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The Influence of Early Language on Reading Achievement, Problem, and Prosocial Behavior in Elementary School

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THE INFLