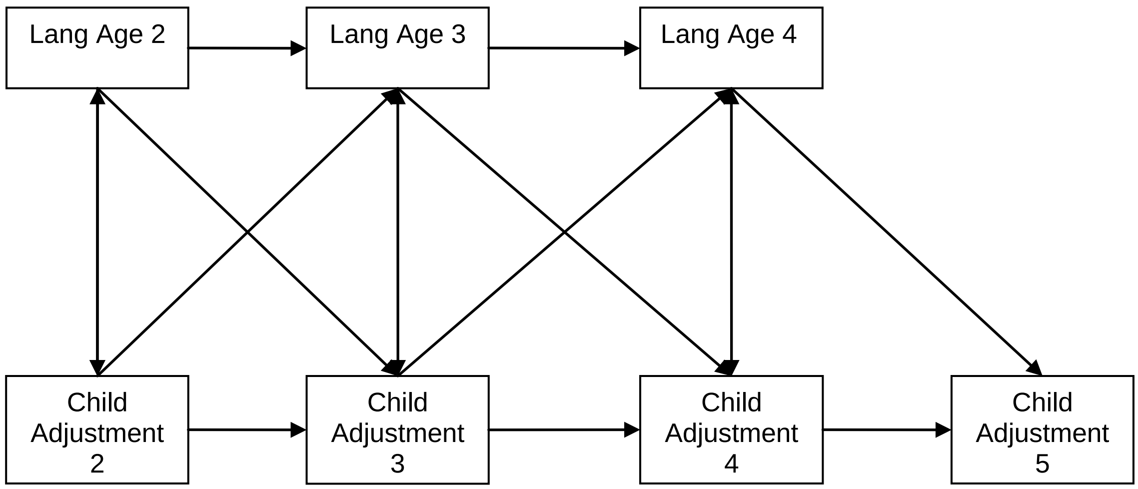


Figure 2. Hypothesized Transactional Relationship between Language Impairment and Behavioral Adjustment

3.3 HYPOTHESIS 3: MODERATING FACTORS ON THE ASSOCIATION BETWEEN LANGUAGE IMPAIRMENT AND CHILD ADJUSTMENT

3.3.1 Hypothesis 3a: Moderating Role of Maternal Nurturance

Based on existing research suggesting that mothers who have high levels of responsive and nurturing behavior are less likely to have children with either emotional and behavioral problems or language impairments (La Paro et al., 2004; Shaw et al., 1994; Skuban et al., 2006; Tamis-Lemonda et al., 2001) it was expected that higher levels of maternal nurturance would moderate longitudinal associations between language impairments and child adjustment between the ages 2 and 3, 3 and 4, and 4 and 5. Specifically, it was expected that high levels of nurturance would attenuate the strength of associations between language impairments and child adjustment between each adjacent assessment point (e.g., ages 2 to 3, 3 to 4, 4 to 5, as shown in Figure 3).

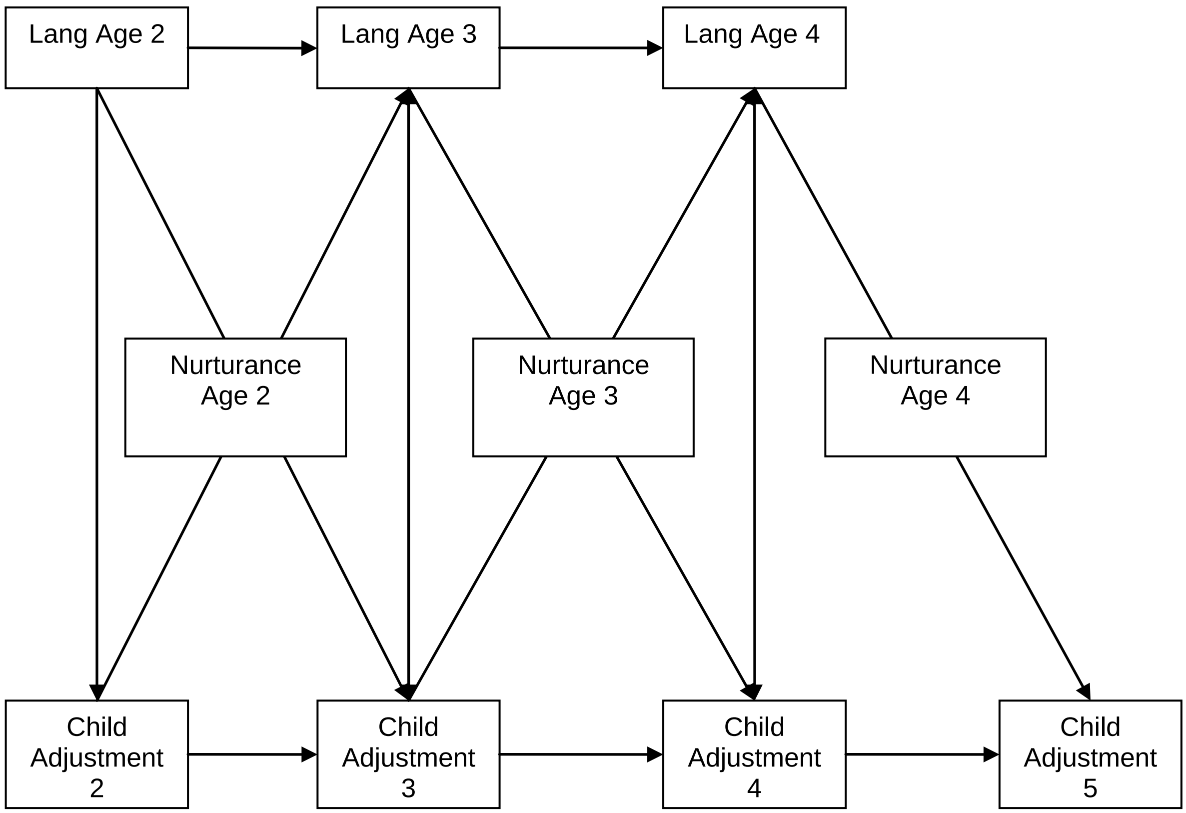


Figure 3. Hypothesized moderating role of maternal nurturance in the relationship between Language Impairments and Child Adjustment

3.3.2 Hypothesis 3b: Moderating Role of Emotion Regulation

Based on existing research that has established the role of adaptive emotion regulation strategies in the reduction of emotional and behavioral problems and language impairments, and conversely the role of negative emotionality in the increase of language problems and child adjustment (Gilliom & Shaw, 2004; Irwin et al., 2002; Stansbury & Zimmermann, 1999), it was expected that observed emotion regulation strategies would moderate the relationship between children's observed language abilities and behavioral adjustment. Specifically, it was hypothesized that planful strategy use (e.g., active distraction) would attenuate the associations between language problems and emotional and behavioral symptoms between the ages of 3 and 4, and the ages of 4 and 5. Conversely, it was hypothesized that less regulated strategy use (e.g., focus on delay) would strengthen the association between language impairments and child adjustment. This model is displayed in Figure 4.

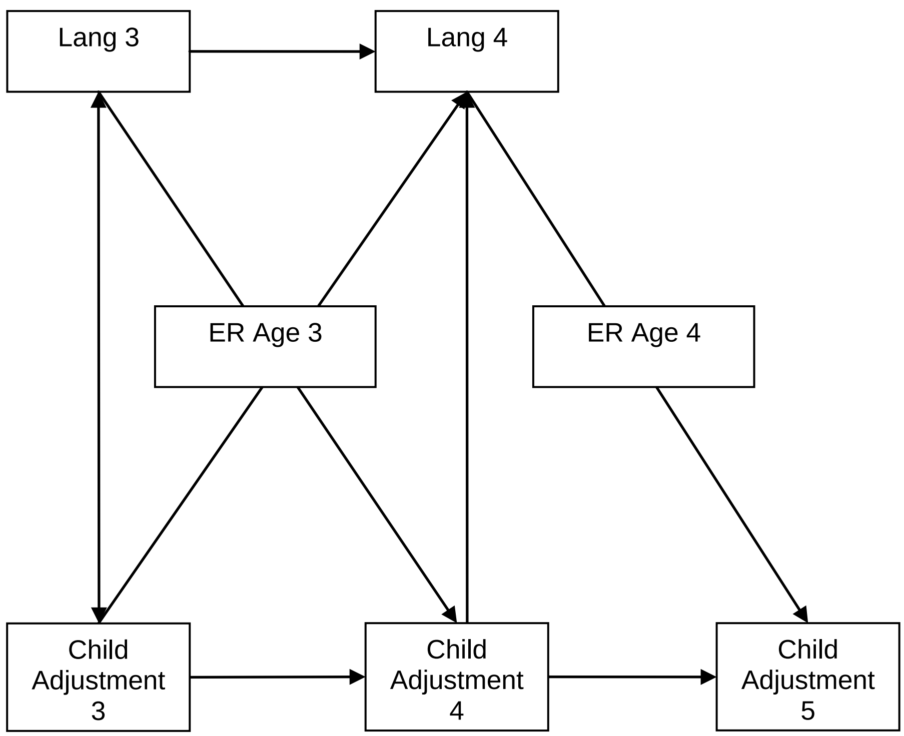


Figure 4. Hypothesized role of children's emotion regulation strategies as a moderator in the relationship between language impairment and child adjustment

4.0 METHODS

4.1 PARTICIPANTS

4.1.1 Recruitment

The proposed sample used data collected as a part of the larger Early Steps multi-site intervention study in three cities (Eugene, OR; Pittsburgh, PA; Charlottesville, VA). Families with a child between the ages of 24 and 35 months were recruited from WIC stations at each site on the basis of their ability to meet eligibility criteria for child, family, and sociodemographic risk. Risk criteria were defined at or above one standard deviation above normative averages on several screening measures within the following three domains: (a) child behavior (conduct problems, high conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status), and (c) sociodemographic risk (low education achievement and low family income using WIC criteria). To be eligible for participation, families needed to have at least one risk factor present in at least two of the three domains (e.g., maternal depression and child conduct problems). The entire study includes a sample of 731 families (49% female) 271 in Eugene, 272 in Pittsburgh, and 188 in Charlottesville. Across the three cities, the breakdown of children's reported ethnicity was as follows: 27.6% African American (AA), 46.6% European American, 13.3% Hispanic-American, 9.9% biracial, and 2.2% other ethnicities (e.g. American Indian, Native Hawaiian). At the time of screening, 70 percent of those families enrolled in the project had an income below $20,000 per year, and the average number of family members per household was 4.42 (*SD* = 1.61). Forty-two percent of the primary caregivers had a high school diploma or GED equivalency, and an additional 32% had 1 to 2 years of post-high-school training.

4.1.2 Retention

Of the 731 families who initially participated, 659 (90%) were available at the one-year follow-up, 619 (85%) participated at the two-year follow-up, and 615 (84%) completed assessment at age five years. Selective attrition analyses revealed no significant differences in project site, children's race, ethnicity, or gender, levels of maternal depression, or children's externalizing behaviors. Furthermore, no differences were found in the number of participants who were not retained in the control versus the intervention groups.

4.1.3 Inclusion Criteria for Subsample

As it was anticipated that data collection for language transcription would be a labor-intensive process, it was determined to use only a portion of the original sample of 731 families. Participants were randomly selected from families who met specific inclusion criteria. First, to eliminate the possible influence of treatment effects on children's outcomes and parenting behaviors, only families who were randomly assigned to the control group (i.e., 364 of the 731 families) were eligible for inclusion. Additionally, as the nature of the project was to examine the relationship between language development and child adjustment in English-speaking children, children who primarily spoke another language at home or who were bilingual were excluded from the subsample. This excluded 91 (12.4%) of the 731 families. To reduce the possible influence of gender and relationship on the association between parenting and other variables, primary caregivers who were not biological mothers at the initial assessment were also excluded. This excluded 31 families, or 4.2 percent of the original sample. Finally, as one of the primary goals was to examine longitudinal patterns of development, families who did not have data from at least two assessments were excluded from the subsample, which excluded another 58 families from the control group.

Therefore of the 731 families, 308 families met inclusion criteria (84.4% of the control group). The subsample was balanced across gender and site to potentially increase the generalizability of findings across site, such that 50 children (25 boys, 25 girls) were randomly selected from each of the three sites (total n = 150) for the subsample. Table 1 shows the socio-demographic data for both the subsample and the entire sample of families. As can be seen in Table 1, the only significant differences between the subsample and the rest of the multi-site sample is in child ethnicity, with the subsample having fewer Hispanic children than the rest of the sample. This difference was expected, as children in whose home Spanish was a primary language were excluded from the subsample.

Table 1. Demographic of subsample (n = 150) and comparison of differences from original sample (*n*= 731)

	Subsample (*n* = 150)	Non-Subsample Children (*n* =581)	Entire Sample (*n* =731)	Difference
Child Age at Time 1	30.4 months	29.9 months	30.0 months	F = 3.89
Child Gender				χ^2 = 0.01
Girls	50.0%	49.4%	49.5%	
Boys	50.0%	50.6%	50.5%	
Child Race				χ^2 = 1.27
European-American	50.7%	50.0%	50.1%	
African-American	29.3%	27.6%	27.9%	
Biracial	14.0%	12.8%	13.0%	
Other	6.0%	8.5%	8.0%	
Child Ethnicity				χ^2 = 6.15*
Non-Hispanic	92.7%	85.0%	86.6%	
Hispanic	7.3%	15.0%	13.4%	
Caregiver Education				χ^2 = 4.94
Less than High School	18.7%	24.7%	23.5%	
High School	38.7%	41.7%	41.0%	
Some College	42.7%	33.6%	35.4%	
Caregiver Marital Status				χ^2 = 0.26
Married/Living	56.7%	58.0%	57.8%	
Together	12.7%	11.2%	11.6%	
Separated/Divorced	30.7%	30.2%	30.3%	
Single, Never Married				
Caregiver Gender				χ^2 = 4.23
Female	100.0%	97.2%	97.8%	
Male	0.0%	2.8%	2.2%	

4.2 PROCEDURE

Families, including the primary caregiver, the target child, and, when available, an alternate caregiver (e.g., other parent or grandparent) were repeatedly assessed during two- to three-hour home assessments when the children were 2, 3, 4 and 5 years of age. Each assessment began by introducing children to an assortment of age-appropriate toys and having them play for 15 minutes while the primary caregiver completed questionnaires. After free play, which began with the child being approached by an adult stranger (i.e., undergraduate videographer), each primary caregiver and child participated in a cleanup task (5 minutes), followed by a delay-of-gratification task (5 minutes), four teaching tasks (3 minutes each, with the last completed by the alternate caregiver and child), a second free play (4 minutes), a second cleanup task (4 minutes), the presentation of two inhibition-inducing tasks (2 minutes each), and a meal preparation and lunch task (20 minutes). The same home visit and observation protocol were repeated at the age 3 and 4 visits for all children regardless of intervention group status. While the protocol was similar across assessment periods, the toys and games used at each age were modified based on the child's age and developmental appropriateness of toys. After the caregiver and child tasks were completed at the age three, four and five assessments, the lead examiner and child completed the Fluharty-2 (Fluharty, 2001), a language screening measure.

The age five assessment varied slightly from the previous protocols. This assessment was also completed in the family's home with the primary caregiver, the target child and when available, an alternate caregiver. The assessment began with the introduction of a selection of age-appropriate toys: the children were given the opportunity to play with them (10 minutes), followed by a toy separation task (6 minutes), a turn-taking task (5 minutes), delay-of-gratification task (3 minutes), six teaching tasks (19 minutes total; 4 with the primary caregiver and two with alternate caregiver), an inhibition-inducing task (2 minutes), and a meal preparation and lunch task (20 minutes). At the end of the assessment, the lead examiner and child completed the Letter-Word Identification, Calculation, and Spelling subtests of the Woodcock-

Johnson-III (McGrew & Woodcock, 2001) and the Fluharty-2 to assess the child's cognitive and language abilities.

Families received $100 for participating in the age 2 assessment, $120 at the age 3 assessment, $140 at the age 4 assessment, and $160 at the age 5 assessment.

4.3 MEASURES

4.3.1 Parent-Report Questionnaires

4.3.1.1 Child Behavior Checklist 1.5-5 (CBCL)

The CBCL is a well validated and widely used 100-item questionnaire that assesses behavioral problems in young children. The primary caregivers completed the CBCL during each assessment. This questionnaire has two broadband factors Internalizing and Externalizing and seven narrow band factors. Test-retest reliability for the CBCL is reported to be 0.90 and 0.87 for the Internalizing and Externalizing factors, respectively (Achenbach & Rescorla, 2000). As the goal of this study was to explore the development of emotional and behavioral problems that commonly occur in young children with language impairment, two narrow band factors, Withdrawn Behavior and Attention Problems, were used when children were ages 2, 3, 4, and 5. While language difficulties have been associated with many forms of behavioral challenges, the literature has shown a consistent pattern of association between social withdrawal and attentional difficulties and language problems (Carson et al., 1998; Cohen et al., 1993).

4.3.1.2 MacArthur Communicative Development Inventory-Short Form (MCDI)

The MCDI Short Form (Fenson et al., 2000) is a widely used parent-report checklist of children's vocabulary. In the current study, parents completed this measure about their children at the age two assessment, using the version of the MCDI designed for children between the ages of 24 and 29 months. Slightly more than half of the children in the sample were older than 30 months (*n* = 84) at the time the MCDI was completed. The younger version was used for the entire sample because we expected a significant portion of the children to show below-average performance. The author contacted Phillip Dale, one of the creators of this measure for confirmation that this version of the MCDI was appropriate for use with this sample, which Dr. Dale confirmed (Phillip Dale, April 2009, personal communication). The MCDI has demonstrated good validity and reliability and has been shown to be significantly correlated with other forms of language assessment (Fenson et al., 2000; Heilmann, Weismer, Evans, & Hollar, 2005). For purposes of the proposed study, maternal report of the raw score of the total words spoken by the target child was the primary variable used in analyses. In addition, standardized scores on the MCDI in the current sample were compared to same-aged and same-gendered peers for some analyses.

4.3.2 Behavioral Observations

4.3.2.1 Home Observation of the Environment (HOME)

The HOME, a measure that assesses the quality of the home environment, was administered at the age 2, 3 and 4 assessments (Caldwell & Bradley, 1984). This measure was selected because it provides an independent assessment of a mother's warmth and responsivity during the observed mother-child interactions. All items are rated as being present (i.e., score of '1') or absent (i.e., score of ‘0’). For purposes of the proposed study, only observationally-based items from the Maternal Responsivity (e.g., “Parent’s voice conveys positive feelings towards a child”) and Acceptance (e.g., “Parent does not shout at child”) scales were used. At the age 2 and 3 assessments, the Toddler-Version of the Home Inventory was completed by observation, and included the 11-item Responsivity scale and the 7-item Acceptance scale, which were summed into a single 18-item Maternal Nurturance scale (Skuban et al., 2006), At the age 4 visit, the Preschool-Version of the Home was completed, and the Responsivity and Acceptance Items from this version of the HOME that overlapped with the Toddler-Version of the HOME were included; however, the age 4 Nurturance Scale contained two fewer items as a result of the change in versions. Thus the scores were averaged, such that a mother with the higher nurturance would have a score closer to one and a mother with lower nurturance would have a score closer to zero.

4.3.2.2 Child Emotion Regulation Strategy Use

Children’s emotion regulation strategy use was coded based on their behavior during administration of the Marvin Cookie Task (1977), a procedure used to evaluate children’s delay-of-gratification skills. During this task, the examiner removed and stored the assessment toys in a large Tupperware container, and then gave the primary caregiver a clear baggie with a cookie inside to hold for three minutes. During this time, the primary caregiver was also given a series of logic puzzles to complete; these were designed to compete with the child for the caregiver’s attention. Caregivers were also instructed to respond to the child however they were most comfortable but to not allow the child to have the cookie until the time was up.

The current study adapted a coding system initially utilized by Grolnick and colleagues (1996) and was further modified by Gilliom and colleagues (2002) to be used in a sample of preschoolers. As these coding systems were initially designed to measure behaviors seen in the laboratory during delay-of-gratification tasks on slightly older children, some modifications were necessary (e.g., adding self-soothing behaviors, such as sucking the thumb or use of a security object; revising instructions to deal with the presence of additional family members or children leaving the room). For a detailed explanation of this coding system, please refer to Appendix A. Child behavioral strategy use was coded in 10-second intervals. At age 3, the task lasted three minutes (i.e., 18 intervals); at age 4, the Wait Task lasted five minutes (i.e., 30 intervals).

For purposes of this study, two behavioral strategies were identified as potential moderating variables. The first group of behaviors can be described as Active Distraction, which is one type of planful behavior that is generally more organized and goal-oriented. Active Distraction represents behaviors that a child uses to distract him/herself from waiting (e.g., dancing around the room, talking to caregivers, entertaining him/herself). Using Active Distraction may help the child manage the frustration of waiting for the cookie or gift. The second behavioral strategy of interest was referred to as Focus-on-Delay-Object. This code is used to describe behaviors that represent distress and frustration from the task, which include temper tantrums, oppositional behavior, noncompliance and whining. Behaviors that encompass Focus-on-Delay-Object were aggregated to generate a ratio of time a child used these strategies.

The author assisted in training six research assistants on use of the coding system. Coders were trained to become reliable with the lead coder over a period of several months. To assess reliability, 20 percent of the interactions (n = 24) was independently rated by all coders and an acceptable inter-rater reliability was reached (Cohen’s Kappa = .61 to .94). All coders were blind to the research hypotheses of this study.

To reduce the quantity of analyses and the likelihood of Type I error, attempts were made to create a single Emotion Regulation factor that composited both the strategies of Active Distraction and Focus-on-Delay-Object at ages three and four. These two strategies could be composited into a single Emotion Regulation factor at age three, but did not show a similar pattern of association at age four. Thus, for consistency across assessment points, the individual strategies of Active Distraction and Focus on Delay were used in analyses. A child's score on these two strategies was the percentage of time during which the child used these strategies over the entire 3-minute observation (e.g., 6 of 18 ten-second intervals) at age three. Thus the children's scores on these measures theoretically could range from 0 (i.e., never using a strategy during the Wait Task) to 18 (i.e., always using the strategy during the Wait Task) at age three or 30 at age four. In reality, Active Distraction scores ranged from 0 to 16 at age three, and from 0 to 26 at age four, while Focus on Delay scores ranged from 0 to 18 at age three and from 0 to 27 at age four.

4.3.3 Language and Cognitive Abilities

4.3.3.1 Language Transcription

From the age three and age four assessments, nine-minutes of parent-child interaction were transcribed for analysis using the Systematic Analysis of Language Transcripts Program (SALT; Miller & Igelsias, 2006). By transcribing the child's conversation, it was possible to calculate a number of measures of the child's language ability. For the purposes of this study, two measures of the child's language ability were used: Mean Length of Utterance (MLU) and Number of Root Words (NRW). These methods of measuring language ability have been proposed as having greater ecological validity and have been used by other researchers for identifying language problems in preschool-aged children (Hewitt, Hammer, Yont, & Tomblin, 2005). These measures of transcribed language have been shown to be significantly associated with standardized measures of language ability, such as the MCDI (Rescorla, 1991), and to differentiate typically developing children from children with language impairment (Rescorla et al., 1997).

Context Used for Transcription

During the age three and age four assessments, there were structured, nine-minute mother-child interactions in which the dyad engaged in three age-appropriate teaching tasks. At both time points, the mother was given three separate tasks and asked by the examiner to help her child complete each task by giving "as much help as she felt was appropriate." At both ages, the dyad was asked to work on each of the three tasks for three minutes and not to move on without instruction from the examiner.

At the age three assessment, the dyad was first asked to build a castle-shaped maze that, when completed correctly, would allow a ball to travel through it. Next, the dyad was presented with foam shapes of varying colors and told to place the shapes onto the appropriately colored peg. Finally, the pair worked on matching shape "cookies" that when put together correctly formed a sandwich cookie (i.e., an Oreo).

Different developmentally appropriate toys were selected for the three teaching tasks at age four. The first task involved the child and mother creating a staircase pattern using an Etch-A-Sketch. Following this task, the mother and child worked on putting together a mosaic puzzle using brightly colored wooden pieces. The last task involved building a train track using all the provided pieces, such that when it was completed, the train could travel continuously around an oval track.

These teaching tasks were selected for transcription because generally they provided the child the greatest opportunity for spontaneous speech. While it was likely that a sufficient corpus of language would not be collected for all children within this nine-minute interaction, it was believed that these tasks were the best situations for language transcription. Due to the nature of other tasks (e.g., wait task, mother preparing lunch while child alone) that parents and children engaged in during the assessment, it was determined that coding additional tasks would not likely produce sufficient language for transcription analysis.

Transcription Reliability

Four undergraduate coders were trained in the transcription of the parent-child dialogues. The author reviewed any tapes that coders reported as having unusual situations or sound issues. Furthermore, slightly more than 20 percent of the tapes were double-coded by at least two transcribers to insure consistency across coders. It was found that inter-rate reliability for MLU was adequate with the ICC = 0.974 ($p < 0.01$). Similarly, there was adequate interrater reliability for the number of utterances that transcribed (ICC = 0.988, $p < 0.01$), and NRW (ICC = 0.972, $p < 0.01$). Finally, all transcriptions were reviewed by the author prior to analysis to insure that coding conventions were consistent across tapes, and if the author noted any problems with the conversation or transcription the interaction was reviewed.

Missing Transcription Data

The study initially attempted to code parent-child dialogues from the age 2 assessments. As it was extremely difficult to understand the children's language at this age, it was not possible to obtain a sufficient number of utterances of intelligibility to allow for appropriate interpretation. Similarly, 10.9% of children spoke fewer than 25 utterances during the nine minute interaction at age three, and 21.8% spoke fewer than 25 utterances at age four. It was found that transcribers were unable to understand an average of 4.7% of the children's conversation during the age three assessment; this rate was identical to the rate of intelligibility during the age four visits. To insure that children who did not make a sufficient number of utterances or were too difficult to understand were not included in final analyses, samples of language in which more than 10 percent was unintelligible or had fewer than 25 utterances were excluded from analysis. Finally, three parent-child interactions could not be transcribed due to mechanical or recording problems (e.g., no sound, scrambled tape).

Mean Length of Utterance (MLU)

MLU measures the proficiency and syntactic complexity of a child's language ability through the coding of the child's speech (Brown, 1973) and is the average number of morphemes that a child produces in a given utterance. MLU can be obtained by transcribing recorded samples of a child's language. The SALT program (Miller & Iglesias, 2006) was used for transcription and analysis for the current study. MLU has been found to be a good measure of linguistic abilities in young children and toddlers (Brown, 1973) and can differentiate young children with language problems from typically developing children (Girolametto et al., 2001). Research has demonstrated that children who are identified as being late talkers on other measures of language ability (e.g., vocabulary checklists) show significant delays in the growth of MLU from the toddler to the preschool period (Rescorla, Dahlsgaard, & Roberts, 2000).

Number of Root Words Spoken (NRW)

NRW is a calculation of the number of unique words used by a child in a speech sample. Using transcription software such as the SALT program (Miller & Igelsias, 2006), the number of individual words that a child uses during a conversation is calculated. Words that are identical in meaning and differ only in bound morphemes are calculated as a single word (e.g., “helping,” “helped,” and “help” would be considered one word, “help”). NRW is a measure that has some similarity to the scores calculated by the MCDI, as it provides a summary of the vocabulary size and lexical understanding of the child during the transcribed conversation.

4.3.3.2 Fluharty-2 (FLU)

The FLU (Fluharty, 2001) is a screening tool that is designed to quickly identify children who may be in need of a thorough language evaluation. It is not a measurement tool that has been used to diagnose language disorders or language impairment. Furthermore, some research has suggested that while the Fluharty has relatively good specificity in correctly identifying children with language problems, it tends to be a measure that has poor sensitivity, and may fail to identify children with notable language deficits (Law, Boyle, Harris, Harkness, & Nye, 2000a; Sturner, Heller, Funk, & Layton, 1993).

The FLU consists of five subtests four of which were administered during the age three, four and five assessments, including: Repeating Sentences; Following Directions and Answering Questions; Describing Actions; and Sequencing Events. These four subscales were then divided into a Receptive Language Quotient, using scores from the Repeating Sentences and Following Direction and Answering Questions subscales, and the Expressive Language Quotient, with the Describing Actions and Sequencing Events. The Expressive and Receptive Language Quotients were then composited into a single General Language Quotient. The measure has been shown to have adequate reliability and validity. The FLU was administered to children by trained examiners during the age three, four and five assessments. For the purposes of this study, the General Language Quotient from the age 3 and age 4 assessments were used. The General

Language Quotient is a standardized score that composites a child's overall performance and includes the expressive and receptive language abilities that are measured individually on the Receptive Language and Expressive Language Quotients.

4.3.3.3 Woodcock Johnson-III (WJ)

The WJ (Mcgrew & Woodcock, 2001) is a compilation of cognitive and achievement batteries to assess the abilities of both children and adults. It has been shown to have adequate reliability and validity. Three of the achievement subtests were administered to children by trained examiners during the age five assessment, including Letter-Word Identification, Spelling, and Calculation. Of these, both Letter-Word Identification and Spelling are identified as measures of children's Reading-Writing abilities (Mcgrew & Woodcock, 2001) and have been shown in standardized samples to be moderately correlated (r = .49). These measures were both used to assess the verbal cognitive abilities. Additionally, children's overall academic performance on the WJ was also used, which is a standardized score that includes all three subscales to provide a measure of the children's general level of academic functioning at school entry.

5.0 RESULTS

5.1 DESCRIPTIVE STATISTICS OF SAMPLE

Descriptive statistics are shown in Table 2. As can be seen, the sample's mean performance on both standardized language assessments the MCDI Short Form and Fluharty-2 was lower than seen in normative samples, with the children scoring more than one standard deviation below the mean standardized score of 100 at age three, and scoring slightly less than one standard deviation below the mean at age four. Similarly, from the age two assessment, it was found that 32.7 percent (*n* = 49) of the sample scored at or below the tenth percentile on the MCDI-short form, suggesting that a higher proportion of children had some expressive language deficits than would be seen in a low-risk sample. The children's academic performance on the Woodcock-Johnson III at age 5 was squarely in the average range, with mean scores very close to the national mean of 100.

As would be expected given the children's inclusion criteria in this sample, the children showed elevated scores on the CBCL subscales of Social Withdrawal and Attention Problems, as the children's mean scores from ages 2 to 5 ranged from one half to three quarters of a standard deviation above the mean.

Table 2. Descriptive Statistics for Study Variables

	Entire Subsample	Boys in Subsample	Girls in Subsample	Gender Differences

	(*n* = 150) Mean (SD)	(*n* = 75) Mean (SD)	(*n* = 75) Mean (SD)	*T* - Scores
Measures of Language Ability				
MCDI Short Form				
Age 2 MCDI—Raw Score	62.76 (24.64)	59.27 (23.62)	66.25 (25.30)	1.75[#]
Age 2 MCDI—Standard Score	90.27 (14.28)	89.80 (13.00)	90.73 (15.52)	0.40
Fluharty-2				
Age 3 Raw Total FLU-2 Score	11.63 (7.80)	10.38 (8.44)	12.98 (7.68)	1.90[#]
Age 3Expressive Lang Quotient	88.26 (10.40)	86.81 (10.32)	89.57 (10.38)	1.54
Age 3 Receptive Lang Quotient	77.34 (10.97)	76.08 (78.61)	78.61 (11.03)	1.37
Age 3 General Lang Quotient	81.06 (10.79)	79.51 (10.60)	82.73 (10.82)	1.72
Age 4 Raw Total FLU-2 Scores	17.41 (8.37)	16.04 (8.44)	18.81 (8.12)	1.98*
Age 4 Expressive Lang Quotient	88.23 (13.00)	92.18 (12.04)	88.13 (10.89)	2.11*
Age 4 Receptive Lang Quotient	90.14 (11.61)	86.52 (13.93)	89.97 (11.84)	1.58
Age 4 General Lang Quotient	88.07 (12.12)	85.99 (12.24)	90.22 (11.71)	2.09*
Transcribed Language				
Age 3 Mean Length of Utterance— Child	2.41 (0.57)	2.42 (0.59)	2.40 (0.55)	-0.16
Age 3 Number of Root Words—Child	56.95 (19.20)	57.83 (21.11)	56.11 (17.32)	0.49
Age 4 Mean Length of Utterance— Child	2.77 (0.57)	2.78 (0.55)	2.75 (0.59)	-0.21
Age 4 Number of Root Words —Child	59.90 (18.39)	59.74 (18.15)	60.09 (18.89)	0.09
Child Academic Skills				
Age 5.5 WJ Letter-Word Recognition	102.10 (11.96)	101.16 (13.77)	102.97 (10.01)	0.86
Age 5.5 WJ Spelling	101.08 (15.37)	97.94 (16.52)	104.04 (13.66)	2.32*
Age 5.5 WJ Overall Academic Skills	99.94 (13.67)	97.89 (15.76)	101.88 (11.14)	1.69
Parent Report of Child Behavioral Symptoms				
Age 2 CBCL Attention Problems T-Score	58.21 (6.97)	58.40 (7.19)	58.03 (6.77)	-0.33
Age 2 CBCL Social Withdrawal T-Score	56.87 (6.15)	56.44 (5.40)	57.31 (6.83)	-0.86
Age 3 CBCL Attention Problems T-Score	57.27 (6.77)	57.65 (6.88)	56.89 (6.69)	-0.92
Age 3 CBCL Social Withdrawal T-Score	57.17 (7.20)	57.71 (7.55)	56.63 (6.83)	-0.69

Age 4 CBCL Attention Problems T-Score	56.03 (6.81)	56.77 (7.83)	55.29 (5.56)	-1.34
Age 4 CBCL Social Withdrawal T-Score	56.44 (7.29)	57.42 (8.01)	55.45 (6.39)	-1.67#
Age 5.5 CBCL Attention Problems T-Score	56.14 (6.30)	56.07 (6.75)	56.21 (5.88)	0.13
Age 5.5 CBCL Social Withdrawal T-Score	54.99 (6.14)	55.35 (6.68)	54.63 (5.59)	-0.69
Observer Ratings of Maternal Nurturance				
Age 2 Home—Maternal Nurturance	0.81 (0.15)	0.80 (0.16)	0.83 (0.14)	-1.34
Age 3 Home—Maternal Nurturance	0.83 (0.15)	0.83 (0.15)	0.83 (0.15)	-0.12
Age 4 Home—Maternal Nurturance	0.71 (0.14)	0.70 (0.14)	0.71 (0.14)	-0.59
Coded Emotion Regulation Strategies				
Age 3 Percentage of Intervals in Focus	0.07 (0.10)	0.09 (0.11)	0.06 (0.09)	1.74#
Age 3 Percentage of Intervals in Distraction	0.19 (0.13)	0.19 (0.13)	0.19 (0.12)	0.11
Age 4 Percentage of Intervals in Focus	0.11 (0.16)	0.12 (0.16)	0.10 (0.15)	1.06
Age 4 Percentage of Intervals in Distraction	0.32 (0.20)	0.32 (0.19)	0.32 (0.21)	0.01

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.2 GENDER AND SITE DIFFERENCES ACROSS MEASURES

While not the primary focus of this study, gender and site were examined to determine whether there were any significant differences in language and child behavior. There were no significant gender differences in children's language on the Age 2 MCDI or the Age 3 Fluharty-2. As seen in Table 2, at age four, girls had significantly higher Fluharty-2 raw scores and higher standard scores on the Expressive Language Quotient and the General Language Quotient compared to boys. It is important to note that these standard scores were derived from norms for same-age and same-gender peers, which also suggest that, within this sample, the boys showed greater language deficits compared to their peers than did the girls. There were no significant differences in the transcribed measures of the boys' and girls' language as measured by either MLU or NRW at ages 3 or 4.

Finally, differences in language ability and child adjustment across the three sites were examined. It was found that there were no significant differences across the three sites in regard to the measures of language ability (*F*-values ranged from 0.04 to 2.14, *ns*) or CBCL ratings of Withdrawn Behavior or Attention Problems (*F*-values ranged from 0.44 to 2.45, *ns*).

5.3 CHARACTERISTICS OF CHILDREN WITH MISSING LANGUAGE DATA

It was initially proposed to use the transcribed measures of language to model trajectories of language development; however, several complications with the data collection made it impossible to use language transcription variables. Age two parent-child transcripts were unable to be coded due to the high frequency of unintelligible statements and the number of children who spoke very little during these interactions. Transcription of age two data was piloted by the author, and it was decided that for many of the children in the subsample, the nine-minute parent-child interaction would not provide a corpus of language that could be analyzed.

At ages 3 and 4, there was a sizable portion of the sample (i.e., *n* ranged from 32 at age three to 50 at age four), whose transcription data could not be used due to the high percentage of unintelligible utterances or the low frequency of utterances. Specifically, at age 3, there were 13 children, and at age 4, there were 20 children whose language was unintelligible more than 10 percent of the time. While the majority of unintelligible utterances were due to the fact that the children's language was incoherent, some of data were unintelligible due to external factors (e.g., relatives talking, siblings crying, train whistles, music), which accounted for three of the interactions at age four and one of the interactions at age three.

As can be seen in Table 2, the children's MLU increased from ages three to four ($t = -5.55$, $p < 0.001$), but there was no difference in the NRW at ages three and four years ($t = -0.98$, *ns*). However, as reflected by the increased instances of missing data between ages three and four years, the number of utterances made by a child decreased between ages three and four years ($t = 6.02$, $p < .001$).

Scores on the MCDI and Fluharty for the children whose language transcription data was excluded from further analysis were compared with the scores for children who had usable transcription data. Of the 150 children, 12 children (8%) had fewer than 25 utterances and/or ≥10% unintelligibility at both the age three and four assessments. Additionally, 46 children (30.7%) were missing transcription data at either the age three or four assessments. There were no significant differences in scores on the Fluharty-2 at ages three and four and the MCDI between children who did and did not have missing transcription data at age three (t = 0.53 to1.01, *ns*). Furthermore, children whose language was missing at both time points had similar performance to the other children on the Fluharty-2 and MCDI (f = 0.01 to 1.22, *ns*). Significant differences were found between those children who did and did not have sufficient language transcription data at age four. Children who had missing transcription data at age four had mothers who reported that their children spoke more words on the MCDI ($M = 69.60$, $SD = 24.28$) than children who did not have missing data ($M = 59.44$, $SD = 24.60$; $t = -2.27$, $p < .05$). Finally, these children had age three Receptive Language Quotients on the FLU ($M = 80.58$, $SD = 12.55$) that were higher than children with age four transcription data ($M = 75.81$, $SD = 10.17$; $t = -2.13$, $p < .05$). A similar pattern of higher receptive language scores on the age four

Fluharty-2 was also observed (t = -2.16, $p < .05$). These findings suggest that missing transcription data was not necessarily an indicator of lower levels of language.

5.4 RESULTS FOR HYPOTHESIS 1

It was hypothesized that several distinct patterns of language development in children would emerge from the ages of 2 to 4 years, including 1) a group of children who show persistent patterns of language delay, 2) a group of children who shows persistent levels of typically developing language, and 3) a group of late talking children who show initial delays but increasing language abilities from ages three to four. Furthermore, it was also anticipated that while children showing these different patterns of language development would, on average, be in the average range of academic function by school entry (i.e., age five years), there would continue to be statistically significant differences in their performance on the Woodcock-Johnson.

This hypothesis was tested using semi-parametric modeling of children's language development from ages two to four (Nagin, 2005) using the Proc TRAJ procedure within the SAS statistical package (Jones, Nagin, & Roeder, 2001). Language development was coded using age two MCDI scores and FLU-2 scores at ages three and four. Although larger samples are typically used for TRAJ, samples of less than 100 have been used with success (Nagin, personal communication, August, 2007).

5.4.1 Results for Hypothesis 1a: Trajectories of Language Development

It was hypothesized that there would be at least three trajectories of language development. Specifically, it was expected that there would be a group of children with persistently low language, a group of children who displayed patterns of delayed language that improved from age two to age four years, and finally a group of children who showed average levels of language across all three ages. To examine these patterns of child language development from age two to four, semi-parametic modeling of children's language development was completed to identify trajectories of language development.

5.4.1.1 Associations between Measures of Language Development

As different measures and/or methods were used to assess language development at age two (i.e., maternal report from the MCDI) than at ages three and four (i.e., FLU-2 administered by an examiner to the child, MLU and NRW transcribed from mother-child interactions), a series of Pearson correlations was computed across scales to assess the magnitude of their associations and determine whether such relationships were comparable to those between the FLU-2 at ages three and four. These correlations are shown in Table 3.

Table 3. Bivariate Correlations between Language Variables from Ages 2 to 4 Years

	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Age 2 MCDI	0.48***	0.47***	0.54***	0.22*	0.10	0.37***	0.53***	0.51***	0.07	0.03
2. Age 3 FLU Exp Lang	---	0.65***	0.90***	0.27**	0.07	0.48***	0.53***	0.58***	0.08	0.20#
3. Age 3 FLU Rec Lang		---	0.91***	0.27**	0.16	0.60***	0.76***	0.77***	0.08	0.06
4. Age 3 FLU			---	0.28**	0.13	0.60***	0.74***	0.76***	0.12	0.19#
5. Age 3 MLU				---	0.53***	0.20*	0.26**	0.25**	0.35***	0.28**

6. Age 3 NRW	---	0.11	0.17#	0.16	0.25*	0.37***
7. Age 4 FLU Exp Lang		---	0.56***	0.87***	0.23*	0.14
8. Age 4 FLU Rec Lang			---	0.90***	0.01	0.03
9. Age 4 FLU				---	0.11	0.06
10. Age 4 MLU					---	0.59***
11. Age 4 NRW						---

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Transcribed measures of language (e.g., children's MLU and NRW) were moderately correlated with one another. Age two MCDI was moderately correlated with the age three and four General Language Quotient on the FLU-2 (*r's* = 0.52 and 0.51, $p < .001$ respectively), moreso than it was correlated with either age three or four MLU (*r's* = 0.22, $p < .05$ and 0.07, *p* = *ns*, at ages three and four years, respectively) or NRW (*r's* = 0.10, and 0.03, *p* = *ns*). The FLU General Language Quotient was obtained at ages 3 and 4, and the children's performance at the two ages was highly correlated ($r = 0.77$, $p < .0001$). While there was no single measure of language development assessed at all three time points, using multiple measures across time points has been done previously with semi-parametric modeling in situations where equivalent measures across time periods were used (see for instance, Feng, Shaw & Silk, 2008). Given the use of two different methods and informants to assess language development (i.e., maternal report versus examiner administration), it was determined that MCDI scores were sufficiently correlated with the General Language Quotient of the FLU to use the MCDI as the indicator of language development at age two with FLU scores at ages three and four in trajectory analyses.

Semi-parametric modeling (Nagin, 2005) was applied to identify distinct trajectories of child language development from ages two to four years. Since trajectory modeling can be influenced by variables being on different scales, MCDI raw scores were converted into standard scores. Raw scores were converted into standardized T-scores and percentile ranks using existing norms (Fenson et al., 2000). Norms for MCDI exist for children up to 30 months. However, as a portion (i.e., 36%) were older than 30 months, T-scores and percentile ranks for children aged 30 months were used for these children. This method of estimation was determined to be the most conservative, as it should over estimate the older children's language abilities. As the General Language Quotient of the FLU was measured using a standard score format rather than with T-Scores used by the MCDI (Fluharty, 2001), children's T-scores on the MCDI were transformed into Standard Scores, such that both measures had a mean of 100 and standard deviations of 15.

To identify the optimal model for language development, two, three, and four trajectories group models were tested. Since group-based trajectory modeling can accommodate for missing data (Nagin, 1995), it was planned to have only those participants with more than one missing data point excluded from analyses. However, since none of the 150 children had missing data at more than one time point, the final sample used to generate trajectories was 150. Given that the sample size of this study is relatively small for trajectory group modeling, models with more than four groups were not tested (Nagin, 2005). The model with four groups included one group with less than one percent of the sample (i.e., n = 1), and was determined to be unsuitable for between-group comparisons, data for this model is not presented.

Initial analyses of the two- and three-group models included quadratic trajectories for all groups. It was found that the two-group model with two quadratic trajectories had a lower Bayesian Information Criterion than the model with three quadratic trajectories. Thus the three-group model was determined to be a better fit of the data than the two-group model.

Further examination of the three-group model suggested that quadratic trajectories adequately described two of the three groups but did not fit the data for one group. The three-group model was then run with this group as intercept only and as a linear trend. The BIC score for the group was higher when this group was modeled with a linear trend, rather than as an intercept-only. In the end, the three-group model, consisting of two quadratic groups and one linear group, appeared to be the best fit of the data. Information on the fit criteria for these models of language development is displayed in Table 4.

Table 4. Information Criterion for Two and Three Group Trajectory Models

Model	BIC (N = 421)	BIC (N = 150)	AIC
2-Group: 2 2	-1637.56	-1633.43	-1621.39
3-Group: 2 2 2	-1632.48	-1626.29	-1608.22
3-Group: 2 1 2	-1629.48	-1623.81	-1607.25
3-Group: 2 0 2	-1636.13	-1630.97	-1615.92

A review of the posterior probabilities of the three-group model with the highest BIC scores indicated that all three groups had posterior probabilities at or exceeding 0.80, which is well above the recommended 0.70 minimum posterior probability (Nagin, 2005). These probabilities are shown in Table 5. It was found that the majority of the children (*n* = 88) were in the Stable Low group and had standard scores consistently one standard deviation below the nationally normed mean (*M* = 82.13 at age 2 to *M* = 81.14 age 4) on the Fluharty-2 and MCDI, which are approximately one to two standard deviations below the mean of same-age and same-gender, typically developing peers. The second group, whose trajectory of language could be described as a Low Increasing group, consisted of a smaller number of children (*n* = 16) whose language increased from ages two to four years, with the standard scores rising from *M* = 87 at age two to *M* = 104 at age four. The final group, termed High Decreasing, represented approximately one third of the entire sample (*n* = 46) and included children whose language was slightly above the nationally normed average at age two (*M* = 107.88), and then decreased at age three (*M* = 87.38), rising slightly at age four (*M* = 90.27). These trajectory patterns are shown in Figure 5.

Table 5. Posterior Probabilities for the Three Group Trajectory Model

Groups	N	Actual %	Predicted %	Probability
Group 1 Stable Low Lang	88	58.67	58.10	0.944
Group 2 Low Increasing Lang	16	10.67	12.70	0.836
Group 3 High Decreasing Lang	46	30.67	29.20	0.866

The observed pattern of trajectories are an approximate fit to the original hypothesis of three groups of language development, including a group of children with typical language development (i.e., High Decreasing group), a late talking group (i.e., Low Increasing group), and a language delayed group (i.e., Stable Low group). The Low Increasing group had initially low scores that increased over the pre-school period until they were in the average range of functioning (i.e., late talker group). Their scores on the MCDI at age two were similar to those children in the Stable Low group, but ultimately were higher than those of the High Decreasing group. The Stable Low group of children could be described as having a persistent pattern of language problems, as their performance on both the MCDI and Fluharty-2 remained more than one standard deviation below the mean of their typically developing peers at all three time points. The final group of children, described here as the High Decreasing group, had scores that remained in the average range of standard scores at all three time points, although their scores decreased somewhat from ages two to four years. Consistent with these findings, there were significant differences across the three groups in the proportion of children whose MCDI scores were below the tenth percentile at the age two assessment ($\chi^2 = 32.98$, $p < .001$). Nearly half of the children in the Stable Low group (48.9%, $n = 43$) and approximately one third of children in the Low Increasing group (37.5%, $n = 6$) scored below the tenth percentile on the MCDI; however, there were no children below the tenth percentile on the MCDI norms in the High Decreasing group.

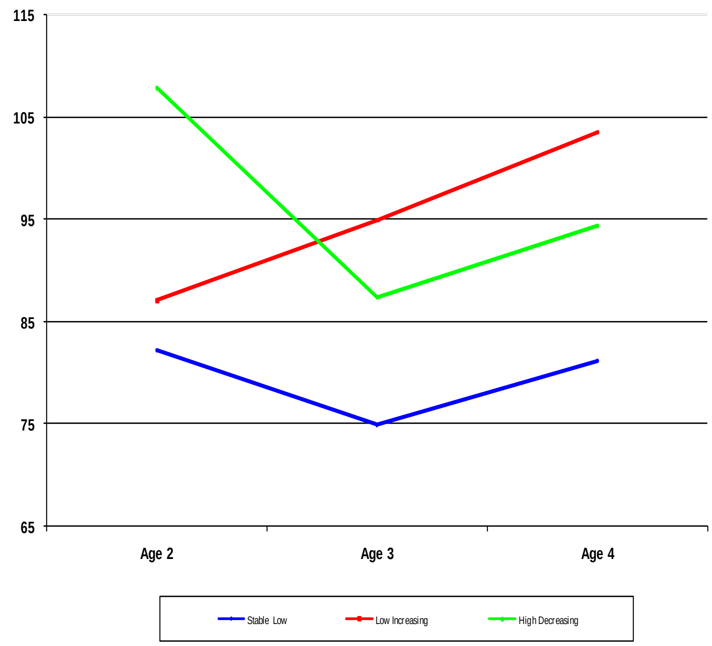


Figure 5. Patterns of Trajectories for Three Group Model

There were no statistically significant differences between the trajectory groups with regard to child gender ($\chi^2 = 1.50$, *ns*), with the Stable Low and High Decreasing groups being evenly divided by gender (46.6% and 52.2% boys, respectively) and the Low Increasing group having six (37.5%) boys. Similarly, no site differences were observed across the three trajectory groups ($\chi^2 = 4.33$, *ns*).

5.4.2 Results for Hypothesis 1b: Continued Deficits in Verbal Abilities in Late Talkers by Age Five

It was hypothesized that both persistent and remittent late talkers would show poorer performance on verbal language tasks than their typically developing peers, as the existing literature on late talking toddlers has demonstrated that they show continuing difficulties in verbally-based cognitive tasks. (Rescorla, 2002, 2005). Furthermore, it was hypothesized that late talkers with persistent language difficulties would show the lowest performance of the three hypothesized groups on the verbally based cognitive tasks. To test this hypothesis, a series of ANOVAs was performed to determine whether late talking children have significantly lower performance on the Spelling and Letter-Word Identification subtests of the Woodcock-Johnson. Trajectory group membership based on the three-group model of language development was used as the independent variable. As shown in Table 6, significant differences between the trajectory groups were found for the Spelling and Letter-Word Identification Subscales as well as the children's Overall Academic Skills Scale on the Woodcock-Johnson. Further, the partial Eta squared values for these two subtests were over 0.15 (see Table 6), meaning that the trajectory group accounted for approximately 15 percent of the overall variance in the children's scores on these two subscales. The effect size for ANOVA for differences in scores on Overall Academic Skills was more modest, with a partial Eta squared of 0.07, which can be interpreted as trajectory group membership accounting for approximately seven percent of the variance in the scores.

To assess which groups were significantly different from one another, post-hoc analyses were performed. As the Levene Test for Equality of Variance showed that there were no significant differences in the variance of the three groups, Tukey HSD post hoc tests were performed to identify specific group differences. It was found that there was a consistent pattern of statistically significant differences between children in the Stable Low group and the High Decreasing group, which was observed on all three subscales, including the Spelling subscale (*F* [2, 129] = 11.98, $p < .001$), the Letter-Word Identification subscale (*F* [2, 130] = 11.66, $p < .001$), and the Overall WJ Academic Skills (*F* [2, 129] = 4.69, $p = 0.12$). No significant differences were observed between the Increasing Low trajectory group and either of the other two trajectory groups.

Table 6. Differences in Age 5.5 WJ Subscales based on Trajectory Group Membership

W-J Subscales Standard Scores	Stable Low (n = 88) Mean (SD)	Low Increasing (n = 16) Mean (SD)	High Decreasing (n = 46) Mean (SD)	*F* – Value	Partial η^2
	Trajectory Groups				
Spelling	97.21 (14.67)[a]	105.79 (12.45)[ab]	106.30 (15.72)[b]	11.98***	0.157
Letter-Word Identification	99.82 (10.50)[a]	101.00 (17.09)[ab]	106.37 (11.51)[b]	11.66***	0.152
Overall Academic Skills	96.92 (12.59)[a]	102.50 (16.97)[ab]	104.40 (13.26)[b]	4.60*	0.067

* $p < .05$, ** $p < .01$, *** $p < .001$. Differences in superscript indicate significant differences between groups.

5.4.3 Results for Hypothesis 1c: Functioning in Late Talkers at Age Five

As the majority of late talking toddlers have been found to no longer be in the clinically significant range on language and achievement measures by the early school-aged period (Girolametto et al., 2001; Manhardt & Rescorla, 2002), it was hypothesized that there would be no significant difference between the percentages of late talkers and typically developing children who are at least in the average range of functioning on the WJ at age five (e.g., at or above a *t*-score of 90).

To test this hypothesis, a chi-square test of independence was calculated with the independent variable being the three trajectory groups of language development derived in Hypothesis 1a. The WJ scales were then divided into scores at or above 90 and those scores that were below 90. A score of 90 was chosen as the cutoff to indicate meaningful dysfunction because it corresponds to the 25th percentile on WJ. Using this threshold, 33 of the 132 children in the sample with valid WJ scores were expected to have standard scores below 90. Of the 132 children who had valid WJ scores at the age 5 assessment, 29 (19.3%) had a standard score below 90 on Overall Academic Skills, 27 (18.0%) scored below a 90 on the Spelling Subtest, and 21 (14.0%) scored below a 90 on the Letter-Word Recognition Subtest. Children who were in the Stable Low group, Low Increasing, and High Decreasing group were equally likely to score above or below a 90 on all three scales of the WJ.

On the Spelling subscale of the WJ, 25 percent of the Stable Low group, 14 percent of the Low Increasing group, and 14 percent of the c High Decreasing group scored below a 90 (χ^2 = 2.54, *ns*). On the Letter-Word Recognition Subtest, 19 percent of the children who were in the Stable Low group, 21 percent of the children in the Low Increasing group, and 9 percent of the children in the High Decreasing group scored below 90. Despite the relatively smaller percentage of children in the High Decreasing group, there was not a significant difference among the three groups in the percentage of children who were in the average range of functioning (χ^2 = 2.21, *ns*). Finally, there was no significant difference between the three groups in the percentage of children who scored in the average range with regard to their Overall Academic Skills (χ^2 = 4.28, *ns*). Twenty-eight percent of Stable Low group, 21 percent of the Low Increasing Group, and 12 percent of the High Decreasing group scored below 90 on Overall Academic Skills.

It was found while testing Hypothesis 1b that the Low Increasing Group's scores were not significantly different from either of the other two groups, and that children in the Stable Low group had lower scores than the High Decreasing group on all three WJ scales. Given these results, a second group of chi-square tests of independence was completed to ascertain whether the inclusion of the Low Increasing group was masking significant differences between the Stable Low and High Decreasing groups in the rates of children scoring in the average range on the WJ. There were no significant differences in the rates of children scoring in the average range on the WJ Spelling subtest ($\chi^2 = 2.12$, *ns*) or the WJ Letter-Word Identification subtest ($\chi^2 = 1.93$, *ns*). However, it was found that children in the High Decreasing group were significantly more likely to score in the average range on the WJ Overall Academic Skills than the children in the Stable Low group ($\chi^2 = 4.26$, $p < .05$).

5.5 RESULTS FOR HYPOTHESIS 2

The second hypothesis focused on expanding the understanding of the bidirectional relationship between language development and behavioral symptoms in preschool-aged children. It was hypothesized that lower levels of language would contribute to the development of later behavioral symptoms and, conversely, that higher ratings of behavioral symptoms would be significantly associated with future language development. Prior to further analysis, the measures of language and child adjustment were screened for normality. The language and child adjustment variables appeared to show patterns of skewness and kurtosis within acceptable limits.

5.5.1 Results for Hypothesis 2a: Direct Associations between Language Impairment and Child Adjustment

It was hypothesized that children with lower observed verbal abilities at ages two, three and four would demonstrate significantly higher rates of emotional and behavioral symptoms on the CBCL at ages 3, 4, and 5. To test this hypothesis, a series of Pearson correlations was calculated. The correlations were between age two language measures (i.e., MCDI scores) and age 3 child adjustment (i.e., CBCL Withdrawn Behavior and Attention Problems subscales). These analyses were repeated from age three language (i.e., FLU-2 General Language Quotient, MLU, and NRW) to age four ratings on the CBCL, and age four language (i.e., FLU-2 General Language Quotient, MLU and NRW) to age five ratings on the CBCL subscales.

Additionally, it was hypothesized that children with higher rates of emotional and behavioral problems would have lower observed verbal abilities at one-year follow-ups. To test this hypothesis, a second series of Pearson correlations was performed between age two social withdrawal and attention problems on the CBCL and age three language measures (i.e., child MLU, and NRW); and between age three Attention Problems and Withdrawn Behavior on the CBCL and age four language measures (i.e., child MLU and NRW). The results of these correlations are presented in Table 7.

Table 7. Bivariate Correletions between Language and Child Adjustment

	Age 2 CBCL Withdrawn Behavior	Age 2 CBCL Attention Problems	Age 3 CBCL Withdrawn Behavior	Age 3 CBCL Attention Problems	Age 4 CBCL Withdrawn Behavior	Age 4 CBCL Attention Problems	Age 5.5 CBCL Withdrawn Behavior	Age 5.5 CBCL Attention Problems
Age 2 MCDI	-0.26**	-0.08	-0.14$^{\#}$	-0.18*	-0.10	-0.15$^{\#}$	-0.0	-0.12
Age 3 FLU Exp Lang	-0.26**	-0.06	-0.23**	-0.13	-0.09	-0.03	-0.03	0.04

Age 3 FLU Rec Lang	-0.12	-0.01	-0.20*	-0.18*	-0.13	-0.08	-0.01	-0.02
Age 3 FLU Gen Lang	-0.21*	-0.02	-0.23*	-0.13	-0.09	-0.04	-0.03	-0.02
Age 3 MLU	-0.21*	-0.23*	-0.11	-0.31***	-0.01	-0.20*	-0.06	-0.14
Age 3 NRW	-0.16#	0.02	-0.21*	-0.17#	-0.16#	-0.07	-0.12	-0.16
Age 4 FLU Exp Lang	-0.15#	-0.09	-0.19*	-0.17*	-0.18*	-0.09	-0.14	-0.08
Age 4 FLU Rec Lang	-0.13	0.01	-0.17*	-0.21*	-0.12	-0.09	-0.02	-0.16#
Age 4 FLU Gen Lang	-0.14	-0.04	-0.20*	-0.22**	-0.16#	-0.11	-0.05	-0.12
Age 4 MLU	-0.12	-0.0 2	-0.05	-0.02	-0.18#	-0.13	0.02	-0.03
Age 4 NRW	-0.14	0.14	-0.16	-0.07	-0.11	-0.22*	-0.06	-0.06

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.5.1.1 Associations between Measures of Child Language and Later Behavioral Adjustment

It was found that MCDI, Fluharty-2 scores, and transcribed language measures were significantly associated with concurrent and future ratings of child problem behaviors. Mothers' report of vocabulary known at age two on the MCDI was negatively correlated with concurrent ratings of Withdrawn Behavior and maternal reports of Attention Problems at age three (*r's* = -0.26 and -0.18, $p < .05$, for Withdrawn Behavior and Attention Problems respectively). These results suggest that children who were described by their mothers as knowing fewer words at age two were more likely to be seen by mothers as having more withdrawn behavior concurrently and higher levels of Attention Problems one year later. The MCDI was not found to be associated with any ratings of child behavior at the age four or five assessment points.

The age three Flu-2 General Language, Receptive Language and Expressive Language Quotients were negatively correlated with concurrent reports of Withdrawn Behaviors, and the age three Fluharty-2 Receptive Language Quotient was also associated with concurrent reports of Attention Problems. However, none of the language quotients was associated with later reports of child behavior at ages four or five. Age four language quotients on the Fluharty-2 were not associated with concurrent or later measures of child behavior on the CBCL.

Transcribed measures of language at ages three and four showed some patterns of association with concurrent and later ratings of behavioral symptoms on the CBCL. Age three MLU was negatively correlated with concurrent ratings of Attention Problems on the CBCL and with ratings of Attention Problems one year later (r = -0.31, $p < 0.01$ and r = -0.20, $p < 0.05$ at ages 3 and 4 respectively). Age three MLU was not correlated with Withdrawn Behavior concurrently or at any subsequent time point. Age three NRW was negatively correlated with concurrent maternal ratings of Withdrawn Behaviors (r = -0.21, $p < 0.05$), but these associations were no longer significant at ages 4 or 5.5. At age 4, NRW was negatively associated with concurrent maternal report of Withdrawn Behaviors (r = -0.22, $p < 0.05$) but not with Attention Problems or any factor of child problem behavior at age five.

5.5.1.2 Association between Child Adjustment and Later Measures of Child Language

Maternal report of behavioral symptoms was also found to be negatively correlated with future measures of child language. Age two CBCL Withdrawn Behavior was negatively associated with the Expressive and General Language Quotients of the Fluharty-2, and with MLU at age three (r's = -0.26, -0.21, and -0.20, $p < 0.05$ for the Expressive Language Quotient, General Language Quotient, and MLU, respectively). There were no associations between age two ratings of Withdrawn Behavior and any measure of child language at age four. Maternal report of Attention Problems at age two was significantly associated with transcribed MLU at the age three assessment (r = -0.23, $p < 0.05$). As with Withdrawn Behavior, there was no significant correlation between age two Attention Problems and any measure of child language at age four.

Ratings on both the age three CBCL Withdrawn Behaviors and Attention Problems subscales were both negatively associated with all language quotients on the Fluharty-2 one year later (r's from -0.17 to -0.22, $p < .05$), but neither age three CBCL subscale was found to be significantly associated with transcribed measures of language at age four.

5.5.2 Results for Hypothesis 2b: Reciprocal Relationship between Language Problems and Child Adjustment

Based on the literature that suggests bidirectionality in the relationship between language difficulties and child adjustment (Baker & Cantwell, 1987; Benner et al., 2002; Hinshaw, 1992), it was hypothesized that language difficulties would be consistently associated with later child adjustment, and that child adjustment would be consistently associated with later language difficulties from ages two to three, three to four, and four to five. To test this hypothesis that there are consistent transactional associations between language impairment and child adjustment, four autoregressive structural-equation models (Hertzog & Nesselroade, 1987) were performed. It was initially hypothesized that a latent factor of language would be feasible to generate using the age 3 and age 4 Fluharty-2, NRW and MLU. The two CBCL subscales (i.e., Withdrawn Behaviors and Attention Problems) were used as measures of child adjustment

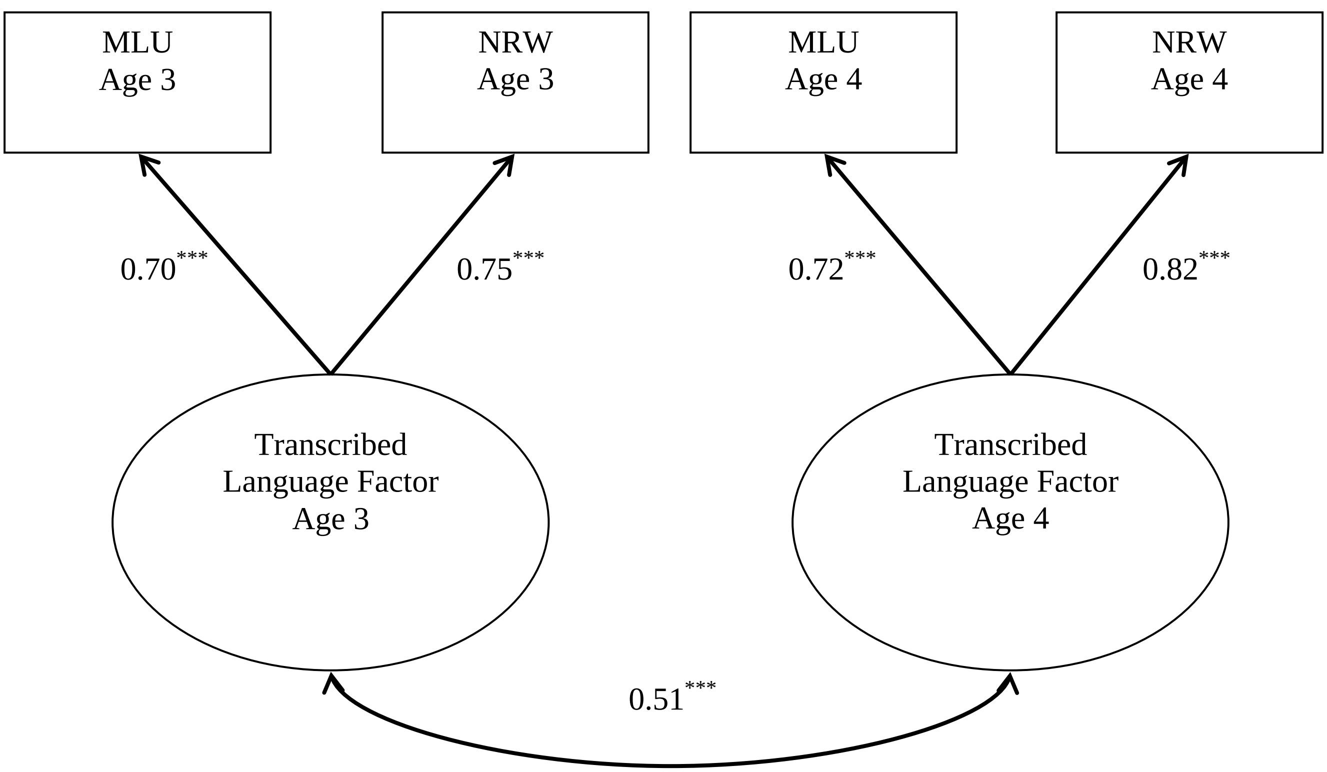
5.5.2.1 Measurement Model for Children's Language

To test this transactional and bidirectional model of language development and child adjustment, an autoregressive structural equation model was used (Hertzog & Nesselroade, 1987). The first step of constructing this model was to develop a latent factor of language that included the available measures of language: MCDI at age two, Fluharty-2 at ages three and four, MLU transcribed from ages three and age four, and finally NRW transcribed from ages three and four. However, given the absence of additional measures of language at age two, it was not possible to develop a latent construct of language development at age two. Thus for the remaining analyses completed for Hypothesis 2 and 3, MCDI at age two was used as a separate predictor variable.

Measurement models of the latent construct of language were completed prior to running the auto-regressive models. Figure 6 shows the final measurement models of children's language at ages three and four. While the original goal was to generate a latent construct of language (i.e., a single factor) using all of the available variables, initial analyses indicated that measurements of the Fluharty-2 and transcribed language did not appear to load on a single factor. Specifically, the loading of Fluhary-2 General Language at ages three and four had lower loadings on the latent factors (0.35 and 0.24, at ages three and four, respectively) than the two measures of transcribed language. Furthermore, fit indices suggested an unsatisfactory fit of the data when the Fluharty-2 was included in the factor, $\chi^2 = 112.19$, $p < .001$, CFI = 0.481, RMSEA = 0.295, SMSR= 0.150, as Comparative Fit Index (CFI) values above 0.95 and Standardized-Root-Mean-Square Residual and Root Mean Square Error of Approximation (RMSEA) values below 0.06 are suggestive of good model fit (Hu & Bentler, 1999). Thus, for the remaining analyses, models were run separately using the Fluharty-2 and the Transcribed Language Factor as two distinct measures of language.

While it has been suggested that measurement models have a minimum of three indicator variables (Anderson & Gerbing, 1988), the Fluharty-2 variables did not show adequate factor loadings or fit from the initial measurement model. Thus, as shown in Figure 6, the two transcribed language variables, MLU and NRW, were used in the measurement models and had significant loadings on the Language Factors at both ages 3 and 4. Further, while the RMSEA was considerably higher than is indicative of a good fit (i.e., 0.19), the remaining fit indices were in the adequate to good range and were the highest of any measurement model examined for the data. Fit indices for this measurement model are shown in Figure 6.

For the remaining analyses, two groups of autoregressive models were performed. First, the Path Analyses with the Fluharty-2 General Language Quotient, MCDI, and the CBCL ratings of child behavior from ages two to five years were run. Second, Autoregressive Structural Equation Models with the latent factor of language, MCDI and CBCL ratings from ages 2 to 5.5 years were completed. In other words, four separate autoregressive models were analyzed.



$\chi 2 = 5.93$, $p < 0.05$
CFI = 0.948
RMSEA = 0.192
SRMR = 0.037

Figure 6. Loadings of MLU and NRW on Latent Factors of Language at Ages 3 and 4

5.5.2.2 Autoregressive Models of Language and Child Adjustment Using MCDI, Fluharty-2 and CBCL Ratings

The first series of nested path models were evaluated to determine whether the hypothesis of significant bidirectional associations between language and behavioral adjustment from ages two to five years was supported. Two separate groups of nested path models were computed for the two CBCL subscales with the Fluharty-2 and MCDI as the measures of language from two to four years.

Autoregressive Models of MCDI, Fluharty-2 Scores and Attention Problems from Ages Two to Five.

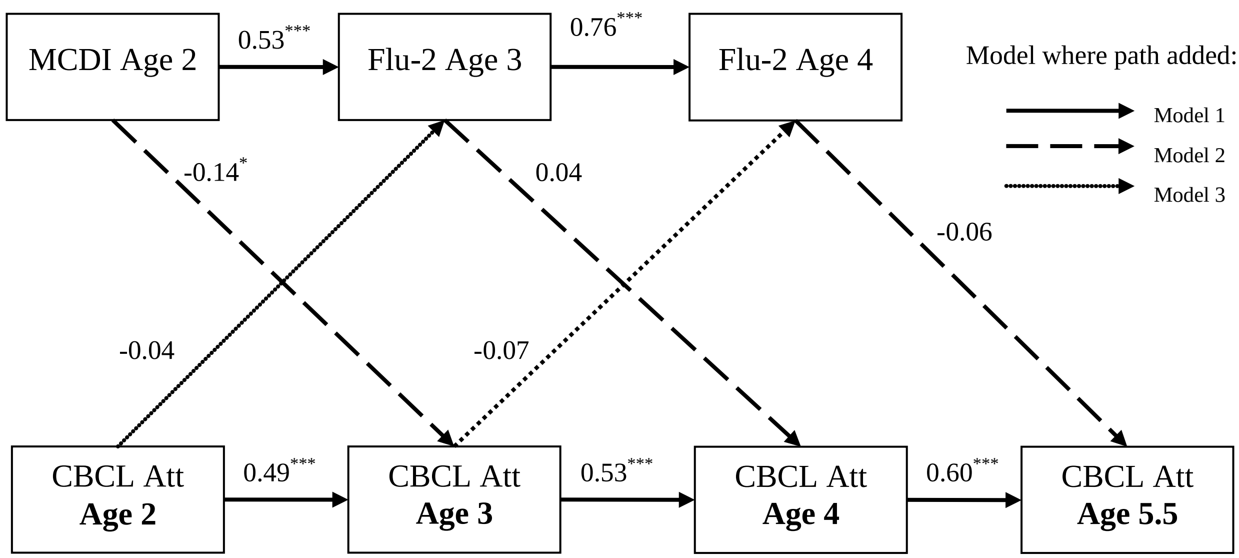
The first model (see Figure 7) evaluated was designed to test the longitudinal stability of children's language development and Attention Problems. This model was the building block to test bidirectional associations between language and child behavior in subsequent models. This Stability Model showed significant effects on all paths, which ranged from 0.51 to 0.76 ($p < .001$ for all path coefficients). It also had adequate fit statistics, which are shown in Table 8, although the χ^2 value of 27.73 was significant ($p < .05$). This model is the most parsimonious model but did not test any of the potential bidirectional associations between language and child adjustment.

Table 8. Model Fit Statistics for MCDI, Fluharty-2 and Attention Problems

Model	CFI	RMSEA	SRMR	χ^2	*Df*	χ^2/df	$\Delta\ \chi^2$ (*df*)
Model 1: Stability Model	0.953	0.081 (0.034 – 0.125)	0.084	27.73*	14	1.98	--
Model 2: Lang to Adjust	0.961	0.080 (0.028 – 0.127)	0.080	23.45*	12	1.95	4.28 (2)
Model 3: Adjust to Lang	0.960	0.089 (0.037 – 0.140)	0.057	21.82*	10	2.18	1.63 (2)
Model 4: Final Model	0.971	0.068 (0.00 – 0.118)	0.056	20.43	12	1.70	7.30[a] (2)*

# $p < .10$, * $p < .05$, ** $p < .01$, [a] This value represents the change from Model 1, which is nested within Model 4

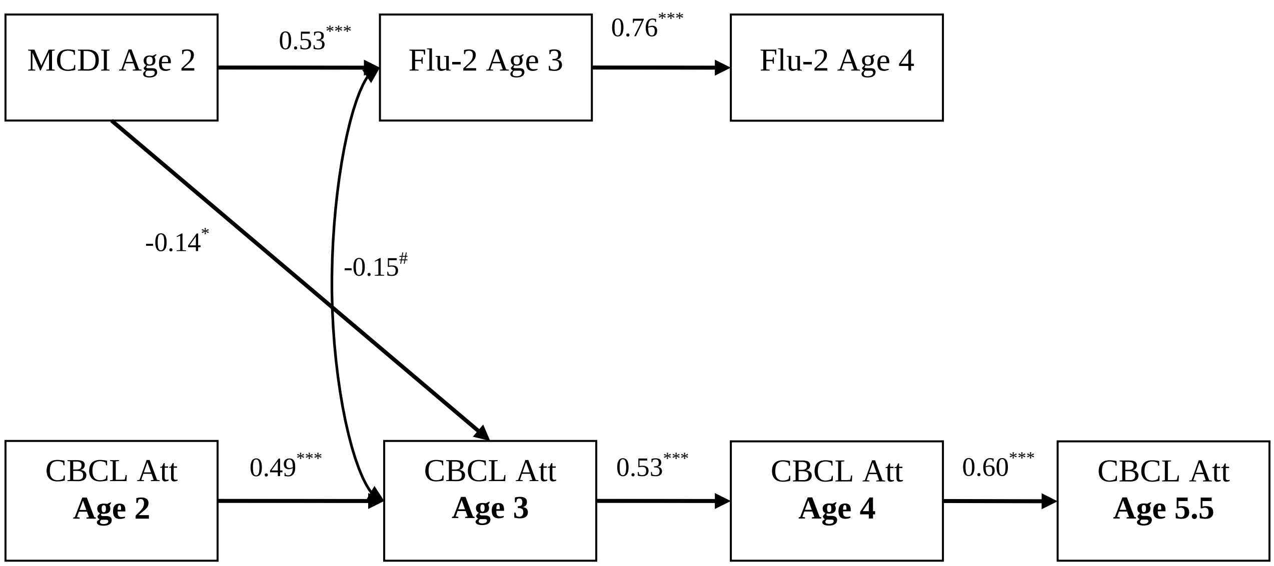
The second model tested the association of earlier language development with subsequent attention problems by adding additional pathways from age two MCDI to age three CBCL Attention Problems, and from age 4 Fluharty-2 General Language Quotient to age 5.5 CBCL Attention Problems. The second model was not found to be a significant improvement over the Stability Model. Two of the three pathways of language predicting to later Attention Problems were not significant. In Model 3, all bidirectional paths were added such that Model 3 had the paths of model 2 with additional paths from CBCL Attention Problems at age 2 to Fluharty-2 scores at age 3, and from CBCL Attention Problems at age 3 to Fluharty-2 scores at age 4. This model did not appear to fit the data as well as the previous two models, and neither of the two additional paths had significant effects. All three models are represented in Figure 7.



 # *p* < .10,***p* < .05, ** *p* < .01, *** *p* < .001**

Figure 7. Model of Bidirectional Paths between MCDI, Fluhary-2 and Attention Problems from Ages 2 to 5.5 Years

The final model removed the non-significant pathways between the language and child adjustment measures, and added, at age 3, one concurrent pathway between children's Fluharty-2 scores and maternal ratings of Attention Problems on the CBCL, which significantly improved the overall model fit from the original stability model. This model is shown in Figure 8. The fit indices were all suggestive of a good fit. Furthermore, the chi-square difference test between Model 1 and Model 4 indicated that while Model 4 was a less parsimonious model than the original stability model, it was a significant improvement ($\chi_{diff}^2 (2) = 7.30$, $p < .05$). This final model indicates that there are few bidirectional influences from ages 2 to 5 years, and the majority of the variance in the model is accounted for by stability in the children's language and behavioral adjustment.



 # *p* < .10,p* < .05, ** *p* < .01, *** *p* < .001**

Figure 8. Final Autoregressive Model of MCDI, Fluharty-2 and CBCL Attention Problems

Autoregressive Models of MCDI, Fluharty-2 Scores, and Withdrawn Behavior from Ages Two to Five.

As with Attention Problems, the first model (see Figure 9) to examine the bidirectional associations between the MCDI, Fluharty-2, and CBCL Withdrawn Behavior was designed to test the longitudinal stability of children's language development and Withdrawn Behaviors.

Again, this model was used as the building block for subsequent models. This Stability Model showed significant path coefficients, ranging from 0.35 to 0.76 (p < .01 for all standardized coefficients), and had adequate fit indices with the exception of a significant χ^2 value of 24.19 (p < .05). These results are shown in Table 9. This model is the most parsimonious model but does not test any of the potential bidirectional associations between language and withdrawn behavior in the sample.

Table 9. Model Fit Statistics for MCDI, Fluharty-2 and Withdrawn Behavior

Model	CFI	RMSEA	SRMR	χ^2	*Df*	χ^2/df	$\Delta\ \chi^2\ (df)$
Model 1: Stability Model	0.954	0.070 (0.012 – 0.115)	0.074	24.19^*	14	1.73	--
Model 2: Lang to Adjust	0.946	0.082 (0.031 – 0.129)	0.067	23.99^*	12	2.00	0.20 (2)
Model 3: Adjus to Lang	0.941	0.093 (0.043 – 0.144)	0.060	23.09^*	10	2.31	0.90 (2)
Model 4: Final Model	0.966	0.063 (0.00 – 0.111)	0.057	20.63	13	4.	$3.56^a\ (1)^\#$

\# p < .10, * p < .05, ** p < .01, [a] This value represents the change from Model 1, which is nested within Model 4

The second model added half of the bidirectional paths between language and CBCL Withdrawn Behavior, including pathways from age two MCDI to age three CBCL Withdrawn Behavior, and from age three Fluharty-2 General Language Quotient to age four CBCL Withdrawn Behavior, and from age four Fluharty-2 General Language Quotient to age five CBCL Withdrawn Behavior. As with the findings of the previous autoregressive model examining Attention Problems and Language, this model was not a significant improvement over the Stability Model. None of the path coefficients of Fluharty-2 onto later Withdrawn Behavior were significant. In Model 3, bi-directional paths were added such that Model 3 had all of the paths of Model 2 with additional paths from CBCL Withdrawn Behavior at age 2 to Fluharty-2 scores at age 3, and from CBCL Withdrawn Behavior at age 3 to Fluharty-2 scores at age 4. This model did not appear to fit the data as well as the original Stability Model. None of the additional paths had significant direct effects, nor did the fit indices suggest that this model adequately explained the data. The three models are illustrated in Figure 9.

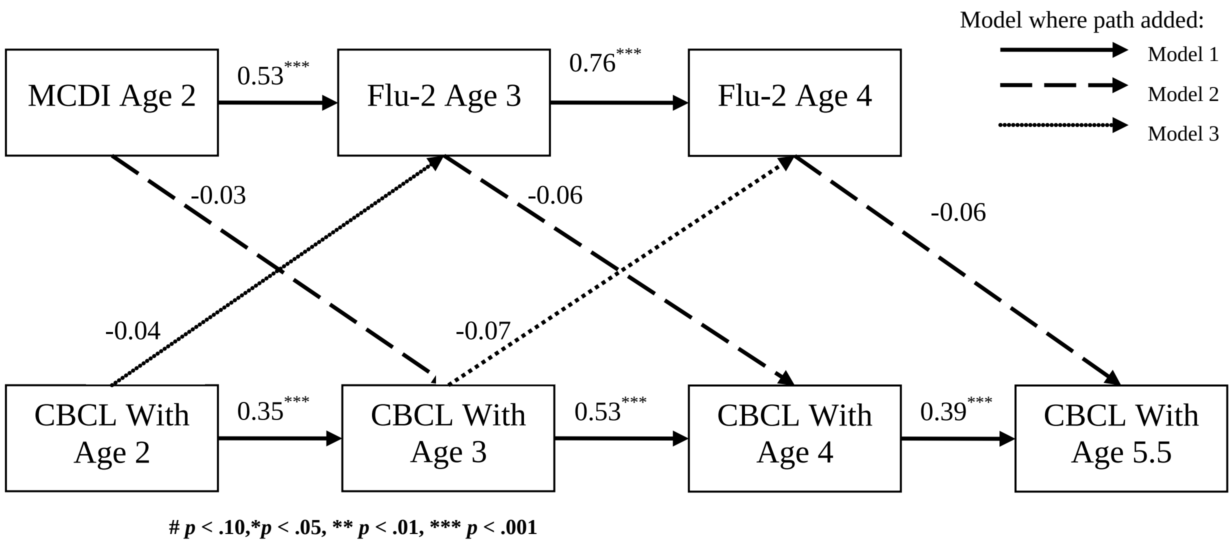


Figure 9. Model of Bidirectional Paths between MCDI, Fluhary-2 and Withdrawn Behavior from Ages 2 to 5.5 Years

Thus, when attempting to identify the final, best-fitting model of the bidirectional associations between CBCL Withdrawn Behavior, and language development, the Stability Model appears to fit the data; however, there appears to be a significant concurrent negative association between Withdrawn Behavior on the CBCL and Fluharty-2 General Language Quotients at age three. This model had adequate fit indices and there was a trend toward the chi-square difference test being significant. It is illustrated in Figure 10.

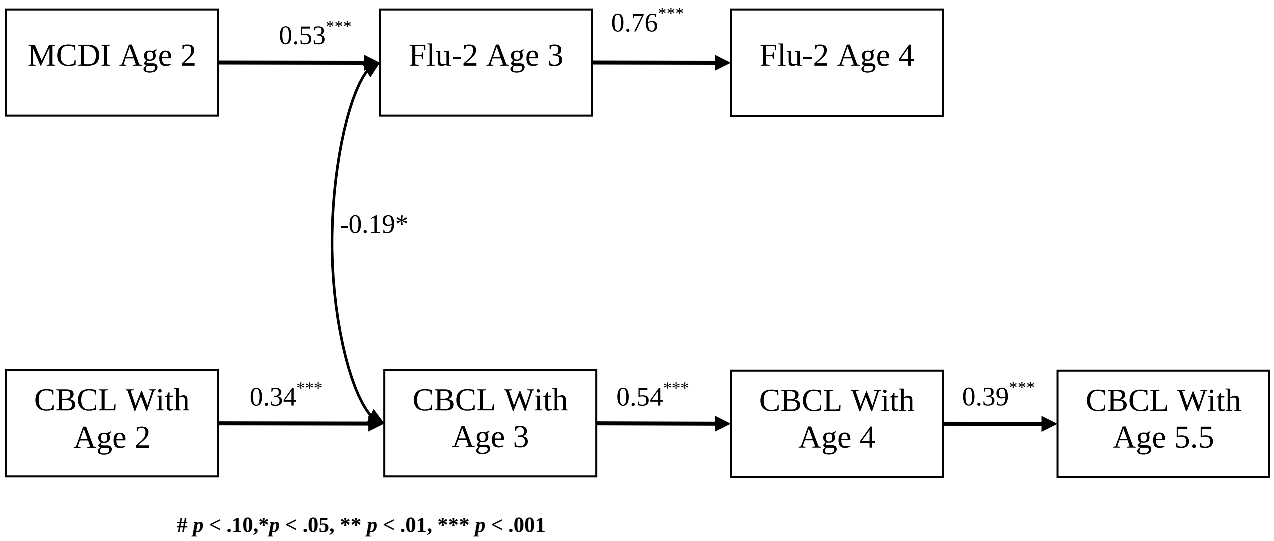


Figure 10. Final Autoregressive Model of MCDI, Fluharty-2 and CBCL Withdrawn Behavior

5.5.2.3 Autoregressive Models of Language and Child Adjustment Using MCDI, Transcribed Language, and CBCL Ratings

Using the measurement model previously described, a second group of models was run using transcribed language measures and CBCL ratings of children's behavior. These models were run separately for each of the CBCL subscales.

Autoregressive Models of MCDI, Transcribed Language, and Attention Problems from Ages Two to Five.

Again, prior to examining the bidirectional associations between language and child adjustment, the first model evaluated the longitudinal stability of children's language development and attention problems. This Stability Model showed significant path coefficients, which ranged from 0.23 to 0.61 (p < .001 for all standardized coefficients), with the lowest loading being between age two MCDI and age three Transcribed Language. Furthermore, the model's fit statistics were not suggestive of a good fit for data. They are shown in Table 10.

Table 10. Model Fit Statistics for MCDI, Transcribed Language, and Attention Problems

Model	CFI	RMSEA	SRMR	χ^2	*Df*	χ^2/ df	$\Delta\ \chi^2\ (df)$
Model 1: Stability Model	0.895	0.084 (0.051 – 0.117)	0.092	51.44^{*}	25	2.06	--
Model 2: Lang to Adjust	0.902	0.085 (0.050 – 0.119)	0.082	47.72	23	2.07	3.72 (2)
Model 3: Adjust to Lang	0.912	0.084 (0.048 – 0.120)	0.080	43.26	21	2.31	4.46 (2)
Model 4: Final Model	0.933	0.071 (0.031 – 0.108)	0.084	38.80	22	1.74	$12.64^{a}\ (3)^{**}$

# $p < .10$, * $p < .05$, ** $p < .01$, [a] This value represents the change from Model 1, which is nested within Model 4

Next, the association of earlier language development with subsequent attention problems was explored by adding in three more paths from age 2 MCDI to age 3 CBCL Attention Problems, the age 3 Transcribed Language factor, and from the age 4 Transcribed Language factor to age 5 CBCL Attention Problems. This model was not found to be a significant improvement over the Stability Model as can be seen in the resulting non-significant chi-square difference test, although the fit indices did improve slightly. Two of the three pathways of language predicting to later Attention Problems were not significant, and the sole significant pathway was from MCDI at age two to Attention Problems at age three, which was found to be significant in the model with Fluharty-2 scores. In Model 3, the two final pathways were added such that all bidirectional paths between Language and Attention Problems were included in the model. These two paths included paths from CBCL Attention Problems at age two to the latent factor of language at age three, and from CBCL Attention Problems at age three to the latent factor of language at age four. As was noted in Model 3, these additional pathways did not appear to significantly improve the data. The direct effects of the pathways for these three models are shown in Figure 11.

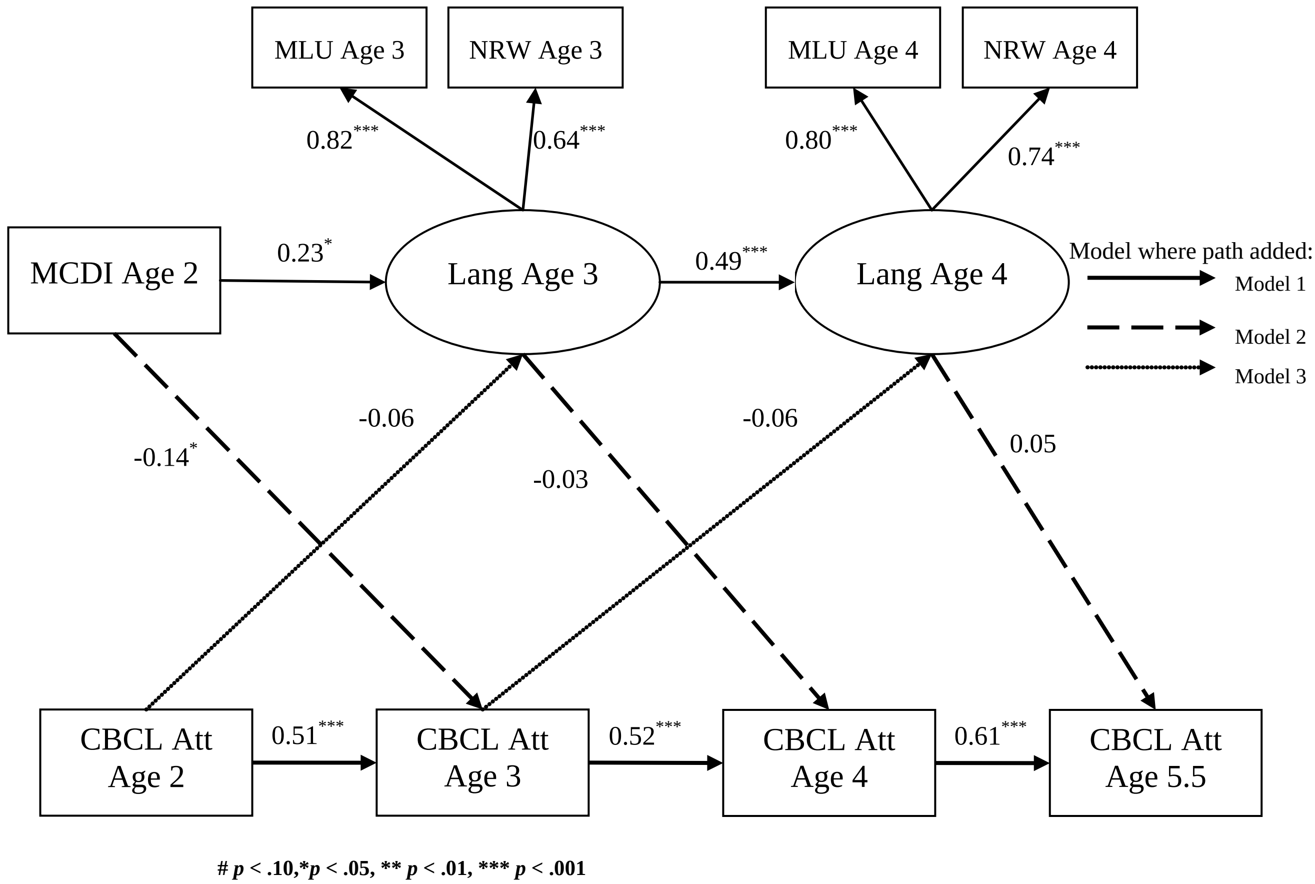
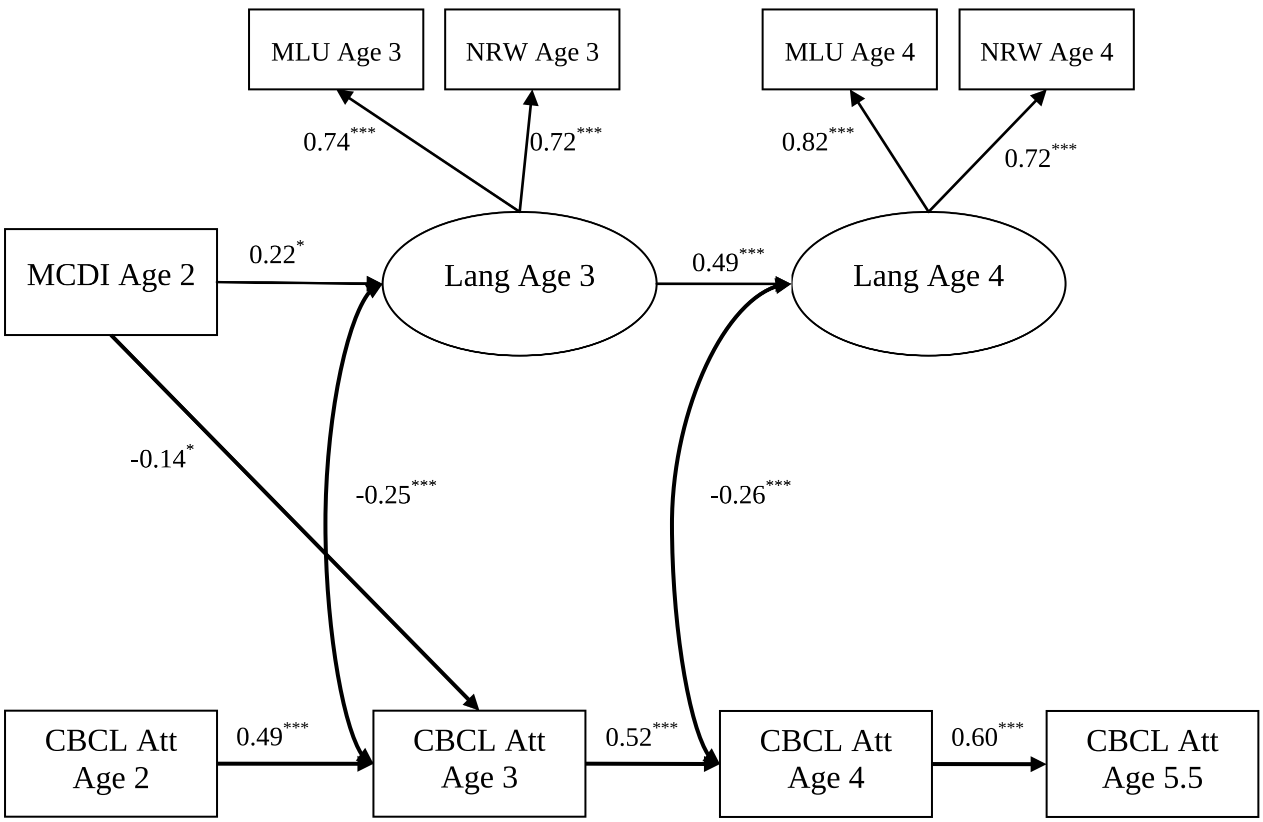


Figure 11. Model of Bidirectional Paths between MCDI, Transcribed Language and Attention Problems from Ages 2 to 5.5 Years

Based on the very slight changes observed in the overall fit of the data with the addition of the pathways in Models 2 and 3, non-significant paths were removed to create the final model of the limited bidirectional association between transcribed language and attention problems in children. This final model, which is shown in Figure 12, retained the one significant pathway from MCDI at age two to age three maternal ratings of Attention Problems. Furthermore, given the significant concurrent associations observed in Hypothesis 2A, correlations between latent factors of language and concurrent ratings of Attention Problems at ages three and four were included in the analysis. The fit indices were generally suggestive of an adequate fit of the data, although none of the fit statistics was considered to be in the "good" range (e.g., CFI > 0.950, RMSEA < 0.06). The chi-square difference test also suggested that this model was a significant improvement over the original model. However, there were few indications of longitudinal and bidirectional associations between Transcribed Language and Attention Problems.



 # p < .10,*p < .05, ** p < .01, *** p < .001

Figure 12. Final Autoregressive Model of MCDI, Transcribed Language, and CBCL Attention Problems

Autoregressive Models of MCDI, Transcribed Language, and CBCL Withdrawn Behavior from Ages Two to Five

The final autoregressive used the latent factor of transcribed language, described above, and the CBCL subscale Withdrawn Behavior. Again, initially the stability model was evaluated to examine the longitudinal stability of children's language development and Withdrawn Behavior. This Stability Model showed significant direct effects, with path coefficients ranging from 0.24 to 0.54 ($p < .01$ for all standardized coefficients), and the lowest loading being between age 2 MCDI and age 3 Transcribed Language, as was seen in the previous models between MCDI and Transcribed Language. The model fit indices, shown in Table 11, for the Stability Model suggested that that this model was an adequate fit for the current data.

Table 11. Model Fit Statistics for MCDI, Transcribed Language and Withdrawn Behavior

Model	CFI	RMSEA	SRMR	χ^2	*Df*	$\chi^2/\ df$	$\Delta\ \chi^2\ (df)$
Model 1: Stability Model	0.925	0.059 (0.008 – 0.095)	0.078	37.98*	25	1.52	--
Model 2: Lang to Adjust	0.912	0.066 (0.024 – 0.103)	0.078	38.21*	23	1.66	--
Model 3: Adjus to Lang	0.921	0.066 (0.020 – 0.104)	0.060	34.68*	21	1.65	3.30 (3)
Model 4: Final Model	0.938	0.054 (0.000 – 0.092)	0.065	34.61	24	1.44	3.37[a] (1)#

# $p < .10$, * $p < .05$, ** $p < .01$, [a] This value represents the change from Model 1, which is nested within Model 4

Next, paths from CBCL Withdrawn Behavior to later language were added to create Model 2. These three paths are from age two MCDI to age three CBCL Withdrawn Behavior, the age three transcribed language factor to age four Withdrawn Behavior, and from the age four latent language factor to age five CBCL Withdrawn Behavior. This model was not found to be a significant improvement over the Stability Model. In fact, there were no significant pathways in this model, and the fit statistics did not show any improvement. This model appeared to be less suited to the available data than the original stability model without the bidirectional pathways.

As was done with previous models, a third model was tested with two additional paths from Withdrawn Behavior on the CBCL at ages 2 and 3 to the latent factors of language at one-year follow-up. The third model included all bidirectional paths between Language and Withdrawn Behavior. These additional pathways did not appear to significantly improve the data, although age 2 Withdrawn Behavior on the CBCL did significantly load to the latent language factor at age 3. The paths of these three models are represented in Figure 13.

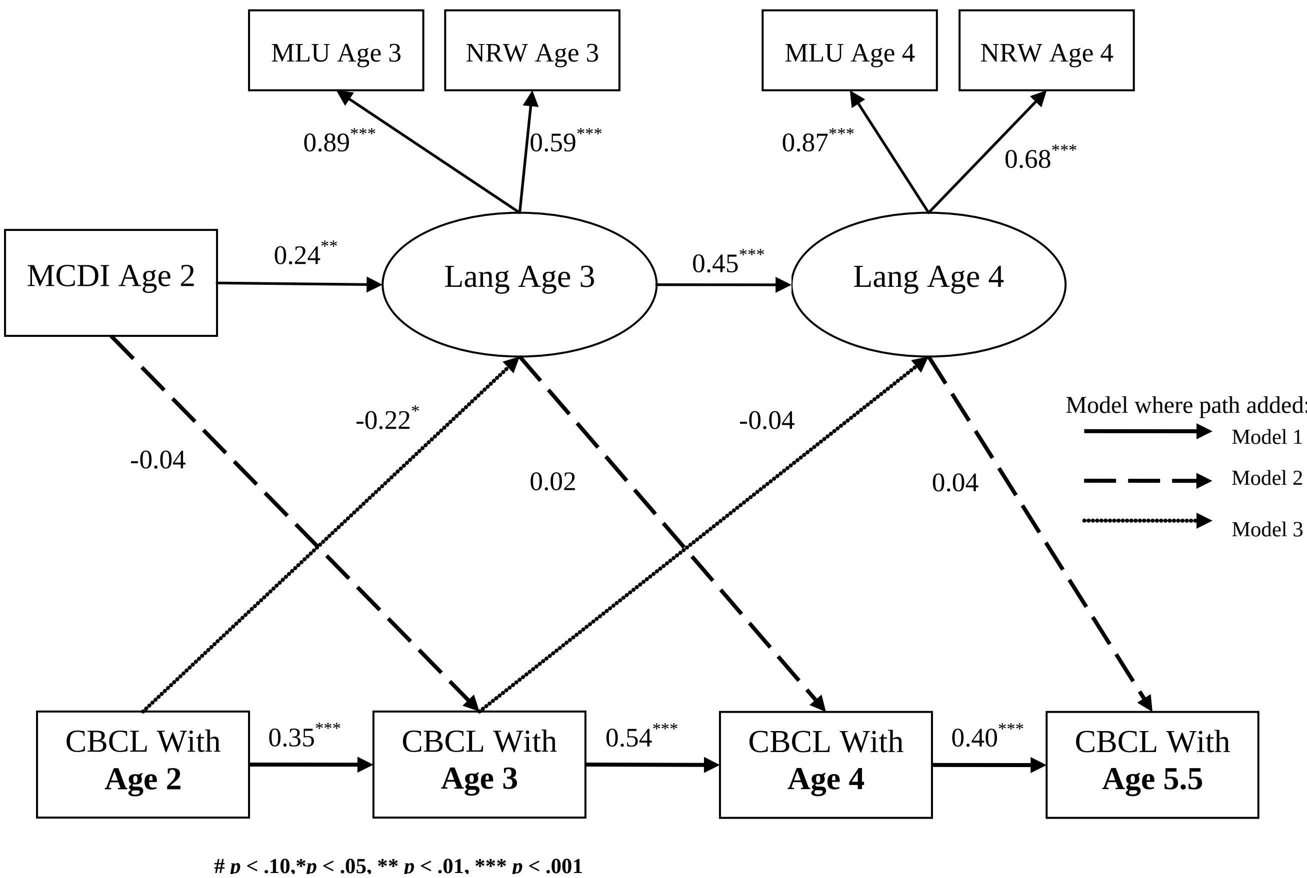


Figure 13. Model of Bidirectional Paths between MCDI, Transcribed Language and Withdrawn Behavior from Ages 2 to 5.5 Years

Based on the very slight changes observed in the overall fit of the data with the addition of the pathways in Models 2 and 3, non-significant paths were removed to create the final model of the limited bidirectional association between the Transcribed Language Factor and CBCL

Withdrawn Behavior in children. This final model, which is shown in Figure 14, retained the one significant pathway from MCDI at age 2 to age 3 maternal ratings of Withdrawn Behavior. The fit indices suggested that this model was generally an adequate fit of the data although none of the fit statistics were considered to be in the "good" range (e.g., CFI > 0.950, RMSEA < 0.06). Additionally, the chi-square difference test suggested that this model was a significant improvement over the original model. However, as can be seen in Figure 14, there were few indications of longitudinal and bidirectional associations between Transcribed Language and Withdrawn Behavior.

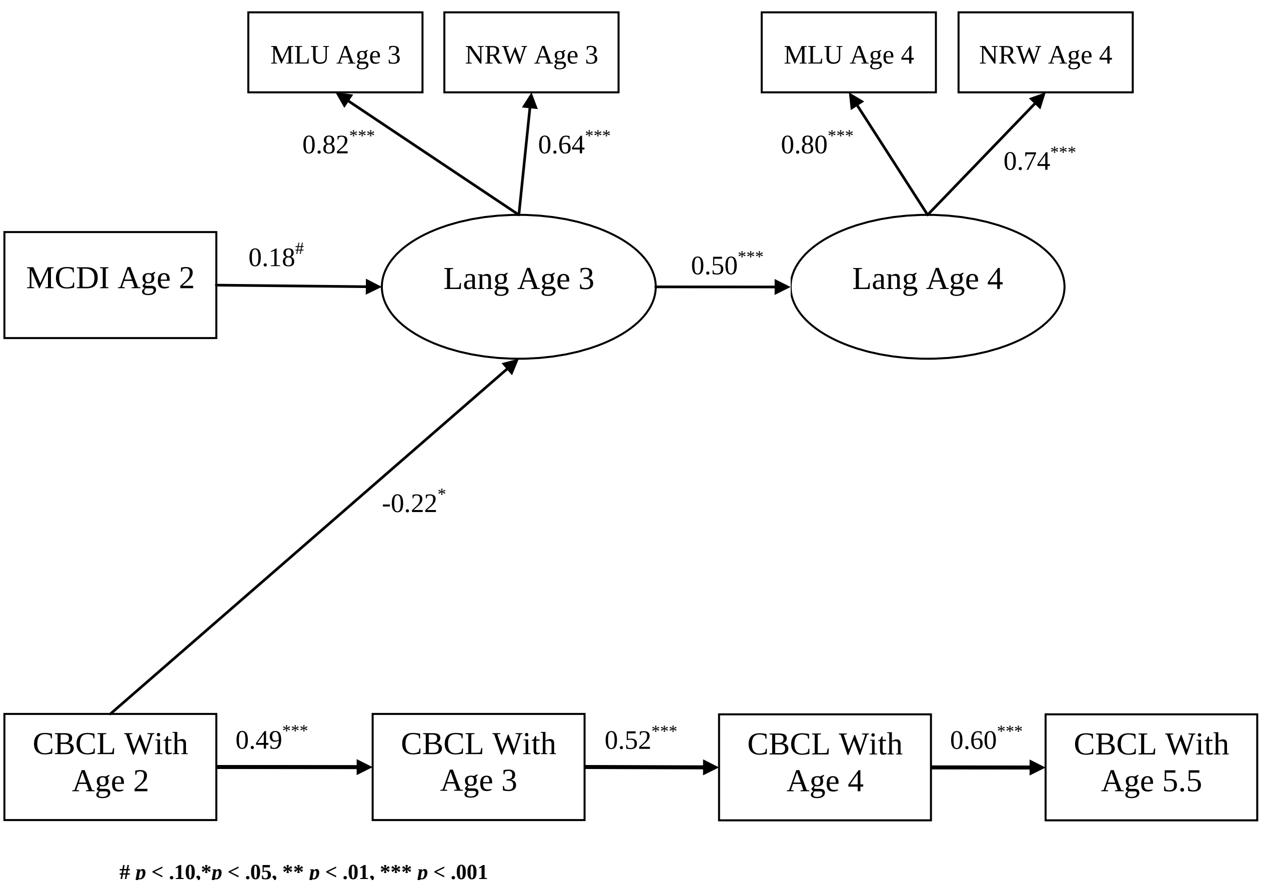


Figure 14. Final Autoregressive Model of MCDI, Transcribed Language, and CBCL Withdrawn Behavior

5.6 RESULTS FOR HYPOTHESIS 3

5.6.1 Results for Hypothesis 3a: Moderating Role of Maternal Nurturance

It was hypothesized that high levels of maternal nurturance would attenuate the longitudinal associations between language difficulties and emotional and behavioral symptoms between ages two and three, three and four, and four and five. To test this hypothesis, a series of hierarchical linear regressions was performed from the ages of 2 to 3, 3 to 4, and 4 to 5 years. As the measures of language did not form a single stable factor, analyses were completed separately for the three types of language measures: the MCDI, the Fluharty-2, and Transcribed Language.

5.6.1.1 Maternal Nurturance Moderating the Association between Children's Language and Later Behavioral Symptoms

To address the potential contribution of maternal nurturance in moderating associations between early language difficulties and later emotional and behavioral problems, in the first series of regressions the CBCL subscales at ages three, four and five served as the dependent variables. The same latent language factor as described above was entered first into each equation, followed by the HOME rating of maternal nurturance and the interaction between the HOME and the language factor. These analyses were performed between the age two MCDI and age three CBCL ratings, age three Transcribed Language and Fluharty-2 scores and age four CBCL ratings, and the age four Transcribed Language and Fluharty-2 scores and age five CBCL ratings.

Moderating Role of Nurturance on the Association between Age Two MCDI Expressive Language and Age Three CBCL Ratings

In the first set of hierarchical linear regressions, the moderating role of Maternal Nurturance on the association between age two MCDI and age 3 CBCL scores was explored. As can be seen in Table 12, it was found that Maternal Nurturance did not moderate the association between maternal report of expressive language on the MCDI at age two and either the Attention Problems or Withdrawn Behavior Subscales of the CBCL. A significant main effect was found with age two Maternal Nurturance in predicting maternal report of children's Withdrawn Behavior at age three (B =-2.73, SE = 1.10, β = -0.20, p < 0.05). Mothers who were observed as displaying higher levels of Maternal Nurturance reported significantly lower levels of Withdrawn Behaviors on the CBCL one year later.

Table 12. Regression Coefficients for Age 2 Maternal Nuturance as Moderator between Age 2 MCDI and Age 3 CBCL

Model	*N*	B	SE B	β	R^2 (Δr^2)
Age 3 Attention Problems					
1. Age 2 MCDI	130	-0.020	0.011	-0.140	0.019(0.019)
2. Age 2 MCDI		-0.019	0.011	-0.135	0.034(0.015)
Age 2 Home Nurturance		-1.567	1.043	-0.122	
3. Age 2 MCDI		-0.018	0.012	-0.129	0.036(0.002)
Age 2 Home Nurturance		-1.625	1.051	-0.127	
Age 2 MCDI x Age 2 Home		-0.043	0.083	-0.043	
Age 3 Withdrawn Behavior					
1. Age 2 MCDI	130	-0.006	0.012	-0.042	0.002(0.002)
2. Age 2 MCDI		-0.004	0.012	-0.027	0.042(0.022)*
Age 2 Home Nurturance		-2.730	1.103	-0.202*	
3. Age 2 MCDI		-0.001	0.012	-0.007	0.056(0.013)
Age 2 Home Nurturance		-2.669	1.099	-0.199*	
Age 2 MCDI x Age 2 Home		-0.127	0.087	-0.120	

# p < .10, * p < 0.05, ** p < 0.01, *** p < 0.001

Moderating Role of Maternal Nurturance on the Association between Age Three and Four Language Measures and Age Four and Five CBCL Ratings

In the next series of hierarchical linear regressions, the possible attenuating influence of Maternal Nurturance in the moderation of the associations between language development (i.e., using the Fluharty-2 General Language Quotients and Transcribed Language at ages three and four) and later CBCL Withdrawn Behavior and Attention Problems subscales was tested. As was seen in the regression analyses between age two MCDI and age three CBCL subscales, Table 13 illustrates that there was no indication that Maternal Nurturance moderated the association between either the Fluharty-2 General Language Quotient or Transcribed Language and later maternal ratings on the CBCL.

However, several significant main effects of Maternal Nurturance on later child adjustment were found. Observer ratings of Maternal Nurturance at ages three and four were significantly associated with later maternal reports of children's Attention Problems on the CBCL after accounting for either of the two measures of child's language. These regressions suggested that mothers who were reported by raters has having higher levels of Maternal Nurturance at age three and four reported fewer Attention Problems in their children at age four and five years. The results of these regression equations are shown in Table 13.

Table 13. Regression Coefficients for Association between Child Language and CBCL Subscales at One Year Follow-up with Maternal Nurturance as a Moderator

Model	*N*	B	SE B	Β	R^2 (Δr^2)
Age 4 Attention Problems					
1. Age 3 Fluharty-2	126	-0.01	0.02	-0.05	0.002(0.002)
2. Age 3 Fluharty-2		-0.01	0.02	-0.04	$0.034(0.032)^*$
Age 3 Home Nurturance		-2.47	1.24	-0.18^*	
3. Age 3 Fluharty-2		-0.01	0.02	-0.05	0.041(0.007)
Age 3 Home Nurturance		-2.61	1.25	-0.19^*	
Age 3 Flu-2 x Age 3 Home		0.12	0.13	0.09	

1. Age 3 Transcribed Lang	118	-0.24	0.20	-0.12	0.013(0.013)
2. Age 3 Transcribed Lang		-0.21	0.19	-0.10	0.044(0.031)$^{\#}$
Age 3 Home Nurturance		-2.36	1.24	-0.18$^{\#}$	
3. Age 3 Transcribed Lang		-0.21	0.20	-0.10	0.044(0.000)
Age 3 Home Nurturance		-2.35	1.25	-0.18$^{\#}$	
Age 3 Lang x Age 3 Home		-0.06	1.32	0.01	
<u>Age 4 Withdrawn Behavior</u>					
1. Age 3 Fluharty-2	126	-0.03	0.02	-0.15$^{\#}$	0.024(0.024)$^{\#}$
2. Age3 Fluharty-2		-0.03	0.02	-0.15$^{\#}$	0.043(0.019)
Age 3 Home Nurturance		-1.98	1.26	-0.14	
3. Age 3Fluharty-2		-0.03	0.02	-0.16$^{\#}$	0.047(0.004)
Age 3 Home Nurturance		-2.09	1.27	-0.15	
Age 3 Flu-2 x Age 3 Home		0.09	0.13	0.06	
1. Age 3 Transcribed Lang	118	-0.17	0.19	-0.08	0.007(0.007)
2. Age 3 Transcribed Lang		-0.13	0.18	-0.07	0.037(0.030)$^{\#}$
Age 3 Home Nurturance		-2.20	1.17	-0.17$^{\#}$	
3. Age 3 Transcribed Lang		-0.13	0.19	-0.06	0.030(0.003)
Age 3 Home Nurturance		-2.24	1.18	-0.18$^{\#}$	
Age 3 Lang x Age 3 Home		-0.76	1.31	-0.05	
<u>Age 5.5 Attention Problems</u>					
1. Age 4 Fluharty-2	126	-0.02	0.01	-0.11	0.013(0.013)
2. Age 4 Fluharty-2		-0.01	0.01	-0.07	0.074(0.061)**
Age 4 Home Nurturance		-3.63	1.22	-0.25**	
3. Age 4 Fluharty-2		-0.01	0.01	-0.07	0.079(0.005)
Age 4 Home Nurturance		-3.53	1.22	-0.24**	
Age 4 Flu-2 x Age 4 Home		0.09	0.10	0.07	
1. Age 4 Transcribed Lang	91	-0.18	0.35	-0.06	0.003(0.003)
2. Age 4 Transcribed Lang		-0.33	0.31	-0.10	0.224(0.221)***
Age 4 Home Nurturance		-11.39	2.29	-0.47***	
3. Age 4 Transcribed Lang		-0.33	0.31	-0.10	0.225(0.001)
Age 4 Home Nurturance		-11.41	2.30	-0.47***	
Age 4 Lang x Age 4 Home		0.35	2.16	0.02	
<u>Age 5.5 Withdrawn Behaviors</u>					
1. Age 4 Fluharty-2	126	-0.01	0.01	-0.06	0.004(0.004)
2. Age 4 Fluharty-2		-0.01	0.01	-0.04	0.025(0.021)
Age 4 Home Nurturance		-1.97	1.20	-0.15	
3. Age 4 Fluharty-2		-0.01	0.01	-0.30	0.036(0.011)
Age 4 Home Nurturance		-2.03	1.20	-0.15$^{\#}$	
Age 4 Flu-2 x Age 4 Home		-0.12	0.10	-0.11	
1. Age 4 Transcribed Lang	91	-0.61	0.20	-0.03	0.001(0.001)
2. Age 4 Transcribed Lang		-0.08	0.20	-0.04	0.011(0.010)
Age 4 Home Nurturance		-1.40	1.49	-0.10	
3. Age 4 Transcribed Lang		-0.08	0.20	-0.04	0.020 (0.008)
Age 4 Home Nurturance		-1.35	1.49	-0.10	
Age 4 Lang x Age 4 Home		-1.21	1.40	-0.09	

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.6.1.2 Maternal Nurturance Moderating the Association between Behavioral Symptoms and Child Language at One-Year Follow-Up

As it was hypothesized that there would be a bidirectional relationship between language and behavioral symptoms, an additional series of hierarchical linear regressions was employed to test the hypothesis that Maternal Nurturance may moderate the association between maternal ratings of child behavior and child language at one year follow-up. In these analyses, language measures at ages three and four served as the dependent variables. The CBCL subscales were entered first, followed by the HOME rating of Maternal Nurturance, and the interaction between the HOME and the CBCL subscales. These analyses were performed between the age two CBCL subscales and the age three language factor, and the age three CBCL subscales and the age four language factor. As can be seen in Table 14, and as found with previous analyses testing the moderating role of Maternal Nurturance, there was little evidence that Maternal Nurturance moderated the association between CBCL ratings of children's behavior and later language.

Table 14. Moderating Role of Maternal Nurturance between Behavioral Ratings and Later Language Development

Model	*N*	B	SE B	β	R^2 (Δr^2)
Age 3 Fluharty-2 General Lang					
1. Age 2 Withdrawn Behavior	130	-1.10	0.54	-0.18*	0.032(0.032)*
2. Age 2 Withdrawn Behavior		-0.85	0.55	-0.14	0.055(0.023)#
Age 2 Home Nurturance		10.91	6.14	0.16#	
3. Age 2 Withdrawn Behavior		-0.96	0.55	-0.16#	0.070(0.015)
Age 2 Home Nurturance		13.82	6.46	0.20*	
Age 2 With x Age 2 Home		-3.71	2.64	-0.13	
1. Age 2 Attention Problems	130	-0.14	0.52	-0.02	0.001(0.001)
2. Age 2 Attention Problems		0.01	0.52	0.01	0.037(0.036)*

Age 2 Home Nurturance		13.28	6.05	0.19	
3. Age 2 Attention Problems		0.02	0.52	0.01	0.045(0.008)
Age 2 Home Nurturance		14.22	6.12	0.21*	
Age 2 With x Age 2 Home		-3.99	3.83	-0.09	
Age 3 Transcribed Language					
1. Age 2 Withdrawn Behavior	118	-0.06	0.06	-0.10	0.010(0.010)
2. Age 2 Withdrawn Behavior		-0.05	0.06	-0.09	0.015(0.015)
Age 2 Home Nurturance		0.46	0.62	0.07	
3. Age 2 Withdrawn Behavior		-0.06	0.06	-0.10	0.016(0.001)
Age 2 Home Nurturance		0.51	0.64	0.08	
Age 2 With x Age 2 Home		0.10	0.28	-0.04	
1. Age 2 Attention Problems	118	-0.06	0.05	-0.12	0.015(0.015)
2. Age 2 Attention Problems		-0.06	0.05	-0.11	0.021(0.007)
Age 2 Home Nurturance		0.53	0.60	0.08	
3. Age 2 Attention Problems		-0.06	0.05	-0.11	0.032(0.011)
Age 2 Home Nurturance		0.40	0.61	0.06	
Age 2 With x Age 2 Home		0.42	0.37	0.11	
Age 4 Fluharty-2 General Lang					
1. Age 3 Withdrawn Behavior	139	-1.17	0.48	-0.20*	0.034(0.034)*
2. Age 3 Withdrawn Behavior		-1.01	0.49	-0.17*	0.059(0.025)
Age 3 Home Nurturance		11.23	6.96	0.14	
3. Age 3 Withdrawn Behavior		-0.99	0.49	-0.17*	0.060(0.001)
Age 3 Home Nurturance		10.78	7.03	0.13	
Age 3 With x Age 3 Home		1.39	2.74	0.04	
1. Age 3 Attention Problems	139	-1.31	0.51	-0.22*	0.046(0.046)*
2. Age 3 Attention Problems		-1.20	0.51	-0.20*	0.067(0.021)#
Age 3 Home Nurturance		11.95	6.85	0.15#	
3. Age 3 Attention Problems		-1.21	0.51	-0.20*	0.073(0.006)
Age 3 Home Nurturance		11.15	6.91	0.14	
Age 3 With x Age 3 Home		3.35	3.61	0.08	
Age 4 Transcribed Language					
1. Age 3 Withdrawn Behavior	99	-0.04	0.06	-0.08	0.007(0.007)
2. Age 3 Withdrawn Behavior		-0.05	0.06	-0.09	0.011(0.004)
Age 3 Home Nurturance		-0.42	0.66	-0.07	
3. Age 3 Withdrawn Behavior		-0.05	0.06	-0.10	0.012(0.001)
Age 3 Home Nurturance		-0.41	0.66	-0.07	
Age 3 With x Age 3 Home		-0.08	0.29	-0.03	
1. Age 3 Attention Problems	99	-0.02	0.05	-0.02	0.002(0.002)
2. Age 3 Attention Problems		-0.01	0.05	-0.05	0.006(0.004)
Age 3 Home Nurturance		-0.41	0.67	-0.12	
3. Age 3 Attention Problems		-0.03	0.05	-0.07	0.060(0.054)*
Age 3 Home Nurturance		-0.79	0.68	-0.12	
Age 3 Att x Age 3 Home		0.79	0.34	0.24*	

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

There was also a significant main effect of age two Maternal Nurturance on children's language at age three. Higher levels of Maternal Nurturance at age two appeared to be associated with higher scores on the Fluharty-2 at age three after accounting for ratings either of children's Withdrawn Behavior or Attention Problems at age two. However, age three Maternal Nurturance was not significantly associated with later ratings of children's language.

Similar to the correlations presented in Table 7, which shows associations between CBCL ratings and children's transcribed language, there were no main effects of maternal report of Withdrawn Behaviors and Attention Problems at either age two or three on subsequent measures of Transcribed Language factor. Furthermore, there were no main effects of Maternal Nurturance on the Transcribed Language factor. There was a single significant interaction; the interaction between Maternal Nurturance and ratings of Attention Problems at age three was significant in predicting the age four Language Factor ($B = 0.79$, $SE = 0.34$, $\beta = 0.24$, $p < 0.05$). The pattern of interaction is shown below in Figure 15.

Test of the Simple Slopes of this significant interaction suggested that Maternal Nurturance was a significant moderator of the relationship between age 3 CBCL Attention Problems and Transcribed Language factor at age four. The unstandardized simple slope for children whose mothers were 1 SD below the mean on Maternal Nurturance was -0.17, for children whose mothers showed mean levels of Maternal Nurturance was -.04, and for children with mothers who displayed Maternal Nurturance 1 *SD* above the mean was 0.08 (see Figure 15). Of these three simple slopes, only at 1 SD below the mean of Maternal Nurturance was the slope significant ($t = -2.15$, $p < .05$). This interaction suggests that in the context of low levels of Maternal Nurturance at age three there was a negative association between maternal report of Attention Problems at age three and language at age four.

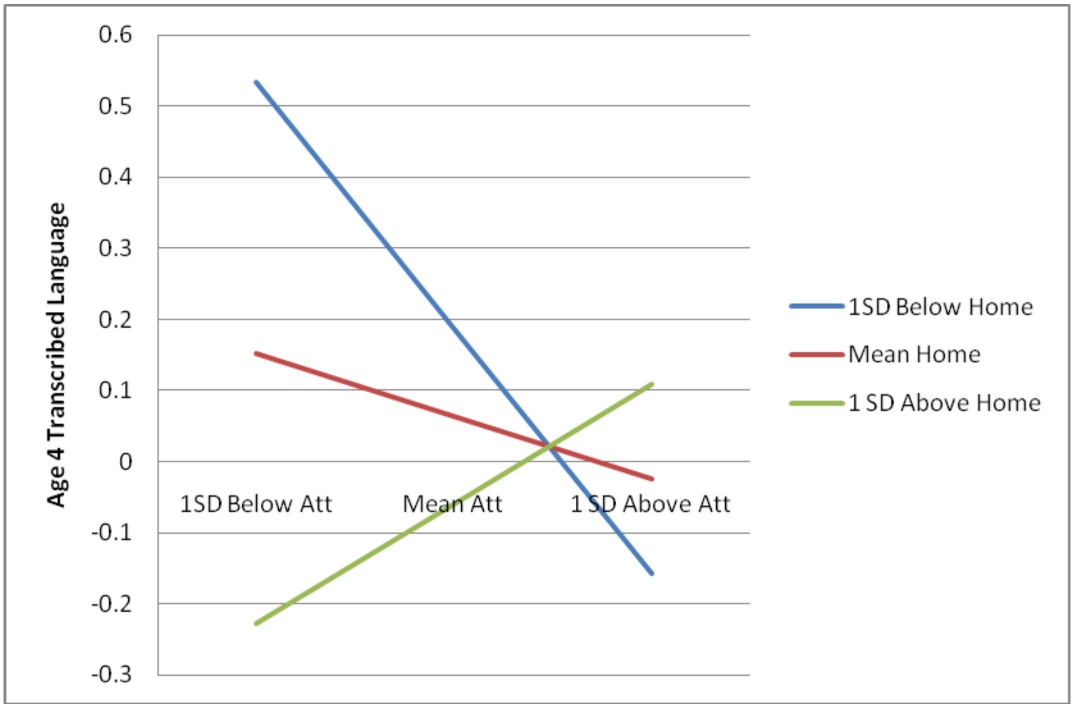


Figure 15. Simple Slopes of Age 3 Attention Problems Predicting Age 4 Transcribed Language at 1 SD below the mean, at mean, and 1 SD above the mean Home scores

5.6.2 Results for Hypothesis 3b: Moderating Role of Emotion Regulation Strategies

It was hypothesized that the observed emotion regulation strategies, Active Distraction and Focus-on-Delay-Object would also moderate the relationship between children's language abilities and behavioral adjustment. To test this hypothesis, another series of hierarchical linear regressions was performed. As with Hypothesis 3a, in the first series of regressions, the 2 CBCL subscales were the dependent variable. Thus either Fluharty-2 scores or the latent language factor were entered first into the equation, followed by either of the two ER strategies (i.e., Active Distraction and Focus-on-Delay-Object), and the interaction between the ER strategies and the language variable. The second series of regressions was performed with either the Fluharty-2 or latent language factor as the dependent variable, with the CBCL subscales entered first into the equation, followed by ER strategy use and the interaction between ER strategy and the language variable.

5.6.2.1 Moderating Role of Emotion Regulation Strategies on the Association between Age Three and Age Four Fluharty-2 General Language Quotients and Age Four and Age Five CBCL Ratings

The first set of hierarchical linear regressions examined the moderating role of two ER Strategies, Active Distraction and Focus-on-Delay-Object, on the associations between Fluharty-2 General Language Quotients at ages three and four and CBCL Withdrawn Behavior and Attention Problems subscales at one-year follow-up. As was seen in the regression analyses with Maternal Nurturance as a moderator between Fluharty-2 scores and later child behavioral symptoms, there were no significant interactions at either age three or four (see Table 15).

Again, as found in analyses focused on the moderating role of Maternal Nurturance, there were two main effects of child ER Strategy Use on maternal ratings of child behavior after accounting for children's performance on the Fluharty-2. Observer ratings of Active Distraction at age three were significantly associated with age four maternal report of children's Withdrawn Behavior on the CBCL (B =-3.90, SE = 1.46, β = -0.23, $p < 0.01$). This association was negative, which indicates that children who used greater levels of Active Distraction during the age 3 Wait Task had lower ratings of Withdrawn Behavior at age four. Observed levels of Active Distraction at the age 4 assessment were also found to be significantly associated with Age five maternal ratings of Attention Problems on the CBCL (B = 3.80, SE = 1.49, β = 0.23, $p < 0.05$). This pattern was the opposite of the pattern observed between age 3 Child Active

Distraction and age four Withdrawn Behaviors, indicating that children who used higher levels of Active Distraction during the Age four visit had mothers who reported higher levels of Attention Problems during the age five assessment.

Table 15. Moderating Role of Observed Child Emotion Regulation between Fluharty-2 Scores and Later CBCL Ratings

Model	*N*	B	SE B	β	R^2 (Δr^2)
Age 4 Attention Problems					
1. Age 3 Fluharty-2	123	-0.01	0.02	-0.06	0.004(0.004)
2. Age 3 Fluharty-2		-0.01	0.02	-0.06	0.004(0.000)
Age 3 Active Distraction		0.48	1.46	0.03	
3. Age 3Fluharty-2		-0.01	0.02	-0.07	0.007(0.003)
Age 3 Active Distraction		0.41	1.47	0.03	
Age 3 Flu-2 x Age 3 Dis		0.07	0.13	0.05	
1. Age 3 Fluharty-2	123	-0.01	0.02	-0.06	0.004(0.004)
2. Age 3 Fluharty-2		-0.01	0.02	-0.03	0.027(0.024)#
Age 3 Focus on Delay		3.65	2.12	0.16#	
3. Age 3 Fluharty-2		-0.02	0.02	-0.09	0.043(0.016)
Age 3 Focus on Delay		2.35	2.31	0.10	
Age 3 Flu-2 x Age 3 Foc		-0.34	0.25	-0.15	
Age 4 Withdrawn Behavior					
1. Age 3 Fluharty-2	123	-0.02	0.02	-0.11	0.012(0.012)
2. Age 3 Fluharty-2		-0.02	0.02	-0.10	0.063(0.051)*
Age 3 Active Distraction		-3.73	1.46	-0.23*	
3. Age 3Fluharty-2		-0.02	0.02	-0.11	0.078(0.014)
Age 3 Active Distraction		-3.90	1.46	-0.24**	
Age 3 Flu-2 x Age 3 Dis		0.18	0.13	0.12	
1. Age 3 Fluharty-2	123	-0.02	0.02	-0.11	0.012(0.012)
2. Age 3 Fluharty-2		-0.02	0.02	-0.10	0.020(0.008)
Age 3 Focus on Delay		2.17	2.17	0.10	
3. Age 3 Fluharty-2		-0.02	0.02	-0.12	0.024(0.004)
Age 3 Focus on Delay		1.50	2.40	0.06	
Age 3 Flu-2 x Age 3 Foc		-0.18	0.25	-0.07	
Age 5.5 Attention Problems					
1. Age 4 Fluharty-2	126	-0.03	0.03	-0.11	0.011(0.011)
2. Age 4 Fluharty-2		-0.03	0.03	-0.11	0.048(0.036)*
Age 4 Active Distraction		3.15	1.45	0.19*	
3. Age 4 Fluharty-2		-0.04	0.03	-0.12	0.070(0.022)#
Age 4 Active Distraction		3.80	1.49	0.23*	
Age 4 Flu-2 x Age 4 Dis		-0.21	0.13	-0.15#	
1. Age 4 Fluharty-2	126	-0.03	0.03	-0.11	0.011(0.011)

2. Age 4 Fluharty-2		-0.03	0.03	-0.10	0.024(0.013)
Age 4 Focus on Delay		2.49	1.94	0.12	
3. Age 4 Fluharty-2		-0.03	0.03	-0.11	0.032(0.007)
Age 4 Focus on Delay		2.84	1.97	0.13	
Age 4 Flu-2 x Age 4 Foc		-0.19	0.19	-0.09	
Age 5.5 Withdrawn Behaviors					
1. Age 4 Fluharty-2	126	-0.01	0.01	-0.03	0.001(0.001)
2. Age 4 Fluharty-2		-0.01	0.01	-0.03	0.001(0.000)
Age 4 Active Distraction		-0.20	0.72	-0.03	
3. Age 4 Fluharty-2		-0.01	0.01	-0.03	0.002(0.001)
Age 4 Active Distraction		-0.19	0.75	-0.02	
Age 4 Flu-2 x Age 4Dis		-0.01	0.06	-0.01	
1. Age 4 Fluharty-2	126	-0.01	0.01	-0.03	0.001(0.001)
2. Age 4 Fluharty-2		-0.01	0.01	-0.03	0.004(0.003)
Age 4 Focus on Delay		0.55	0.95	0.05	
3. Age 4 Fluharty-2		-0.01	0.01	-0.01	0.030(0.026)#
Age 4 Focus on Delay		0.23	0.96	0.02	
Age 4 Flu-2 x Age 4 Foc		0.17	0.09	0.17#	

# $p < .10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.6.2.2 Moderating Role of Emotion Regulation on the Association between Age Three and Age 4 Transcribed Language Factor and Age Four and Five CBCL Ratings

The next group of hierarchical linear regressions, shown in Table 16, examined the moderating role of ER Strategy Use on the associations between the Transcribed Language factor at ages 3 and 4 and CBCL Withdrawn Behavior and Attention Problems subscales at one-year follow-up. Consistent with previous analyses, and as can be seen in Table 16, there was no indication of any interactions between observed ER strategies and children's transcribed language at either ages three or four years. Furthermore, only one main effect was found. It was found that children's Focus-on-Delay-Object at age three was significantly associated with age four maternal ratings of attention problems after accounting for children's transcribed language at age three and the interaction between language and Focus on Delay ($B = 4.60$, $SE = 1.97$, $\beta = 0.23$, $p < 0.05$). This association was positive, which suggests that children who more frequently focus on the delay during the Wait Task at age 3 had mothers who reported higher levels of CBCL Attention Problems at age 4.

Table 16. Moderating Role of Observed Child Emotion Regulation between Transcribed Measure of Child Language and Later CBCL Ratings

Model	*N*	B	SE B	β	R^2 (Δr^2)
Age 4 Attention Problems					
1. Age 3 Lang Factor	110	-0.23	0.20	-0.11	0.013(0.013)
2. Age 3 Lang Factor		-0.24	0.21	-0.12	0.013(0.000)
Age 3 Active Distraction		0.26	1.81	0.02	
3. Age 3 Lang Factor		-0.25	0.22	-0.12	0.014(0.001)
Age 3 Active Distraction		0.21	1.83	0.01	
Age 3 Lang x Age 3 Dis		0.41	1.49	0.03	
1. Age 3 Lang Factor	110	-0.23	0.20	-0.11	0.013(0.013)
2. Age 3 Lang Factor		-0.16	0.20	-0.08	0.061(0.048)*
Age 3 Focus on Delay		4.55	1.94	0.22*	
3. Age 3 Lang Factor		-0.16	0.20	-0.08	0.061(0.000)
Age 3 Focus on Delay		4.60	1.97	0.23*	
Age 3 Lang x Age 3 Foc		0.39	1.97	0.02	
Age 4 Withdrawn Behavior					
1. Age 3 Lang Factor	110	-0.22	0.19	-0.12	0.013(0.013)
2. Age 3 Lang Factor		-0.13	0.20	-0.07	0.028(0.015)
Age 3 Active Distraction		-2.14	1.69	-0.13	
3. Age 3 Lang Factor		-0.12	0.20	-0.06	0.028(0.000)
Age 3 Active Distraction		-2.08	1.71	-0.13	
Age 3 Lang x Age 3 Dis		-0.44	1.39	0.03	
1. Age 3 Lang Factor	110	-0.22	0.19	-0.12	0.013(0.013)
2. Age 3 Lang Factor		-0.18	0.19	-0.09	0.034(0.020)
Age 3 Focus on Delay		2.78	1.85	0.14	
3. Age 3 Lang Factor		-0.18	0.19	-0.10	0.035(0.001)
Age 3 Focus on Delay		2.68	1.88	0.14	
Age 3 Lang x Age 3 Foc		-0.71	1.88	-0.04	
Age 5.5 Attention Problems					
1. Age 4 Lang Factor	89	-0.18	0.34	-0.06	0.003(0.003)
2. Age 4 Lang Factor		-0.22	0.34	-0.07	0.018(0.015)
Age 4 Active Distraction		2.06	1.78	0.13	
3. Age 4 Lang Factor		-0.23	0.35	-0.07	0.019(0.001)
Age 4 Active Distraction		2.07	1.79	0.13	
Age 4 Lang x Age 4 Dis		0.50	1.82	0.03	
1. Age 4 Lang Factor	89	-0.18	0.34	-0.06	0.003(0.003)
2. Age 4 Lang Factor		-0.22	0.34	-0.07	0.016(0.013)
Age 4 Focus on Delay		2.36	2.23	0.11	

3. Age 4 Lang Factor		-0.19	0.36	-0.06	0.017(0.001)
Age 4 Focus on Delay		2.44	2.26	0.12	
Age 4 Lang x Age 4 Foc		-0.57	2.09	-0.03	
Age 5.5 Withdrawn Behaviors					
1. Age 4 Lang Factor	89	0.01	0.17	0.01	0.001(0.001)
2. Age 4 Lang Factor		0.01	0.18	0.01	0.001(0.000)
Age 4 Active Distraction		0.03	0.91	0.01	
3. Age 4 Lang Factor		0.02	0.18	0.01	0.001(0.000)
Age 4 Active Distraction		0.03	0.91	0.01	
Age 4 Langx Age 4 Dis		0.03	0.93	0.01	
1. Age 4 Lang Factor	89	0.01	0.17	0.01	0.000(0.000)
2. Age 4 Lang Factor		0.02	0.18	0.01	0.007(0.007)
Age 4 Focus on Delay		-0.90	1.13	-0.09	
3. Age 4 Lang Factor		0.01	0.18	0.01	0.009(0.002)
Age 4 Focus on Delay		-0.95	1.15	-0.09	
Age 4 Lang x Age 4 Foc		0.35	1.07	0.04	

# *p* < .10, * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

5.6.2.3 Moderating Role of Emotion Regulation on the Association between CBCL Ratings at Age Three and Age Four Performance on Subsequent Language Measures

Finally, a series of hierarchical linear regressions was performed to study the possible moderating influence of children's ER strategy use on the associations between ratings of behavior on the CBCL Withdrawn Behavior and Attention Problems subscales, and the later Language Measures. The dependent variables included both the Fluharty-2 General Language Quotient and the Transcribed Language factor from the age three assessments. Thus maternal ratings of either Attention Problems or Withdrawn Behavior at age three was entered first, followed by the ER strategy (e.g., Focus-on-Delay-Object or Active Distraction), and finally the interaction between CBCL rating and ER Strategy. The results of these regressions are shown in Table 17.

Table 17. Moderating Role of Observed Child Emotion Regulation between Child Behavior at Age 3 and Measures of Language at Age 4

Model	*N*	B	SE B	β	R^2 (Δr^2)
Age 4 Fluharty-2 General Language					
Age 3 CBCL Attention Problems					
1. Age 3 Attention Problems	131	-1.32	0.52	-0.22*	0.048(0.048)*
2. Age 3 Attention Problems		-1.32	0.52	-0.22*	0.068(0.020)#
Age 3 Child Distraction		13.93	8.27	0.14#	
3. Age 3 Attention Problems		-1.29	0.52	-0.21*	0.070(0.002)
Age 3 Child Distraction		14.14	8.31	0.15#	
Age 3 Att x Age 3 Dis		1.89	4.40	0.04	
1. Age 3 Attention Problems	131	-1.32	0.52	-0.22*	0.048(0.048)*
2. Age 3 Attention Problems		-1.10	0.52	-0.18*	0.092(0.044)*
Age 3 Focus on Delay		-27.67	11.03	-0.22*	
3. Age 3 Attention Problems		-1.14	0.52	-0.19*	0.102(0.010)
Age 3 Focus on Delay		-24.07	11.42	-0.19*	
Age 3 Att x Age 3 Foc		-6.37	5.37	-0.10	
Age 3 CBCL Withdrawn Behavior					
1. Age 3 Withdrawn Behavior	131	-1.12	0.51	-0.19*	0.037(0.037)*
2. Age 3 Withdrawn Behavior		-1.01	0.51	-0.17*	0.049(0.012)
Age 3 Child Distraction		11.05	8.48	0.11	
3. Age 3 Withdrawn Behavior		-1.02	0.52	-0.17*	0.050(0.002)
Age 3 Child Distraction		11.11	8.51	0.12	
Age 3 Att x Age 3 Dis		1.59	3.91	0.04	
1. Age 3 Withdrawn Behavior	131	-1.12	0.51	-0.19*	0.037(0.037)*
2. Age 3 Withdrawn Behavior		-0.87	0.51	-0.15#	0.082(0.052)*
Age 3 Focus on Delay		-27.92	11.17	-0.22*	
3. Age 3 Withdrawn Behavior		-0.83	0.51	-0.14	0.087(0.005)
Age 3 Focus on Delay		-32.04	12.09	-0.25**	
Age 3 With x Age 3 Foc		4.57	5.16	0.08	
Age 4 Transcribed Language Factor					
Age 3 CBCL Attention Problems					
1. Age 3 Attention Problems	93	-0.02	0.05	-0.05	0.002(0.002)
2. Age 3 Attention Problems		-0.02	0.05	-0.04	0.042(0.042)#
Age 3 Child Distraction		1.61	0.84	0.20#	
3. Age 3 Attention Problems		-0.01	0.05	-0.03	0.070(0.039)
Age 3 Child Distraction		1.66	0.83	0.21*	
Age 3 Att x Age 3 Dis		0.66	0.40	0.17	
1. Age 3 Attention Problems	93	-0.02	0.05	-0.05	0.002(0.002)
2. Age 3 Attention Problems		-0.03	0.05	-0.05	0.004(0.002)
Age 3 Focus on Delay		0.43	1.07	0.04	
3. Age 3 Attention Problems		-0.02	0.05	-0.05	0.006(0.002)

Age 3 Focus on Delay		0.34	1.09	0.03	
Age 3 Att x Age 3 Foc		0.25	0.57	0.05	
Age 3 CBCL Withdrawn Behavior	93				
1. Age 3 Withdrawn Behavior		-0.07	0.06	-0.12	0.014(0.014)
2. Age 3 Withdrawn Behavior		-0.05	0.06	-0.08	0.047(0.033)$^{\#}$
Age 3 Child Distraction		1.51	0.85	0.19$^{\#}$	
3. Age 3 Withdrawn Behavior		-0.05	0.06	-0.08	0.047(0.000)
Age 3 Child Distraction		1.50	0.86	0.19$^{\#}$	
Age 3 Att x Age 3 Dis		-0.04	0.45	-0.01	
	93				
1. Age 3 Withdrawn Behavior		-0.07	0.06	-0.12	0.014(0.014)
2. Age 3 Withdrawn Behavior		-0.07	0.06	-0.12	0.016(0.002)
Age 3 Focus on Delay		0.50	1.06	0.05	
3. Age 3 Withdrawn Behavior		-0.10	0.06	-0.17	0.055(0.039)*
Age 3 Focus on Delay		0.80	1.06	0.08	
Age 3 With x Age 3 Foc		-1.41	0.74	-0.20*	

# *p* < .10, * *p* < 0.05, ** *p* < 0.01, *** *p* < 0.001

Consistent with the previous regression equations with ER as a moderator, few significant interactions or main effects were found. There was a significant main effect of age three Focus-on-Delay-Object strategy use on children's performance on the Fluharty-2 at age four after accounting for either age three CBCL Attention Problems (B = -24.07, SE = 11.42, β = -0.19, p < 0.05), or age 3 CBCL Withdrawn Behavior (B = -32.04, SE = 12.09, β= -0.25, p < 0.01). In both equations, the relationship was negative, which indicates that children who display higher levels of Focus-on-Delay-Object at age three were found to have lower scores on the General Language Quotient of the Fluharty-2 at age four. There was one significant main effect for age three Active Distraction strategies on children's Transcribed Language at age 4 (B =1.66, SE = 0.83, β = 0.21, p < 0.05), suggesting that children who used Active Distraction more frequently at age three were more likely to have higher levels of transcribed language at age four.

One significant interaction did emerge between maternal report of CBCL Withdrawn Behavior at age three and observed level of Focus- on-Delay-Object during the age three Wait

Task (*B* =-1.41, *SE* = 0.74, β = -0.20, $p < 0.05$). The pattern of this interaction is illustrated below in Figure 16.

Tests of the Simple Slopes of this significant interaction suggested that children's Focus on Delay during the Wait Task at age three was a significant moderator of the relationship between age three CBCL Withdrawn Behavior and the age four Transcribed Language. The unstandardized simple slope for children whose level of Focus-on-Delay-Objects was 1 *SD* below the mean was 0.04, for children whose mean levels of Focus-on-Delay-Object was -.10, and for children who displayed levels of Focus-on-Delay-Object that was 1 *SD* above the mean was -0.24 (see Figure 16). Of these three simple slopes, only at 1 SD above the mean of Focus-on-Delay-Object was the slope significant ($t = -2.24$, $p <.05$) though there was a trend toward the slope being significant at mean levels of Focus-on-Delay-Object ($t = -1.69$, $p <.10$) Children's levels of Focus on Delay and emotional distress during the Wait Task did not appear to differentiate children's language abilities if the children also had high levels of Withdrawn Behavior. However, the children who were coded as displaying high levels of Focus-on-Delay-Object at age four were found to have a negative association between CBCL Withdrawn Behaviors at age three and Transcribed Language at age four.

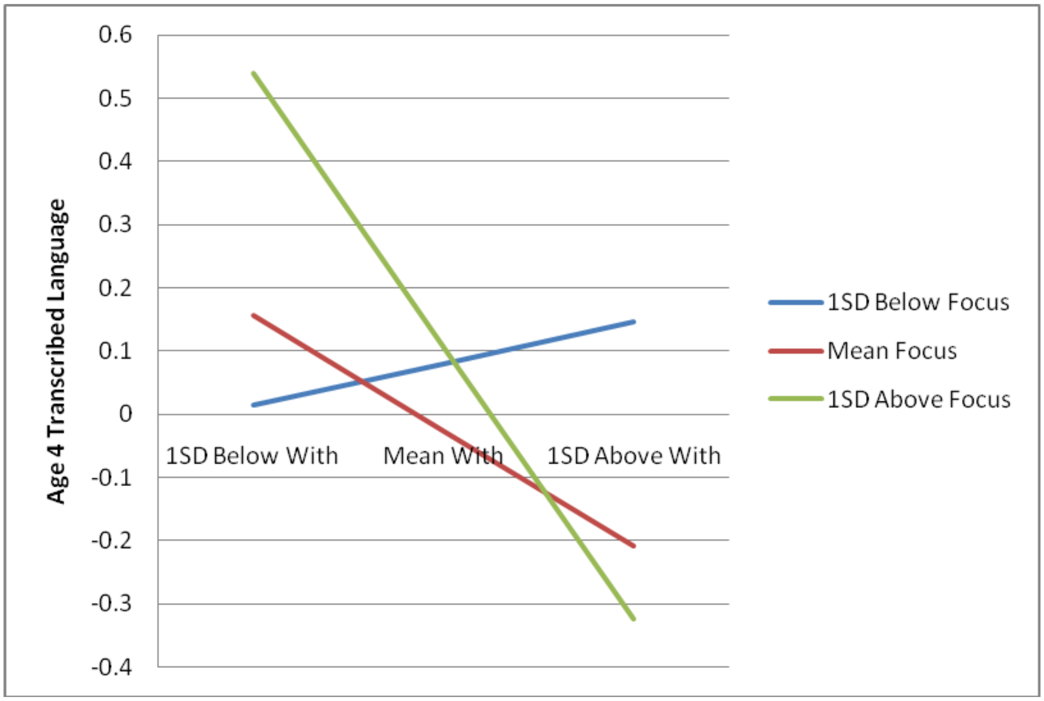


Figure 16. Simple Slopes of Age 3 Withdrawn Behavior Predicting Age 4 Transcribed Language at 1 SD below the mean, at mean, and 1 SD above the mean Focus on Delay

6.0 DISCUSSION

The over-arching goal of this study was to further understand the bidirectional associations between language development and child adjustment in preschool-aged children. Furthermore, as the majority of research has examined the co-occurrence of language development and behavioral problems in either clinic and/or lower-risk middle class samples, this study aimed to explore these associations in a low-income, high-risk sample of children who are at heightened risk for both language and behavioral problems (Brooks Gunn & Duncan, 1997; Horwitz et al., 2003; Qi & Kaiser, 2004).

6.1 REVIEW OF STUDY RESULTS

6.1.1 Trajectories of Language Development

This study had three primary purposes. The first was to identify the patterns of language development from age two to age four in a sample of low-income, high-risk children and examine how these patterns of language development were associated with academic achievement at school entry. While the over-arching goal of this study was to understand the associations between language development and behavioral adjustment, this series of analyses was an important first step in understanding patterns of language development within a high-risk population. Previous research has suggested that a portion of children identified with poor language during toddlerhood may have transient lags that improve by the end of the preschool period (Paul, 1993; Thal et al., 1991). It was hypothesized that children would display three patterns of language development that were indicative of average language development, language delay (i.e., transient language lags), and persistent language problems. Using semi-parametric modeling, the data suggested support for this hypothesis, and a three-group trajectory model was identified. One of these groups could generally be described as children who had language abilities in the average range of functioning from two to four years. There was also a group of children who had lower language skills at age two, but showed a sharper increase in language development from age two to age four, such that their standard scores increased from approximately 1 SD below the mean at age two to scores around the mean of 100 at ages three and four. This group showed a pattern similar to that known in the literature as late talking toddlers (Paul et al., 1997; Rescorla, 2002). However, the final group that included more than half of the children who could be described as having persistently low scores on language measures at all three time points, scored more than 1 SD below the normative mean.

The second part of this hypothesis was that both persistent (i.e., children categorized in the Stable Low group) and late talkers (i.e., children categorized in the Low Increasing group) would show poorer performance on verbal academic tasks than would the group of children who showed more typical patterns of language development (i.e., children categorized in the High Decreasing group). The literature has indicated that while many late-talking toddlers are within the average range of functioning on many academic, reading, and language measures, statistically significant differences between late talkers and typically developing children continue to be present during the school-age period (Paul et al., 1997; Rescorla, 2005).

However, support for this hypothesis was not found, as children in the Low Increasing trajectory group were not found to be significantly different from the High Decreasing trajectory group on language-based measures of academic achievement at age five years. The Low Increasing group's scores on the Woodcock-Johnson were not statistically different from either the group of children with persistent language problems or the typically developing trajectory groups. Of the three groups of children, the children who could be described as having a persistently lower pattern of language development (i.e., the Stable Low trajectory group) showed the lowest performance on the Woodcock-Johnson at five years, and had significantly lower score on the Woodcock-Johnson than children in the High Decreasing trajectory group.

Furthermore, it was hypothesized that children in trajectory groups with lower levels of language in toddlerhood would not differ from the typically developing group in the percentage of children who were at least in the average range of functioning (e.g., at or above a standard score of 90). This hypothesis was generally supported, as the three trajectory groups showed no differences in the percentage of children who were in the average range of academic functioning at age five. However, in analyses that compared only the Stable Low trajectory group with the High Decreasing group, there was a significant difference in the percentage of children who scored within the average range on the Overall Academic Skills, with children in the Stable Low group being less likely to be within the average range than children in the Decreasing High Group. Thus children in the Low Increasing group may have masked the differences between the group of children with the highest language abilities and the trajectory group with the lowest language abilities, such that children in the Stable Low trajectory group do represent children who likely will have greater academic difficulties than other children within the sample.

6.1.2 Bidirectional Associations Between Language Development and Child Adjustment

The second primary goal of this study was to identify longitudinal patterns of co-occurrence between language development and child adjustment. Previous research has found that children who have language problems display higher levels of behavioral problems, including more problems with attention and social withdrawal than their typically developing peers, both concurrent and subsequent to the identification of their language problems (Beitchman, Wilson, Brownlie, Walters, & Et Al., 1996b; Botting & Conti-Ramsden, 2000; Stevenson, Richman, & Graham, 1985). Furthermore, research using clinical and psychiatric populations has suggested that school-aged children with emotional and behavioral problems have higher rates of language impairment than seen in typically developing populations (Cohen et al., 1993; Kim & Kaiser, 2000). Thus it was hypothesized that children with lower observed verbal abilities at ages two, three, and four would have significantly higher rates of emotional and behavioral symptoms at ages three, four, and five, and that those children with higher levels of behavioral symptoms at ages two and three would have lower verbal abilities at ages three and four.

There was partial support for this hypothesis. The first method of testing the hypothesis used bivariate correlations between language and child adjustment measures. These correlations suggested that there were a few significant associations between language development and child adjustment, including primarily concurrent measures of language and behavioral adjustment. However, few correlations continued to be significant at either the two- or three-year follow-ups, and there were no significant associations between measures of child adjustment at age five and previous measures of language development.

The second method of exploring this hypothesis employed autoregressive models to understand longitudinal and transactional associations between language and behavioral adjustment. These models found extremely limited support for transactional processes between language and child adjustment, with few pathways indicating significant direct effects. The stability of the measures of children's language and child adjustment across time was consistently seen in all the models. Associations between age 2 MCDI and age 3 CBCL subscales were found to be some of the few significant pathways; however, both MCDI and CBCL are measures completed by the mother and thus have shared variance, which may explain the significant, albeit modest, loadings between these variables.

6.1.3 Moderating Role of Maternal Nurturance and Emotion Regulation

The final goal of this study was to examine the possible moderating role of two factors that have been found to be associated with both language development and child adjustment. To date, there has been little study of factors that could moderate this association. This study examined two moderators, the first a child measure of emotion regulation and the second, a measure of maternal sensitivity or nurturance. As both maternal nurturance and children's emotion regulation have been significantly associated with language development and behavioral adjustment (Eisenberg et al., 2005; Elardo, Bradley, & Caldwell, 1977; Fujiki et al., 2004; La Paro et al., 2004), it was hypothesized that these variables may moderate the association between language and child adjustment.

While main effects of both emotion regulation and child nurturance on language and child adjustment were found, the results showed little evidence that these variables were moderators of the relationship between language and child adjustment. In fact, only two instances of possible moderation were identified though both interactions showed similar patterns of moderation. Maternal Nurturance at age three moderated the association between

CBCL Attention Problems at age three and the Transcribed Language at age four. It was found that there was a stronger negative association between Attention Problems and Language in the context of lower levels of Maternal Nurturance. Similarly, Focus on Delay during the Wait Task at age three moderated the association between age three CBCL Withdrawn Behavior and Transcribed Language at age four. For children who displayed a higher frequency of Focus on Delay, and thus more distress during the Wait Task, there was a stronger negative association between Withdrawn Behavior at age three and Transcribed Language at age four.

6.2 WHO ARE THE LATE TALKERS IN THIS SAMPLE?

While this study found extremely limited support for the majority of primary hypotheses, two notable findings were identified utilizing a person-oriented modeling approach. First, the use of a semi-parametric modeling procedure supported the validity of identifying a group of late talking preschoolers whose language is temporarily delayed and discriminated it from a group of preschoolers who demonstrate more lasting patterns of language deficits. While the literature has repeatedly suggested that many toddler- and preschool-aged children with initially poor or delayed language "catch up" to their typically developing peers, there have been few studies that have attempted to identify and differentiate these children from those who may have more chronic patterns of language difficulties, particularly using a person-centered method of analysis. Second, children in the different language trajectory groups showed different patterns of academic achievement at school entry.

By using semi-parametric modeling, this study attempted to separate the children who catch up from those who appear to have more lasting language deficits. Within this sample, the late talkers were actually a relatively small group of children just slightly more than 10 percent of this sample compared to the much larger group of children who had continued language lags across all three ages, which comprised close to 60 percent of the sample. This percentage of children who had transient lags is smaller than was reported in more middle-class samples (Rescorla et al., 1997; Thal et al., 1991). In a large sample of more than 2,800 toddlers, 423 children were identified as having low expressive language at age two on the MCDI; however, by age four, nearly half of these children with early expressive language difficulties no longer had scores suggestive of language problems (Bishop et al., 2003). Thus the current sample of low-income children potentially appears to contain a smaller percentage of children who catch up to their peers than might be expected in a normative sample.

However, when the late talking children were compared to the other two groups on academic achievement at age 5, their profile was not significantly different from those children who had displayed the highest language scores (i.e., the High Decreasing group). Thus these findings offer some indication that a group of late talkers can be identified, at least among a sample of children identified on the basis of multiple types of adversity, and, similar to peers living in less adverse socioeconomic contexts, they appear to catch up to their peers by school entry. These findings might be stronger in larger samples, as only 18 children in this sample might be described as "late-talkers," and the absence of significant differences between the Low Increasing group and the other two trajectory groups may be due, in part, to the lack of power.

6.2.1 Methodological Complications of the Trajectory Analyses

One methodological limitation to the analyses makes the replication of these findings necessary, as this limitation severely limits the generalizability and strength of these analyses. While MCDI and Fluharty-2 General Language Quotient were highly correlated (i.e., *r's* > 0.50), there are several significant differences in the methods of measurement between these variables. First, MCDI is solely a construct of expressive (i.e., spoken) language, whereas the Fluharty-2 General Language Quotient is a brief screener of aspects of receptive (i.e., understood) and expressive language. None of the subtests of the General Language Quotient measure expressive vocabulary size, which is measured by the MCDI. Second, the MCDI is a maternal-report measure, while the Fluharty-2 is administered by trained examiners, meaning that there was also a change in informants from ages two to three. As seen in Figure 5, the children who displayed a trajectory of late talking (i.e., the Low Increasing group) showed the most notable rise in language from the age two to age three assessments, and the High Decreasing and Low Increasing trajectory groups had similar scores on the Fluharty-2 at ages three and four, suggesting that the differentiation between the High Decreasing and Low Increasing group may be an artifact of the measures used rather than two distinct patterns of language development.

The changes in the Low Increasing group's standard scores from age two to three allow for alternative explanations of the trajectory's patterns. One theory is that the Low Increasing group is not truly language delayed at age two; rather, these children may have mothers who under-report their children's spoken language. Alternatively, the Low Increasing group might also have language difficulties that are limited to spoken vocabulary size, which is assessed on the MCDI and not on the Fluharty-2.

Furthermore, the Low Increasing trajectory group at age five had Woodcock-Johnson scores that were not significantly different from those children who displayed more typical patterns of preschool language development (i.e., the High Decreasing group), which was not initially hypothesized. Children in the Low Increasing group had scores that could not be statistically differentiated from children in the High Decreasing trajectory group with average language scores across early childhood; however, they were also not significantly different from the children in the Stable Low group. While the absence of significant differences on the WJ scales could support the possibility that the children in this Low Increasing group could be similar to the children in the High Decreasing groups, the small sample size and lack of significant difference with the Stable Low group makes the meaning of the findings unclear. It is possible that the High Decreasing and Low Increasing trajectories represent two distinct groups, but it is also possible that these groups could be artifacts of the change in measures of language from age two to age three.

6.3 WHO ARE THE STABLE LOW LANGUAGE CHILDREN?

Approximately half of the children in this sample were placed in the Stable Low trajectory group. Thus a majority of the children had patterns of language development that were more than one standard deviation below the normative mean on two different measures of language development at three different time points. Furthermore, children in the Stable Low trajectory group had significantly lower scores on the academic achievement scales than did the High Decreasing trajectory group at age five, and the effect size of these differences in later academic achievement was substantial, with more than 15 percent of the variance in two of the Woodcock-Johnson subscales being explained by trajectory group membership.

What led so many of the children in this sample to be in this persistently low trajectory group? While none of these children can be labeled as having clinically impaired language deficits because of the nature of the language measured used, more children in this sample had FLU-2 scores in the Below Average range than would be expected based on a normal distribution (i.e., 13%). Similarly, about 30% of children in this sample scored at or below the normed 10th percentile on the MCDI at age two. Given the size of these two groups, this sample of children may have had poorer language development than one might observe in a normal, low-risk sample. Prevalence estimates of language delays on similar language measures have been found to be much lower in normative samples (Horwitz et al., 2003) while other low-income samples have reported more than half of their sample obtained scores more than 1 SD below the normative mean (King et al., 2005).

One possible explanation for the disproportionately high number of children in the Stable Low group could be genetic and environmental factors that might occur more frequently in a sample that was recruited on the basis of socioeconomic, family, and child risk. In addition to perhaps carrying higher genetic loadings for psychopathology and/or poorer language development, these children are likely to be in rearing environments where they receive less verbal input than middle-income children or lower-income children without additional risk factors present (e.g., maternal depression, being a teen parent) (La Paro et al., 2004).

6.4 WHAT DO AVERAGE WOODCOCK-JOHNSON SCORES MEAN?

While significant differences were found between the Stable Low trajectory group and the High Decreasing group in their performance on all WJ subscales, the mean scores for both of these groups and for the Low Increasing group were all within the average range. The literature has consistently suggested that children living in impoverished environments have lower scores on cognitive and academic achievement than their middle-class peers (McLoyd, 1998), so it was surprising to find that the mean score on the WJ hovered around the normative mean of 100 for all three scales for the Low Increasing and High Decreasing groups (*M* ranged from 99.94 to 102.10; see Table 2). Furthermore, even the children in the Stable Low language trajectory group had scores that were only slightly below the normative mean of 100 (*M* ranged from 96.92 to 99.32, see Table 6) despite having two established risk factors for reduced academic achievement: diminished language abilities (Beitchman, Wilson, Brownlie, Walters, & Et Al., 1996a; Rescorla, 2000) and socio-economic risk (McLoyd, 1998).

The children's scores on the language-based measures also showed improvement from age two to four. For example, at age 2, more than one third of children received scores in the lowest tenth percentile on the MCDI. Similarly, at age 3, the mean score on the General Language Quotient on the Fluharty-2 was just over 80 (1.33 SDs below the normative mean); however, by the time the children were approximately 4-years-old, the sample's mean score on the Fluhary-2 was approximately 90 (.67 SDs below the normative mean). Thus it appears that there was overall improvement in the children's language abilities despite the high-risk, low-income nature of the sample. It is possible that these changes represent regression to the mean and suggest that only in the context of the most severe delays will children not develop the ability to communicate through language. Perhaps the mean WJ scores that were observed are simply an extension of this general level of improvement in language-based abilities from age two to five.

There are other possible explanations for this pattern that are due to way in which language development was measured, or to 'third variable' contextual influences that were not directly examined in the study. First, age 5, when the children were assessed on verbal skills represents the younger end of the age-range of the measure. It is possible that the majority of children scored in the average range due to artifactual factors, such as the 'floor effect' of using the WJ at a developmental period when few items differentiate among levels of academic ability. This possibility could be tested by retesting children on the WJ in later grades, when typically developing children would more likely show greater verbal skills than atypically-developing children. In fact, children in the current sample are being tested on the WJ at ages 7 and 8, so data on this issue will be forthcoming.

Another explanation for these findings could be individual differences in contextual factors that were not carefully measured in the study (e.g., quality of child care, intervention services). For example, perhaps many of the children were enrolled in school readiness programs such as Head Start between the ages of 3 and 5, and their participation in these programs contributed to gains in their academic achievement at school entry.

6.5 METHODS OF MEASURING LANGUAGE IN LOW-INCOME SAMPLES

While not directly hypothesized in this study, the measurement of language within this low-income sample represented a significant challenge. In addition to using the Fluharty-2, a standardized screener for potential language problems, this study also attempted to use transcribed measures of language to examine children's patterns of language development. Unfortunately, coding of transcribed language presented as one of the greatest challenges to the study, as many of the children's language and conversations with their mothers were infrequent or difficult to understand, which limited the meaningfulness of the measures of transcribed language within this dataset.

Transcribed language measures have been shown to contribute to the understanding of the development of language, as they have greater ecological validity than do structured language assessments, and among middle-class, low-risk samples of children, aspects of transcribed language have also been found to identify children with language problems (S. L. Eisenberg, Fersko, & Lundgren, 2001; Hewitt, Hammer, Yont, & Tomblin, 2006). Relatively few studies (Coster, Gersten, Beeghly, & Cicchetti, 1989) have used transcribed language to study patterns of language development in low-income or high-risk samples. Coster and colleagues (1989) found that high-risk toddlers who suffered from a history of maltreatment had lower MLU than socio-demographically-matched toddlers, but, as a whole, all these children were middle- to low-income. Similarly, there is relatively less research on national norms of MLU or NRW, though children who have language delays have been found to use less complex language (Hewitt et al., 2005; Rescorla et al., 2000). One of the primary goals of this study was to provide further insight into impoverished children's language development using measures such as MLU, NRW or the Index of Productive Syntax (Scarborough, 1990).

Unfortunately, neither MLU nor NRW was found to be associated with children's behavioral adjustment over time. The absence of findings may be less an indication of the value of the use of transcribed language and more the consequence of applying it with this sample, particularly given the relatively short period of time that was coded. First, there was a large quantity of missing data, which was due to either the low level of production by the children or the transcribers' inability to understand what the children were saying. While there did not appear to be any consistent pattern for the missing data, and as children with missing data had similar levels of language compared to others in the sample, it is possible that the quantity of missing data decreased the likelihood that individual differences would be found.

In addition to the quantity of the missing data, the nature of the situation in which the children's language was transcribed may have interfered with the statistical meaningfulness of the variables. First, the context of the parent-child interaction was extremely structured. The demands of the context may have limited the expressiveness of children with greater language abilities, such that their language looked less sophisticated while, conversely, the demands and structure of the task supported the children with weaker language skills. Additionally, one task in particular that was completed by the mother-child dyad at the age four assessment (i.e., Etch-A-Sketch task) did not appear to elicit conversation or dialogue. While working on this task together, the dyads generally did not speak, which further reduced the corpus of language that could be analyzed, particularly given the relatively short duration of the mother-child interaction.

6.6 WHY IS THE ASSOCIATION BETWEEN LANGUAGE AND CHILD ADJUSTMENT SO MODEST?

This study found only modest associations between language and child adjustment in this low-income, high-risk sample, with effect sizes that typically explained less than 6 percent of the variance concurrently and even more modest and nonsignificant variance across time. As previously mentioned, there is a substantial body of literature that has found more significant associations between language development and child adjustment, yet those findings were not replicated in these analyses.

However, the sample used in this study is a departure from previous research. First, many of the studies that have found stronger associations between language and child adjustment have relied on populations of children who were being treated for either language impairment

(Aram et al., 1984; Beitchman et al., 1999) or problem behavior (Cohen et al., 1993). Stronger patterns of co-occurrence would be expected among children who have clinically significant language or behavioral problems.

Furthermore, the children in this sample were late-toddler and early-preschool-aged, rather than school-aged, children. Studies that have used samples of either slightly older children (Beitchman et al., 2001; Willinger et al., 2003b) or children who span a broader range of ages (Cantwell & Baker, 1987; Cohen et al., 1993) appear to have found stronger associations between language development and child adjustment. Studies that have used samples of children who were initially seen at two or three years of age have found more limited patterns of association, particularly when the children were followed longitudinally (Rescorla et al., 2007). It is possible that the co-occurrence between child adjustment and language development is stronger when studied in older children, as poorer language abilities may have different meanings for children's development in school-aged children.

This sample includes only children who are low-income and high-risk for behavioral problems, which is a population that has been relatively under-studied in this field (see notable exceptions: Qi & Kaiser, 2004; King et al., 2005). As these high-risk children have many other risks factors that are less likely to be experienced within a normative or middle-class population, language deficits and child adjustment may be more weakly associated due to the children's exposure to many risk factors. In contrast, in the context of fewer risk factors, the role of language problems in children's problem behavior may be more clearly seen and contribute relatively greater variance compared to its level of influence in multi-risk, lower-SES samples.

Methodological limitations of the design also may have attenuated the magnitude of the associations between language and problem behavior. For the transcribed language measures, there was a sizable portion of missing data. It could be theorized that the children who were excluded from further analysis due to their missing data are actually the children of greatest interest, as they expressed less language during the parent-child interactions. However, these children generally did not appear to be significantly different from their peers on other measures of language, such as the MCDI or Fluharty-2. In addition, on measures where there was a significant difference between children who spoke intelligibly at lower versus higher rates, the children with missing data actually performed better on these standardized measures of language development than the rest of the sample. These results make it difficult to conclude that the children with missing transcription data have poorer language skills. Also, this study only examined two aspects of child adjustment, Withdrawn Behavior and Attention Problems, which were selected based on their more consistent patterns of association with language development in the literature (Carson et al., 1998; Cohen et al., 1993; Irwin et al., 2002; Kim & Kaiser, 2000). It is possible that examining other aspects of child adjustment, such as aggression or conduct problems, might have yielded stronger patterns of association with language development. Similarly, using other informants' reports of children's problem behaviors, such as teacher reports of withdrawal and inattention might have led to alternate findings.

6.7 IS THERE MODERATION?

Disappointingly, there was little evidence of the moderating role of children's emotion regulation or maternal nurturance on the associations between language and child adjustment. In fact, there were only modest main effects between language measures and the CBCL subscales. Furthermore, the Fluharty-2 scores appeared to be more strongly associated with child adjustment and the moderating variables than the latent language factor. Out of more than 30 hierarchical linear regressions computed, only two significant interactions emerged. These were the only two significant interactions that were found despite the less conserved method of analysis that did not include controlling prior levels of language ability or child adjustment. Given these results, it is important to not over-estimate the significance of these two interactions, as they may be due to chance. These interactions also have modest effect sizes, with each explaining approximately 4 percent of the variance, which further highlights the need for caution when interpreting their statistical and clinical meaningfulness.

Consistent with previous studies (Murray & Yingling, 2000; Nicely et al., 1999; Shaw & Vondra, 1995), there were main effects of Maternal Nurturance on Withdrawn Behavior, Attention Problems, and Fluharty-2 scores. These patterns were in the expected direction, with higher levels of Maternal Nurturance being associated with higher Fluharty-2 scores and lower CBCL ratings. There was no direct association between Maternal Nurturance and Transcribed Language.

Out of more than 15 hierarchical linear regressions that were calculated, only one interaction was found involving Maternal Nurturance. In this interaction, age 3 Maternal Nurturance moderated the relationship between CBCL Attention Problems at age 3 and Transcribed Language at age 4. The patterns of interaction suggested that children who have less nurturing mothers are more likely to demonstrate a negative association between language and attention.

It was originally hypothesized that higher levels of Maternal Nurturance may attenuate the association between language and child adjustment. Theoretically, children whose mothers are highly nurturing would have children who would be less vulnerable to the previously found link established between early language and later behavioral difficulties or early behavioral problems and later language problems. However, and paradoxically, for children who had lower ratings of Attention Problems at age three, higher levels of Maternal Nurturance (i.e., scores 1 SD above the sample mean) were actually associated with less complex language during the age four mother-child interaction.

Rather than having high levels of Maternal Nurturance attenuate the association between language and inattention, this pattern of moderation indicates that low levels of maternal nurturing behavior may strengthen the relationship between inattentive behaviors and language development. One explanation for this pattern of moderation is that inattentive children are in greater need of encouragement and empathy from their mothers to help orient them to their environment. Without this emotional grounding, inattentive children may spend less time engaging in socially appropriate interactions, which provide valuable opportunities for language development.

Similarly, emotion regulation strategies were related to both behavioral ratings and child language. Active Distraction was found to be associated with behavioral symptoms on the CBCL, with higher levels of Active Distraction being associated with *higher* ratings on the Attention Problem scale and lower ratings on the Withdrawn Behaviors scale. Although the former result was not expected, it is possible that distraction, albeit adaptive in the context of a delay of gratification task, may also be a marker of inattention. The use of Focus-on-Delay as a strategy during the Wait Task was associated in the expected directions with CBCL Attention Problems and Fluharty-2 Scores but was not directly associated with either Withdrawn Behavior or Transcribed Language. However, it was found that Focus-on-Delay moderated the relationship between age three Withdrawn Behavior and age four Transcribed Language. This was the only significant pattern of interaction identified for either emotion regulation strategy.

The second significant interaction occurred between age 3 ratings of Withdrawn Behavior and focus on delay in relation to later transcribed language. This pattern of interaction was similar to the previously described interaction. Children who spent a greater percentage of time engaging in Focus-on-Delay during the Wait Task had higher levels of language provided that they also did not demonstrate above-average levels of withdrawal. High levels of Focus-on-Delay strengthened the negative association between withdrawal and later language development, whereas children who used Focus-on-Delay as an emotion regulation strategy were less frequently found to have a slightly positive association between earlier withdrawal and language problems. Both of these interactions provide some preliminary evidence that characteristics of the child and family may moderate the relationship between language and later adjustment. However, the absence of a consistent pattern of findings illustrates the need for further studies of moderators.

7.0 CONCLUSIONS AND IMPLICATIONS

Overall, this study's hypotheses were partially supported. This study sought to increase the field's understanding of patterns of language development within a high-risk, low-income sample. Furthermore, it attempted to explore longitudinal and bidirectional associations between measures of child adjustment and language. The results of this study provide some evidence that a group of children who demonstrate transient lags in their language can be differentiated from children with persistent patterns of lower language abilities. However, given the small size of this sample and the type of population used, it is important that trajectory analyses of larger, more normative samples be analyzed to discern whether these patterns of development are consistent across other populations. The number of children with language lags may be higher in high risk populations. Clinically, it is important to devise methods for the identification of children who are likely to show early and persistent language deficits, as these children are at greater need of services and support than late talking children, who tend to catch up to their typically developing peers. If the current results are replicated in other high-risk samples, it will also be important for providers to recognize that many children don't catch up and that language at age 2 may signal of more persistent difficulties. Thus it may not be beneficial to "watch and wait."

Second, this study found that there were patterns of association between language and child adjustment; however, these associations were extremely modest and accounted for relatively little variance (r^2 values between .03 and .05). The size of these associations makes it particularly challenging to explore more complex bidirectional and transactional patterns of association, particularly given the small sample size. However, these associations, together with several decades of research, suggest the need to be mindful of evaluating language when treating children with behavioral challenges, and vice versa. It is important to note that while significant associations were found between language and child adjustment, these results support only the idea that language and behavioral problems may co-occur, not that they are causally influenced by each other.

8.0 LIMITATIONS AND FUTURE DIRECTIONS

There were a number of limitations to this study, which may influence the generalizability of the findings. The sample is quite small for the complexity of the analyses used and should be replicated using larger samples of high- and lower-risk children. Since this sample is actually a subsample of a larger study of children, it would be possible to replicate these findings using some of the existing measures of language (e.g., Fluharty, MacArthur), which would substantially increase the power for detecting associations between language functioning and child adjustment. Such replications are also needed, as there were several methodological challenges to the trajectory analyses. The small sample size, use of multiple measures, and presence of only three time points all may influence the results of the semi-parametric modeling.

While there are benefits to using a sample of younger children who were not diagnosed with either language or behavioral problems, this is also a limitation of the findings. Given the measures of language development that were used in the analyses, there was no way to identify children who had clinically significant language impairments. Thus there was no method to determine whether the children classified as having poorer language development were actually language-impaired.

Another limitation was the sample, which only included children who are at heightened risk for behavioral and language problems because of child, family, and socio-demographic risk. At ages two and three years, children in this study were, on average, scoring lower on language measures and higher on ratings of problem behavior than were their typically developing peers. Thus, despite recruiting the sample from multiple geographic locations that included urban, suburban, and rural communities and including a large minority of ethnically-diverse children as well as a comparable percentage of girls and boys, the findings of this study may not generalize to a normative population. As less research has studied trajectories of language development and moderators of language development, testing or even replication of the study hypotheses within a normative sample is needed.

Finally, this study attempted to examine how early language and behavioral difficulties were related to academic achievement and behavioral symptoms from the toddler to school-aged period. While data exist over a period of three and half years, language development occurs prior to the second birthday, and school adjustment continues beyond the start of Kindergarten. Having a longitudinal and prospective design that was begun prior to the toddler period and that included an earlier measure of language would have further strengthened the study's methodological base. Similarly, as language delays may be the result of cognitive deficits, the inclusion of a measure of cognitive ability as a covariate would have further strengthened the study's design.

While this study has a number of limitations, it is an important first step in the understanding early patterns of language development. Additionally, no studies to date have examined maternal and child risk factors as longitudinal predictors of associations between child language and behavioral adjustment from the toddler period through school entry.

APPENDIX A Wait Task Coding System

A.1 START TIMES

Coders must remember that it is very important to start the task at the appropriate time. Do not rely upon the filmer's stopwatch as a guide, the filmer's cues for starting the Wait Task are not the same as the coder's. In *almost every* case, coding should begin when the examiner finishes giving the instructions for the task. In order to begin coding, the examiner *must have done* the following things: 1) Put the top on the toy crate; 2) Hand the cookie or present to the mother. Occasionally, examiners will make mistakes and give the cookie prior to the instructions or put the toys away, or take an inappropriately long period of time to give instructions. If something unusual occurs, bring the tape to the coding team leader for guidance. Similarly, if the examiner gives no instructions write down the ID and bring it to the coding team leader to do the start time by consensus.

A.2 INTERVAL CODES

A.2.1 Child Strategies

Child strategies are the behaviors in which the child engages during task to help them wait for the end of the task. Determine whether the child uses these strategies in each 10 second interval. Multiple, simultaneous occurring with passive waiting or focus on delay.strategies are possible with the exception of distraction simultaneously

A.2.2 Behavior Not Codable

This could be due to the child leaving camera view, an environmental distraction (e.g. alternate caregiver steps in or sibling comes in and plays with TC), or the task ending early. Situations in which the mother ends up on the telephone for the task, the television is turned on, or some other unusual environmental distraction, should be brought to coding team meetings.

A.2.3 Distraction

This is the most frequently coded strategy. It includes all behavior with the goal of occupying the child's attention. Fantasy play, mature conversation with mother, helping mom complete questionnaires, exploration of room, singing, humming, rolling, making faces, sucking toes, listening to someone talking, climbing on furniture, staring in mirror, scratching.

Exploring the room with eyes counts is *only* counted as distraction if it is *very clear* that this looking is goal-oriented. Eye movement clear enough to be counted will most likely be paired with head movement. If you are debating between coding distraction or coding passive waiting due to ambiguous eye movement, code it as passive waiting. Occasionally, a body part will twitch or move slightly when a child is engaging in passive waiting, you should *not* code these incidents as distraction.

Count all walking, running, skipping or twirling about the room. If a child does something like turning off the lights in the room, but is then told not to do that by a figure of authority, the next time the child turns off the lights it is coded as focus on task since the authority figure has made not turning the lights off a part of the task.

In order to provide further information about distraction, we have created two subcategories of distraction. A child may use both types of distraction at the same time.

A.2.4 Interactive Distraction

This code includes all behavior in which the child is distracting themselves by engaging with another person. This person could be: the PC, AC, Filmer, Examiner a sibling or another family member. A mother may initiate a conversation with her child during the task, and this would still be coded as interactive distraction. Frequently, a mother may spend the first ten to twenty seconds setting up the task, and this would be coded as interactive distraction. Any interaction that is initiated by the PC or another person, in which the child and *another* person engage, is interactive distraction as the child is using another person to help distract him/herself. Interactive distraction may be nonverbal, for example, a child and mother looking at each other and smiling would still be coded as interactive distraction.

A.2.5 Solitary Distraction

This code includes all the other types of distraction that a child may use, that do not involve another person. A child playing by himself or dancing around the room would count. A child who is twirling around the room while talking to his mother would be coded as engaging in <u>both</u> forms of distraction. Any *purposeful* body movement that does not involve another person is solitary distraction.

A.2.6 Information gathering

Includes *questions* aimed at learning more about the waiting situation. The goal of this behavior is for the child to learn about the rules and structure of the task. Code a question as Information Gathering only the first time the question is asked. If the same question is asked a second time it is coded as focus on task. A behavior such as, "Can I have the cookie, can I have the cookie, can I have the cookie?" or "Is it time yet? Is it time yet?" would not be coded as information gathering. Information gathering does not include statements or questions indicating that the child wants to change the situation (i.e. getting the toys, leaving the room), such as "I hate waiting," or "I want the cookie!" All questions are not coded as information gathering. The questions must be directly related to the task in order to be coded as information gathering.

A.2.7 Passive Waiting

At least 5 consecutive seconds of non-goal oriented behavior such as sitting or standing. Not engaging in fantasy play, mature conversation, or any other distraction that occupies the child's attention. Child must not be actively looking at something or exploring the environment with his eyes. The child must be a "bump on a log" with a blank stare. The child seems to be "zoning out" when engaging in this behavior. It is possible for a child to be passively waiting, self-soothing, and physical comfort seeking at the same time, such as zoning out while sucking a thumb. If passive waiting is coded in one interval and drags over into the next interval, code the behavior as passive waiting in the second interval no matter how briefly the child passively waits. The 5 second rule only applies to determining if the child has “zoned out” enough for the behavior to be called passive waiting.

A.2.8 Physical comfort-seeking

Includes wanting to be held, touching mother, reclining on mother’s lap, snuggling, etc. Code behaviors as physical comfort seeking only if the touches have a primary goal of being in contact with the mother or alternate caregiver. Do not count touches that are part of a game (i.e patty cake) or that are aggressive. This behavior must be goal oriented, so do not count it if the child accidentally brushes against the mom or touches her while trying to grab something out of her hand. This is the child touching the mother for the comfort that touching brings. A child holding up his arms to be held by the mother or AC would count as physical comfort seeking in that the child is trying to initiate physical contact.

This touching must be initiated by the child. If the touching is initiated by the mother or alternate caregiver, start coding it as physical comfort-seeking once the child has been in contact with the mom or AC for 5 seconds without squirming, struggling with, or otherwise attempting to end his physical contact with the mom or AC. This will mainly come up when the mother places the child on her lap and the child is content in sitting there.

A.2.9 Focus on delay object or waiting task

Speaking about or trying to retrieve the toys. Speaking about or trying to end the waiting period, but not about cookies (e.g. asking mom to play with toys, trying to leave the room or open the box with the toys). Pointing at the toys in the basket would count. Tantruming over toys being picked up would count. Asking questions that are trying to understand the task, such as “Can I play with the toys after I eat the cookie?” or “Can I play with the toys later?” are not initially counted as focus, as they provide the child with information about the task (and are thus coded as Information Gathering). If the child continues to ask the same question over and over, after obtaining an answer, the behavior is focus.

A child throwing things at or acting aggressively toward his mom counts as focus since he is trying to end the waiting period. This code captures bad behavior mainly. Frequently negativity is also focus on delay, but not necessarily. If the child hurts him/herself or begins to fuss over something not task related, then the behavior is not coded as focus although it would still be child negativity.

Whenever the child touches either of the two blue plastic bins it counts as focus, unless the touch seems to be part of the clean-up task. Touching all other bags does not count as focus unless the mom or the examiner has told the child not to get into those bags. As part of the requirements of the task, the child is required to stay within the room. If the child leaves the room, the behavior is considered focus.

If the mom sets a rule and the child breaks the rule then this is coded as focus. If, however, the child continues to break the rule and the mother does not enforce the rule, the rule breaking is no longer considered to be focus after the first interval in which the child breaks the rule. For example, if the mother tells the child, “Come here and talk to me,” if the child ignores the mother’s command, the behavior is coded as focus. However, if the mother does not continue to demand that the child obeys her, the behavior *after the first complete interval after the command* is no longer focus.

A.2.10 Focus by Encouragement

This is when the child acts badly because he is actively encouraged by his mother or the alternate caregiver to do so. This includes any time when the child could be coded as focusing on delay object or waiting task but was lead to do so by his mother or the alternate caregiver. The mother or alternate caregiver may encourage the child to focus by teasing, mocking, or otherwise taunting the child by throwing the rules of the waiting task in his face. The person encouraging the child to focus must be aware of the wait task rules in order for this code to be used.

The most blatant examples of “Focus by Encouragement” are when the mother or alternate caregiver taunts or teases the child so that they remain focused on the task. For example, a mother who waves the cookie in the child’s face, and says “Don’t you want the cookie? Mmmm, it looks really yummy!” would be coded as Focus by Encouragement. Code this behavior whenever you see it, even if the child is able to distract themselves or engage in another behavior while their parent or AC is doing this.

A.2.11 Self-Soothing

The child uses his or her own body or some object to soothe and comfort himself/herself. This includes things like sucking his thumb or fingers, rocking back and forth, touching his hair repeatedly, repeatedly stroking a cheek, cuddling a comfort object, blanket or toy, and drinking from a bottle or sippy cup.

A.3 CHILD AFFECT

Toddlers, especially children with less language, make a wide variety of ambiguous noises. A similar sounding grunt or squeal can be made for both pleasure and frustration/sadness. If a child makes an ambiguous noise in the absence of clear facial affect or physical signs of negativity/positivity (e.g., stomping, flailing the arms, clapping hands), do not code it. This coding system is designed to be conservative, so when in doubt do *not* code it.

A.3.1 Affect Not Codeable

This could be due to the child or mother leaving the camera view, an environmental distraction, or the task ends early. The person's face must be viewable for 4 consecutive or nonconsecutive seconds during the interval in order to get affect codeable but not get positivity or negativity. Positivity and negativity can be given even if the person is not viewable for 4 seconds of the interval.

A.3.2 Child Positivity

Positivity can be demonstrated by child through laughter, giggling and smiling as well as the tone of voice. If you cannot see the child's face, but you hear what is unmistakably laughter or giggling, code the child as displaying positivity. Occasionally, when you cannot see a face, you will "hear a smile" in the person's tone of voice. In other words, what the child is saying is affectively positive. This does not mean that the content of what the child is saying is positive, but the tone of the statement is positive (e.g., saying, "This is so much fun," in a sarcastic manner is not positive, despite the positive content.) Only code tone of voice in the absence of facial expression as positivity if it is **obvious**; do not code ambiguous or weakly positive tone of voice as positivity.

In general the following behaviors may be coded as positivity:

1. Positive physical gestures: Hugs, kisses, clapping, smiles and laughter.
2. Positive comments: Anything said with a positive tone of voice regardless of the content.

A.3.3 Child Negativity

A child may demonstrate negativity by crying, whining, frowning, pouting, fussing or throwing a temper tantrum, as well as engaging in acts of physical aggression. In children with some language, negativity can also be present in the tone of voice. Additionally, some children may physically display negativity (e.g., squirming to get out of their mother's arms; stomping their feet, flailing on the floor, hitting the mother). A child who expresses frustration or anger with the task, regardless of the tone of voice, would be coded as displaying negativity (e.g., "I hate this!", "If I have to play with this dumb toy for one more minute, I am going to kill myself.") Sarcasm would also be coded as negativity (e.g., "Playing with this broken dinosaur is *really fun.*")

In general the following behaviors may be coded as negativity:

1. Negative physical gestures: Hitting, kicking, stomping, pouting, crying, screaming, etc.
2. Negative comments: Anything said with a negative tone of voice, shouting angrily, sarcasm, complaining, whining, nagging, etc.

A.4 MATERNAL AFFECT

A.4.1 Maternal Positivity

Positivity can be demonstrated by the mother in the same way as was demonstrated by the child: laughing, giggling, smiling and a positive tone of voice. Again, if you cannot see the mother's face, but you hear what is unmistakably laughter, code the mother as displaying positivity. Only code tone of voice in the absence of facial expression as positivity if it is obvious; do not code ambiguous or weakly positive tone of voice as positivity. Usually, tone of voice in the absence of clear facial expressions needs to be accompanied by praise of some type. A mother may indicate positivity by praising her child (e.g., "Good job with waiting while mommy works on these questions!") or clapping; however, these statements need to be somewhat affectively charged— the tone of the voice needs to reflect the message that the mother is communicating.

In general the following behaviors may be coded as negativity:

1. Positive physical gestures: Hugs, kisses, clapping, smiles and laughter.
2. Positive comments: Anything said with a positive tone of voice regardless of the content.
3. Praise or complimenting the child (provided it is accompanied by some positive affect).

A.4.2 Maternal Negativity

A mother may indicate negativity in the tone of her voice, scowling, sighing or yelling, or via nonverbal gestures (e.g., threatening to hit the child, expressions of anger). Mothers who are reprimanding or scolding their children may sound irritated or annoyed with their children. Mothers who physically swat or grab their child for punishment should also be coded as displaying negativity. Also, extremely inappropriate comments or put-downs should be coded as maternal negativity, *even if the tone is not strongly negative* (e.g., "You are being such a brat").

Any name-calling by a mother should be coded as negativity. Obvious complaints about the child can also be coded as negativity (e.g., “Why can’t you ever do what I tell you to?”); however, they should be accompanied by some frustration in the tone of voice. Any threat by a mother with or without a negative tone of voice should count as negativity (e.g., A mother while *laughing* says, “I’m going to trade you in for a different child!” or “If you don’t sit still, I’m going to get the spoon!”) A mother who is telling her child not to do something is *not* coded as displaying negativity, unless her tone of voice makes it clear that she is angry or frustrated.

In general the following behaviors may be coded as negativity:

1. Negative physical gestures: Hitting, spanking, swatting, stomping, grabbing a child harshly, etc.
2. Negative comments: Anything said with a negative tone of voice, shouting angrily, name-calling, issuing harsh threats, complaining, yelling, scolding, etc.

A.5 GLOBAL CODES

A.5.1 Advanced Organizers

This code is used to assess how well the parent sets up the task for the child so that the child has an understanding of what is going on. The parent can do this by:

1) Providing an overview of the task requirements and the task goal:

- “You’re going to have to wait for a few minutes while mommy completes questionnaires.”
- “They had to put the toys away for a little while but more toys will come out after I’m finished (with questionnaires).”
- “Her [*sic*] give it back later”

- “Sit here with mommy”

- “Mommy has to do this”

2) Relating the current task to a task more familiar to the child:

- “This is just like when we have to wait at the doctor’s office”

3) Directing attention to important aspects of the task or identifying possible problem areas for the child:

- “We have a limited amount of time.” (Identifying a task constraint)

4) Offering suggestions for how to organize and approach the task:

- “You may get bored so why don’t you find something else to occupy yourself.”

A.5.2 Things to consider

- Ask yourself if the mom’s action prepares the child for the actual task
- This is only coded in the beginning of the task - once the first 30 seconds (this may change to a minute or whatever is reasonable) has finished any of these statements are no longer an advanced organizer
- Only up the score if the mom adds additional information in her preparation for the task, not if she is just repeating herself over and over again.
- Count advanced organizers even if they are the mother’s reaction to the child’s bad behavior.

A single comment can be counted as both an advanced organizer and strategy information.

A.5.3 5-point rating system:

1 = No advance organizers given.

2 = Some less than adequate organizer is given (Mommy is going to do this, can you sit there for a minute.)

3 = Adequate advance organizers. (Usually includes 1 - 2 of the defining features but may not be in detail, or mom may give 2-3 advanced organizers in one category)

4 =

5 = Excellent advance organizers. (Usually includes 2 - 3 of the defining features with attention to detail)

A.5.4 Strategy Information

This code is used to assess the amount of task/strategy information parents provide to the child. Task/strategy information is defined as any information that makes the thought process salient for the child or serves to advance the child's understanding of the problem-solving situation. These may include:

1) Discussing general task management strategies/techniques

- "You might get bored, so why don't you find something to do."

Can have overlap with advanced organizers in the beginning and then it's coded independently.

2) Suggesting specific strategies to use-Count quality and quantity.

- "Why don't you come over and read my questionnaire with me?"
- "Count how many blocks are in the wall over there."
- "Why don't you sing a song?"
- "Help me with your brother."
- "Take your medicine."
- "Why don't you take off your shoes?"

- “Look at these papers with me.”

3) Providing information about how to use strategies

4) Discussing reasons for using particular strategies

- “If you sing a song the time will go faster.”

5) Describing conditions when particular strategies would be beneficial.

The mom repeating herself only counts to a point. Saying the same thing over and over doesn’t get more credit unless she is adding something to the help.

A.5.5 5-point rating scale:

1 = No task or strategy information was provided.

2 = One very general strategy is given but does not go far enough to answer “why” or give specific information on how to engage that strategy

3 = Useful strategy information is shared several times, or one valuable strategy or good quality piece of strategy information is shared.

4 =

5 = Very valuable strategy information is shared regularly.

A.5.6 Encouragement

This code is used to assess the adequacy of the parents’ attempts to support the child’s efforts during the task or to maintain the child’s good behavior during the task. The quantity and quality of the encouragement counts. Parental support may include:

1) presenting the task as a worthwhile challenge, pointing out that attempting difficult tasks can be fun, or discussing the merits of the task;

- "Oh this would be a good time for you to sing the ABC song!"
- Mom is acting silly or has a very peppy/happy tone to her voice.

2) providing motivational/ bolstering statements throughout the instructions:

For example: Good, That's good, You got it!, Very good! That's a good way to do it. There you go! Such a big boy! You can do it! Thank you for getting me those pieces! What a good helper! You're being a good baby today huh?Etc.

Supporting the child's positive behavior through acknowledging his behavior and reinforcing that behavior counts as encouragement.

3) Bribery/reward

A.5.7 5-point rating scale:

1 = No supportive statements offered.

2 = 1 supportive comment

3 = Adequate support provided: several encouraging comments but not necessarily consistently through the task (many times they are all bunched at the end)

4 =

5 = High degree of support offered: numerous encouraging comments; consistently encouraging/supportive to the child

A.5.8 Recruiting Child's Active Cognitive Involvement

The degree to which the parents encouraged their child's active cognitive involvement in the problem-solving task rather than simply stating the answer, directing their child's actions, or doing the task for the child. Parents who used <u>prompts, questions, and hints</u> are credited with encouraging the child to take an active role cognitively. Ask yourself if the mother's comments get the child to think about his actions and how to handle the situation. **If the mom intervenes too quickly and answers the question for the child it does not count as active involvement (e.g. "What do you think you could do during this time? Do you think you could read a book?" (Mom points to answer her own question)**

Example of active cognitive involvement: Mom says, "What are you going to do while mommy does this?"

A.5.9 5-point rating scale:

1 = No prompts, hints, or questions used to encourage child's active role. Parent simply tells child the answer or what to do or does it for the child.

2 =

3 = Several instances of prompts, hints, or questions used to encourage child′s active role along with several instances of more directive techniques.

4 =

5 = Prompts, hints, and questions are used regularly to encourage the child′s active role in problem-solving process.

BIBLIOGRAPHY

Achenbach, T. M., & Rescorla, L. A. (2000). *Manual for the ASEBA Preschool Forms and Profiles*. Burlington, VT: University of Vermont Department of Psychiatry.

Adams, C. D., Hillman, N., & Gaydos, G. R. (1994). Behavioral difficulties in toddlers: Impact of sociocultural and biological risk factors. *Journal of Clinical Child Psychology, 23*, 373-381.

Aguilar, B., Sroufe, L., Egeland, B., & Carlson, E. (2000). Distinguishing the early-onset/persistent and adolescence-onset antisocial behavior types: From birth to 16 years. *Development & Psychopathology, 12*, 109-132.

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment*. Hillside, NJ: Lawrence Erlbaum.

American Psychiatric Association (2000). *Diagnostic and Statistical Manual of Mental Disorders* (4th, Text Revised ed.). Washington, D.C.: American Psychiatric Association.

Anderson, J. C., & Gerbing, D. W. (1988). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin*, *103*, 411-423.

Aram, D. M., Ekelman, B. L., & Nation, J. E. (1984). Preschoolers with language disorders: 10 years later. *Journal of Speech & Hearing Research, 27*, 232-244.

Arriaga, R. I., Fenson, L., Cronan, T., & Pethick, S. J. (1998). Scores on the MacArthur Communicative Development Inventory of children from low- and middle-income families. *Applied Psycholinguistics, 19*, 209-223.

Baker, L., & Cantwell, D. P. (1982a). Developmental, social and behavioral characteristics of speech and language disordered children. *Child Psychiatry & Human Development, 12*, 195-206.

Baker, L., & Cantwell, D. P. (1982b). Psychiatric disorder in children with different types of communication disorders. *Journal of Communication Disorders, 15*, 113-126.

Baker, L., & Cantwell, D. P. (1987). Comparison of well, emotionally disordered, and behaviorally disordered children with linguistic problems. *Journal of the American Academy of Child & Adolescent Psychiatry, 26*, 193-196.

Baker, L., & Cantwell, D. P. (1992). Attention deficit disorder and speech/language disorders. *Comprehensive Mental Health Care, 2*, 3-16.

Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin, 121*, 65-94.

Barkley, R. A. (1998). *Attention-deficit hyperactivity disorder: A handbook for diagnosis and treatment*. New York: The Guilford Press.

Baumwell, L., Tamis-LeMonda, C. S., & Bornstein, M. H. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior & Development, 20*, 247-258.

Beck, J. E., & Shaw, D. S. (2005). The influence of perinatal complications and environmental adversity on boys' antisocial behavior. *Journal of Child Psychology and Psychiatry 46*, 35-46.

Bee, H. L., Barnard, K. E., Eyres, S. J., Gray, C. A., Hammond, M. A., Spietz, A. L. et al. (1982). Prediction of IQ and language skill from perinatal status, child performance, family characteristics, and mother-infant interaction. *Child Development, 53*, 1134-1156.

Beitchman, J. H., Douglas, L., Wilson, B., Johnson, C., Young, A., Atkinson, L. et al. (1999). Adolescent substance use disorders: Findings from a 14-year follow-up of speech/language-impaired and control children. *Journal of Clinical Child Psychology, 28*, 312-321.

Beitchman, J. H., Hood, J., & Inglis, A. (1990). Psychiatric risk in children with speech and language disorders. *Journal of Abnormal Child Psychology, 18*, 283-296.

Beitchman, J. H., Hood, J., Rochon, J., & Peterson, M. (1989). Empirical classification of speech/language impairment in children: II. Behavioral characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry, 28*, 118-123.

Beitchman, J. H., Nair, R., Clegg, M., & Ferguson, B. (1986). Prevalence of psychiatric disorders in children with speech and language disorders. *Journal of the American Academy of Child Psychiatry, 25*, 528-535.

Beitchman, J. H., Nair, R., Clegg, M., Ferguson, B., & et al. (1986). Prevalence of psychiatric disorders in children with speech and language disorders. *Journal of the American Academy of Child Psychiatry, 25*, 528-535.

Beitchman, J. H., Nair, R., Clegg, M., & Patel, P. (1986). Prevalence of speech and language disorders in 5-year-old kindergarten children in the Ottawa-Carleton region. *Journal of Speech & Hearing Disorders, 51*, 98-110.

Beitchman, J. H., Peterson, M., & Clegg, M. (1988). Speech and language impairment and psychiatric disorder: The relevance of family demographic variables. *Child Psychiatry & Human Development, 18*, 191-207.

Beitchman, J. H., Wilson, B., Brownlie, E., Walters, H., & et al. (1996a). Long-term consistency in speech/language profiles: I. Developmental and academic outcomes. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 804-814.

Beitchman, J. H., Wilson, B., Brownlie, E., Walters, H., & et al. (1996b). Long-term consistency in speech/language profiles: II. Behavioral, emotional, and social outcomes. *Journal of the American Academy of Child & Adolescent Psychiatry, 35*, 815-825.

Beitchman, J. H., Wilson, B., Johnson, C. J., Atkinson, L., Young, A., Adlaf, E. et al. (2001). Fourteen-year follow-up of speech/language-impaired and control children: Psychiatric outcome. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 75-82.

Benner, G. J., Nelson, J. R., & Epstein, M. H. (2002). Language skills of children with EBD: A literature review. *Journal of Emotional and Behavioral Disorders, 10*, 43-59.

Bishop, D. V. M., Price, T. S., Dale, P. S., & Plomin, R. (2003). Outcomes of Early Language Delay: II. Etiology of transient and persistent language difficulties. *Journal of Speech, Language and Hearing Research, 46*, 561-575.

Bornstein, M. H., Vibbert, M., Tal, J., & O'Donnell, K. (1992). Toddler language and play in the second year: Stability, covariation and influences of parenting. *First Language, 12*, 323-338.

Bosquet, M., & Egeland, B. (2006). The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. *Development and Psychopathology, 18*, 517-550.

Botting, N., & Conti-Ramsden, G. (2000). Social and behavioural difficulties in children with language impairment. *Child Language Teaching & Therapy, 16*, 105-120.

Brinton, B., & Fujiki, M. (1993). Language, social skills, and socioemotional behavior. *Language, Speech, and Hearing Services in Schools, 24*, 194-198.

Brinton, B., & Fujiki, M. (2003). Social development in children with specific language impairment and profound hearing loss. In P. K. Smith & C. Hart, H (Eds.), *Blackwell handbook of childhood social development* (pp. 588-603). Malden, MA: Blackwell Publishing.

Brooks Gunn, J., & Duncan, G. J. (1997). The effects of poverty on children. *Future of Children, 7*, 55-71.

Brown, R. (1973). *A First Language: The Early Stages*. Cambridge, MA: Harvard University Press.

Brownlie, E., Beitchman, J. H., Escobar, M., Young, A., Atkinson, L., Johnson, C. et al. (2004). Early Language Impairment and Young Adult Delinquent and Aggressive Behavior. *Journal of Abnormal Child Psychology, 32*, 453-467.

Caldwell, B. M., & Bradley, R. H. (1984). *Home Observation for Measurement of the Environment*. Little Rock, AR: University of Arkansas at Little Rock.

Calkins, S. D. (1994). Origins and outcomes of individual differences in emotion regulation. In N. A. Fox (Ed.), *Monographs of the Society for Research in Child Development* (Vol. serial No. 240, Vol. 59, pp. 53-72). Chicago: University of Chicago Press.

Calkins, S. D., & Dedmon, S. E. (2000). Physiological and behavioral regulation in two-year-old children with aggressive/destructive behavior problems. *Journal of Abnormal Child Psychology, 28*, 103-118.

Campbell, S. B., Pierce, E. W., Moore, G., & Marakovitz, S. (1996). Boys' externalizing problems at elementary school age: Pathways from early behavior problems, maternal control, and family stress. *Development and Psychopathology, 8*, 701-719.

Campbell, S. B., Shaw, D. S., & Gilliom, M. (2000). Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. *Development and Psychopathology, 12*, 467-488.

Cantwell, D. P., & Baker, L. (1987). Prevalence and type of psychiatric disorder and developmental disorders in three speech and language groups. *Journal of Communication Disorders, 20*, 151-160.

Cantwell, D. P., Baker, L., & Mattison, R. E. (1980). Psychiatric disorders in children with speech and language retardation: Factors associated with development. *Archives of General Psychiatry, 37*, 423-426.

Carson, D. K., Klee, T., Perry, C. K., Muskina, G., & Donaghy, T. (1998). Comparisons of children with delayed and normal language at 24 months of age on measures of behavioral difficulties, social and cognitive development. *Infant Mental Health Journal, 19*, 59-75.

Caulfield, M. B., Fischel, J. E., DeBaryshe, B. D., & Whitehurst, G. J. (1989). Behavioral correlates of developmental expressive language disorder. *Journal of Abnormal Child Psychology, 17*, 187-201.

Cohen, N. J., Davine, M., Horodezky, N., Lipsett, L., & et al. (1993). Unsuspected language impairment in psychiatrically disturbed children: Prevalence and language and behavioral characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry, 32*, 595-603.

Cohen, N. J., & Lipsett, L. (1991). Recognized and unrecognized language impairment in psychologically disturbed children: Child symptomatology, maternal depression, and family dysfunction: Preliminary report. *Canadian Journal of Behavioural Science*, *23*, 376-389.

Cohen, N. J., Vallance, D. D., Barwick, M., Im, N., Menna, R., Horodezky, N. B. et al. (2000). The interface between ADHD and language impairment: An examination of language, achievement, and cognitive processing. *Journal of Child Psychology and Psychiatry*, *41*, 353-362.

Cole, P. M., Zahn-Waxler, C., Fox, N. A., Usher, B. A., & Welsh, J. D. (1996). Individual differences in emotion regulation and behavior problems in preschool children. *Journal of Abnormal Psychology, 105*, 518-529.

Costello, E., Mustillo, S., Erkanli, A., Keeler, G., & Angold, A. (2003). Prevalence and Development of Psychiatric Disorders in Childhood and Adolescence. *Archives of General Psychiatry, 60*, 837-844.

Coster, W. J., Gersten, M. S., Beeghly, M., & Cicchetti, D. (1989). Communicative functioning in maltreated toddlers. *Developmental Psychology, 25*, 1020-1029.

Craig, H. K. (1993). Social skills of children with Specific Language Impairment: Peer relationshps. *Language, Speech, and Hearing Services in Schools, 24*, 206-215.

Dale, P. S., Price, T. S., Bishop, D. V., & Plomin, R. (2003). Outcomes of early language delay: I. Predicting persistent and transient language difficulties at 3 and 4 years. *Journal of Speech, Language, and Hearing Research*, *46*, 544-560.

Dale, P. S., Simonoff, E., Bishop, D. V., Eley, T. C., Oliver, B., Price, T. S. et al. (1998). Genetic influence on language delay in two-year-old children. *Nature Neuroscience*, *1*, 324-328.

Davis, A. D., Sanger, D. D., & Morris-Friehe, M. (1991). Language skills of delinquent and nondelinquent adolescent males. *Journal of Communication Disorders, 24*, 251-266.

Desmarais, C., Sylvestre, A., Meyer, F., Bairati, I., & Rouleau, N. (2008). Systematic review of the literature on characteristics of late-talking toddlers. *International Journal of Language and Commuication Disorders, 43*, 361-389.

Dionne, G., Tremblay, R., Boivin, M., Laplante, D., & Perusse, D. (2003). Physical aggression and expressive vocabulary in 19-month-old twins. *Developmental Psychology*, *39*, 261-273.

Eisenberg, N., Zhou, Q., Spinrad, T. L., Valiente, C., Fabes, R. A., & Liew, J. (2005). Relations Among Positive Parenting, Children's Effortful Control, and Externalizing Problems: A Three-Wave Longitudinal Study. *Child Development, 76*, 1055-1071.

Eisenberg, S. L., Fersko, T. M., & Lundgren, C. (2001). The use of MLU for identifying language impairment in preschool children: A review. *American Journal of Speech-Language Pathology, 10*, 323-342.

Elardo, R., Bradley, R., & Caldwell, B. M. (1977). A longitudinal study of the relation of infants' home environments to language development at age three. *Child Development*, *48*, 595-603.

Ellis Weismer, S., Murray-Branch, J., & Miller, J. F. (1994). A prospective longitudinal study of language development in late talkers. *Journal of Speech & Hearing Research, 37*, 852-867.
Erickson, M. F., Sroufe, L., & Egeland, B. (1985). The relationship between quality of attachment and behavior problems in preschool in a high-risk sample. *Monographs of the Society for Research in Child Development, 50 (1-2),* 147-166.
Evans, G. W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development, 73*, 1238-1248.
Fagan, J., & Iglesias, A. (2000). The relationship between fathers' and children's communication skills and children's behavior problems: A study of Head Start children. *Early Education and Development, 11*, 307-320.
Feng, X., Shaw, D. S., & Silk, J. S. (2008). Developmental trajectories of anxiety symptoms among boys across early and middle childhood. *Journal of Abnormal Psychology, 117*.
Fenson, L., Dale, P. S., Reznick, J., Bates, E., & et al. (1994). Variability in early communicative development. *Monographs of the Society for Research in Child Development, 59*, v-173.
Fenson, L., Pethick, S., Renda, C., Cox, J. L., Dale, P. S., & Reznick, J. S. (2000). Short-form versions of the MacArthur Communicative Development Inventories. *Applied Psycholinguistics, 21*, 95-116.
Fish, M., & Pinkerman, B. (2003). Language skills in low-SES rural Appalachian children: Normative development and individual differences, infancy to preschool. *Journal of Applied Developmental Psychology, 23*, 539-565.
Fluharty, N. B. (2001). *Fluharty-2: Fluharty Preschool Speech and Language Screen Test* (2 ed.). Austin, TX: Pro-Ed.
Fox, A., Dodd, B., & Howard, D. (2002). Risk factors for speech disorders in children. *International Journal of Language & Communication Disorders, 37*, 117-131.
Fried, P. A., O'Connell, C. M., & Watkinson, B. (1992). 60- and 72-month follow-up of children prenatally exposed to marijuana, cigarettes, and alcohol: cognitive and language assessment. *Journal of Developmental and Behavioral Pediatrics, 13*, 383-391.
Fujiki, M., Brinton, B., & Clarke, D. (2002). Emotion regulation in children with specific language impairment. *Language, Speech, and Hearing Services in Schools, 33*, 102-111.
Fujiki, M., Brinton, B., & Todd, C. M. (1996). Social skills of children with specific language impairment. *Language, Speech, and Hearing Services in Schools, 27*, 195-202.
Fujiki, M., Spackman, M. P., Brinton, B., & Hall, A. (2004). The Relationship of Language and Emotion Regulation Skills to Reticence in Children With Specific Language Impairment. *Journal of Speech, Language, and Hearing Research, 47*, 637-646.
Gallagher, T. M. (1999). Interrelationships among children's language, behavior, and emotional problems. *Topics in Language Disorders, 19*, 1-15.
Gardner, F., Ward, S., Burton, J., & Wilson, C. (2003). The role of mother-child joint play in the early development of children's conduct problems: A longitudinal observational study. *Social Development, 12*, 361-378.
Gardner, F. E. M., Sonuga-Barke, E. J. S., & Sayal, K. (1999). Parents anticipating misbehaviour: an observational study of strategies parents use to prevent conflict with behaviour problem children. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 40*, 1185-1196.

Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology, 16*, 313-333.
Gilliom, M., Shaw, D. S., Beck, J. E., Schonberg, M. A., & Lukon, J. L. (2002). Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology, 38*, 222-235.
Girolametto, L., Wiigs, M., Smyth, R., Weitzman, E., & Pearce, P. S. (2001). Children with a history of expressive vocabulary delay: Outcomes at 5 years of age. *American Journal of Speech-Language Pathology, 10*, 358-369.
Glascoe, F. P. (1991). Can clinical judgment detect children with speech-language problems? *Pediatrics, 87*, 317-322.
Greenberg, M. T., Speltz, M. L., Deklyen, M., & Endriga, M. C. (1991). Attachment security in preschoolers with and without externalizing behavior problems: A replication. *Development and Psychopathology, 3*, 413-430.
Grolnick, W. S., Bridges, L. J., & Connell, J. P. (1996). Emotion regulation in two-year-olds: Strategies and emotional expression in four contexts. *Child Development, 67*, 928-941.
Hammer, C. S., Tomblin, J. B., Zhang, X., & Weiss, A. L. (2001). Relationship between parenting behaviours and specific language impairment in children. *International Journal of Language & Communication Disorders, 36*, 185-205.
Heilmann, J., Weismer, S. E., Evans, J., & Hollar, C. (2005). Utility of the MacArthur-Bates Communicative Development Inventory in Identifying Language Abilities of Late-Talking and Typically Developing Toddlers. *American Journal of Speech-Language Pathology, 14*, 40-51.
Hertzog, C., & Nesselroade, J. R. (1987). Beyond autoregressive models: Some implications of the trait-state distinction for the structural modeling of developmental change. *Child Development, 58*, 93-109.
Hester, P., & Kaiser, A. P. (1998). Early intervention for the prevention of conduct disorder: Research issues in early indenfication, implementation and interpretation of treatment outcomes. *Behavioral Disorders, 28*.
Hewitt, L. E., Hammer, C. S., Yont, K. M., & Tomblin, J. (2005). Language sampling for kindergarten children with and without SLI: Mean length of utterance, IPSYN, and NDW. *Journal of Communication Disorders, 38*, 197-213.
Hewitt, L. E., Hammer, C. S., Yont, K. M., & Tomblin, J. B. (2006). Language sampling for kindergarten children with and without SLI: mean length of utterance, IPSYN, and NDW. *Journal of Communication Disorders, 38*, 197-213.
Hinshaw, S. P. (1992). Externalizing behavior problems and academic underachievement in childhood and adolescence: Causal relationships and underlying mechanisms. *Psychological Bulletin, 111*, 127-155.
Hoff, E., & Tian, C. (2005). Socioeconomic status and cultural influences on language. *Journal of Communication Disorders, 38*, 271-278.
Horwitz, S. M., Irwin, J. R., Briggs-Gowan, M. J., Heenan, J. M., Mendoza, J., & Carter, A. S. (2003). Language Delay in a Community Cohort of Young Children. *Journal of the American Academy of Child & Adolescent Psychiatry, 42*, 932-940.
Hu, L.-t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

Hummel, L. J., & Prizant, B. M. (1993). A socioemotional perspective for understanding social difficulties of school-age children with language disorders. *Language, Speech, and Hearing Services in Schools*, *24*, 216-224.
Irwin, J. R., Carter, A. S., & Briggs-Gowan, M. J. (2002). The social-emotional development of "late-talking" toddlers. *Journal of the American Academy of Child & Adolescent Psychiatry, 41*, 1324-1332.
Jones, B. L., Nagin, D. S., & Roeder, K. (2001). A SAS procedure based on mixture models for estimating developmental trajectories. *Sociological Research and Methods, 29,* 374-393.
Kaiser, A. P., Cai, X., Hancock, T. B., & Foster, E. (2002). Teacher-reported behavior problems and language delays in boys and girls enrolled in Head Start. *Behavioral Disorders, 28,* 23-39.
Kaiser, A. P., Hancock, T. B., Cai, X., Foster, E., & Hester, P. P. (2000). Parent-reported behavioral problems and language delays in boys and girls enrolled in Head Start classrooms. *Behavioral Disorders, 26*, 26-41.
Keenan, K., Shaw, D. S., Walsh, B., Delliquadri, E., & et al. (1997). DSM-III-R disorders in preschool children from low-income families. *Journal of the American Academy of Child & Adolescent Psychiatry, 36*, 620-627.
Kelly, D. J. (1998). A clinical synthesis of the "Late Talker" literature: Implications for service delivery. *Language, Speech, and Hearing Services in Schools, 29*, 76-84.
Kim, O. H., & Kaiser, A. P. (2000). Language characteristics of children with ADHD. *Communication Disorders Quarterly, 21*, 154-165.
King, T. M., Rosenberg, L. A., Fuddy, L., McFarlane, E., Sia, C., & Duggan, A. K. (2005). Prevalence and Early Identification of Language Delays Among At-Risk Three Year Olds. *Journal of Developmental & Behavioral Pediatrics, 26*, 293-303.
Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology, 25,* 343-354.
Kotsopoulos, A., & Boodoosingh, L. (1987). Language and speech disorders in children attending a day psychiatric programme. *British Journal of Disorders of Communication, 22*, 227-236.
Kovacs, M., & Devlin, B. (1998). Internalizing disorders in childhood. *Journal of Child Psychology and Psychiatry, 39*, 47-63.
La Paro, K. M., Justice, L., Skibbe, L. E., & Pianta, R. C. (2004). Relations Among Maternal, Child, and Demographic Factors and the Persistence of Preschool Language Impairment. *American Journal of Speech-Language Pathology, 13*, 291-303.
Landry, S. H., Smith, K. E., Miller-Loncar, C. L., & Swank, P. R. (1997). Predicting cognitive-language and social growth curves from early maternal behaviors in children at varying degrees of biological risk. *Developmental Psychology, 33*, 1040-1053.
Law, J., Boyle, J., Harris, F., Harkness, A., & Nye, C. (2000a). The feasibility of universal screening for primary speech and language delay: findings from a systematic review of the literature. *Developmental Medicine & Child Neurology, 42*, 190-200.
Law, J., Boyle, J., Harris, F., Harkness, A., & Nye, C. (2000b). Prevalence and natural history of primary speech and language delay: Findings from a systematic review of the literature. *International Journal of Language & Communication Disorders, 35*, 165-188.
Love, A. J., & Thompson, M. G. (1988). Language disorders and attention deficit disorders in young children referred for psychiatric services: Analysis of prevalence and a conceptual synthesis. *American Journal of Orthopsychiatry, 58*, 52-64.

Luster, T., & Vandenbelt, M. (1999). Caregiving by low-income adolescent mothers and the language abilities of their 30-month-old children. *Infant Mental Health Journal, 20*, 148-165.

Mack, A. E., & Warr-Leeper, G. A. (1992). Language abilities in boys with chronic behavior disorders. *Language, Speech, and Hearing Services in Schools, 23*, 214-223.

Manhardt, J., & Rescorla, L. (2002). Oral narrative skills of late talkers at ages 8 and 9. *Applied Psycholinguistics*, *23*, 1-21.

Marvin, R. S. (1977). An ethological-cognitive model for the attenuation of mother-infant
attachment behavior. In T. M. Alloway, L. Krames & P. Pliner (Eds.), *The development of social attachments* (Vol. 3, pp. 25-60). New York: Plenum.

McCabe, P. C. (2005). Social and Behavioral Correlates of Preschoolers with Specific Language Impairment. *Psychology in the Schools, 42*, 373-387.

McCabe, P. C., & Meller, P. J. (2004). The relationship between langauge and social competence: How language impairment affects social growth. *Psychology in the Schools, 41*, 313-321.

McGrew, K. S., & Woodcock, R. W. (2001). *Woodcock-Johnson III: Technical Manual*. Itasca, IL: Riverside Publishing.

McLeod, J. D., & Shanahan, M. J. (1993). Poverty, parenting, and children's mental health. *American Sociological Review, 58*, 351-366.

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist*, *53*, 185-204.

Mendez, J. L., Fantuzzo, J., & Cicchetti, D. (2002). Profiles of social competence among low-income African American preschool children. *Child Development*, *73*, 1085-1100.

Miller, J. F., & Iglesias, A. (2006). Systematic Analysis of Language Transcripts (SALT), English and Spanish (Version 9). Madison, WI: Language Analysis Lab, University of Wisconsin-Madison.

Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: Follow-up at age 26 years. *Development and Psychopathology, 14*, 179-207.

Montgomery, J. W. (2002). Understanding the language difficulties of children with specific language impairments: Does verbal working memory matter? *American Journal of Speech-Language Pathology, 11*, 77-91.

Morisset, C. E., Barnard, K. E., Greenberg, M. T., Booth, C. L., & et al. (1990). Environmental influences on early language development: The context of social risk. *Development and Psychopathology, 2*, 127-149.

Murray, A. D., & Yingling, J. L. (2000). Competence in language at 24 months: Relations with attachment security and home stimulation. *Journal of Genetic Psychology, 161*, 133-140.

Nagin, D. S. (2005). *Group-Based Modeling of Development*. Cambridge, MA: Harvard University Press.

Nicely, P., Tamis-LeMonda, C. S., & Bornstein, M. H. (1999). Mothers' attuned responses to infant affect expressivity promote earlier achievement of language milestones. *Infant Behavior & Development, 22*, 557-568.

Olson, H., Streissguth, A., Sampson, P., Barr, H., Bookstein, F., & Thiede, K. (1997). Association of prenatal alcohol exposure with behavioral and learning problems in early adolescence. . *Journal of the American Academy of Child & Adolescent Psychiatry, 36*, 1187-1195.

Owens, E. B., & Shaw, D. S. (2003). Poverty and early childhood adjustment. In Luthar, Suniya S (Ed). *Resilience and vulnerability: Adaptation in the context of childhood adversities. (pp. 267-292).* New York: Cambridge University Press.

Pan, B. A., Rowe, M. L., Singer, J. D., & Snow, C. E. (2005). Maternal Correlates of Growth in Toddler Vocabulary Production in Low-Income Families. *Child Development, 76*, 763-782.

Paul, R. (1991). Profiles of toddlers with slow expressive language development. *Topics in Language Disorders, 11*, 1-13.

Paul, R. (1993). Patterns of development in late talkers: Preschool years. *Journal of Childhood Communication Disorders, 15*, 7-14.

Paul, R. (1996). Clinical implications of the natural history of slow expressive language development. . *American Journal of Speech-Language Pathology, 5*, 5-21.

Paul, R., & James, D. F. (1990). Language delay and parental perceptions. *Journal of the American Academy of Child & Adolescent Psychiatry, 29*, 669-670.

Paul, R., & Kellogg, L. (1997). Temperament in late talkers. *Journal of Child Psychology and Psychiatry, 38*, 803-811.

Paul, R., Looney, S. S., & Dahm, P. S. (1991). Communication and socialization skills at ages 2 and 3 in "late-talking" young children. *Journal of Speech & Hearing Research, 34*, 858-865.

Paul, R., Murray, C., Clancy, K., & Andrews, D. (1997). Reading and metaphonological outcomes in late talkers. *Journal of Speech, Language, and Hearing Research, 40*, 1037-1047.

Pennington, B. F., & Ozonoff, S. (1996). Executive functions and developmental psychopathology. *Journal of Child Psychology and Psychiatry, 37*, 51-87.

Pettit, G. S., Bates, J. E., & Dodge, K. A. (1997). Supportive parenting, ecological context, and children's adjustment: A seven-year longitudinal study. *Child Development, 68*, 908-923.

Prizant, B. M., Audet, L. R., Burke, G. M., Hummel, L. J., & et al. (1990). Communication disorders and emotional/behavioral disorders in children and adolescents. *Journal of Speech & Hearing Disorders, 55*, 179-192.

Qi, C. H., & Kaiser, A. P. (2004). Problem behaviors of low-income children with language delays: An observation study. *Journal of Speech, Language, and Hearing Research, 47*, 595-609.

Redmond, S. M., & Rice, M. L. (1998). The socioemotional behaviors of children with SLI: Social adaptation or social deviance? *Journal of Speech, Language, and Hearing Research, 41*, 688-700.

Renken, B., Egeland, B., Marvinney, D., Mangelsdorf, S., & et al. (1989). Early childhood antecedents of aggression and passive-withdrawal in early elementary school. *Journal of Personality 57*, 257-281.

Rescorla, L. (1991). Identifying expressive language delay at age two. *Topics in Language Disorders, 11*, 14-20.

Rescorla, L. (2000). Do late-talking toddlers turn out to have reading difficulties a decade later?'. *Annals of Dyslexia, 50*, 87-102.

Rescorla, L. (2002). Language and reading outcomes to age 9 in late-talking toddlers. *Journal of Speech, Language, and Hearing Research, 45*, 360-371.

Rescorla, L. (2005). Age 13 Language and Reading Outcomes in Late-Talking Toddlers. *Journal of Speech, Language, and Hearing Research, 48*, 459-472.

Rescorla, L., Dahlsgaard, K., & Roberts, J. (2000). Late-talking toddlers: MLU and IPSyn outcomes at 3;0 and 4;0. *Journal of Child Language, 27*, 643-664.

Rescorla, L., Hadicke-Wiley, M., & Escarce, E. (1993). Epidemiological investigation of expressive language delay at age two. *First Language, 13*, 5-22.

Rescorla, L., Roberts, J., & Dahlsgaard, K. (1997). Late talkers at 2: Outcome at age 3. *Journal of Speech & Hearing Research, 40*, 556-566.

Rescorla, L., Ross, G. S., & McClure, S. (2007). Language Delay and Behavioral/Emotional Problems in Toddlers: Findings from Two Developmental Clinics. *Journal of Speech, Language, and Hearing Research, 50*, 1063-1078.

Rescorla, L., & Schwartz, E. (1990). Outcome of toddlers with specific expressive language delay. *Applied Psycholinguistics, 11*, 393-407.

Sanger, D., Moore-Brown, B., Magnuson, G., & Svoboda, N. (2001). Prevalence of language problems among adolescent delinquents: A closer look. *Communication Disorders Quarterly, 23*, 17-26.

Shaw, D. S., Bell, R. Q., & Gilliom, M. (2000). A truly early starter model of antisocial behavior revisited. *Clinical Child and Family Psychology Review, 3*, 155-172.

Shaw, D. S., Keenan, K., & Vondra, J. I. (1994). Developmental precursors of externalizing behavior: Ages 1 to 3. *Developmental Psychology, 30*, 355-364.

Shaw, D. S., & Vondra, J. I. (1995). Infant attachment security and maternal predictors of early behavior problems: A longitudinal study of low-income families. *Journal of Abnormal Child Psychology, 23*, 335-357.

Shaw, D. S., Winslow, E. B., & Flanagan, C. (1999). A prospective study of the effects of marital status and family relations on young children's adjustment among African American and European American families. *Child Development, 70, 742-755*.

Skuban, E. M., Shaw, D. S., Gardner, F., Supplee, L. H., & Nichols, S. R. (2006). The correlates of dyadic synchrony in high-risk, low-income toddler boys. *Infant Behavior & Development, 29*, 423-434.

Smith, K. E., Landry, S. H., & Swank, P. R. (2000). Does the content of mothers' verbal stimulation explain differences in children's development of verbal and nonverbal cognitive skills? *Journal of School Psychology, 38*, 27-49.

Stansbury, K., & Zimmermann, L. K. (1999). Relations among child language skills, maternal socializations of emotion regulation, and child behavior problems. *Child Psychiatry & Human Development, 30*, 121-142.

Stanton-Chapman, T. L., Chapman, D. A., Bainbridge, N. L., & Scott, K. G. (2002). Identification of early risk factors for language impairment. *Research in Developmental Disabilities, 23*, 390-405.

Steelman, L. M., Assel, M. A., Swank, P. R., Smith, K. E., & Landry, S. H. (2002). Early maternal warm responsiveness as a predictor of child social skills: Direct and indirect paths of influence over time. *Journal of Applied Developmental Psychology, 23*, 135-156.

Stevenson, J. (1996). Developmental changes in the mechanisms linking language disabilities and behavior disorders. In J. H. E. C. Beitchman, Nancy J (Ed); Konstantareas, M. Mary (Ed); Tannock, Rosemary (Ed) (Ed.), *Language, learning, and behavior disorders: Developmental, biological, and clinical perspectives.* (pp. 78-99). New York: Cambridge University Press.

Stevenson, J., & Richman, N. (1978). Behavior, language, and development in three-year-old children. *Journal of Autism & Childhood Schizophrenia, 8*, 299-313.

Stevenson, J., Richman, N., & Graham, P. J. (1985). Behaviour problems and language abilities at three years and behavioural deviance at eight years. *Journal of Child Psychology and Psychiatry, 26*, 215-230.

Sturner, R. A., Heller, J. H., Funk, S. G., & Layton, T. L. (1993). The Fluharty Preschool Speech and Language Screening Test: A population-based validation study using sample-independent decision rules. *Journal of Speech and Hearing Research, 36*, 739-745.

Tamis-LeMonda, C. S., Bornstein, M. H., & Baumwell, L. (2001). Maternal responsiveness and children's achievement of language milestones. *Child Development, 72*, 748-767.

Thal, D. J., & Bates, E. (1988). Language and gesture in late talkers. *Journal of Speech & Hearing Research, 31*, 115-123.

Thal, D. J., Tobias, S., & Morrison, D. (1991). Language and gesture in late talkers: A 1-year follow-up. *Journal of Speech & Hearing Research, 34*, 604-612.

Tomasello, M., & Farrar, M. J. (1986). Joint attention and early language. *Child Development, 57,* 1454-1463.

Tomblin, J., Hardy, J. C., & Hein, H. A. (1991). Predicting poor-communication status in preschool children using risk factors present at birth. *Journal of Speech & Hearing Research, 34*, 1096-1105.

Toppelberg, C. O., & Shapiro, T. (2000). Language disorders: A 10-year research update review. *Journal of the American Academy of Child & Adolescent Psychiatry, 39,* 143-152.

Vondra, J. I., Shaw, D. S., Swearingen, L., Cohen, M., & Owens, E. B. (2001). Attachment stability and emotional and behavioral regulation from infancy to preschool age. *Development and Psychopathology, 13,* 13-33.

Wakschlag, L. S., Lahey, B. B., Loeber, R., Green, S. M., Gordon, R. A., & Leventhal, B. L. (1997). Maternal smoking during pregnancy and the risk of conduct disorder in boys. *Archives of General Psychiatry, 54,* 670-676.

Weismer, S. E., Evans, J., & Hesketh, L. J. (1999). An examination of verbal working memory capacity in children with specific language impairment. *Journal of Speech, Language, and Hearing Research, 42*, 1249-1260.

Whitehurst, G. J., & Fischel, J. E. (1994). Early developmental language delay: What, if anything, should the clinician do about it? *Journal of Child Psychology and Psychiatry, 35*, 613-648.

Williams, D., Stott, C., Goodyer, I., & Sahakian, B. (2000). Specific language impairment with or without hyperactivity: Neuropsychological evidence for frontostriatal dysfunction. *Developmental Medicine & Child Neurology, 42,* 368-375.

Willinger, U., Brunner, E., Diendorfer-Radner, G., Sams, J., Sirsch, U., & Eisenwort, B. (2003a). Behaviour in children with langauge development disorders. *Canadian Journal of Psychiatry, 48*, 607-614.

Willinger, U., Brunner, E., Diendorfer-Radner, G., Sams, J., Sirsch, U., & Eisenwort, B. (2003b). Behaviour in children with language development disorders. *Canadian Journal of Psychiatry, 48*, 607-614.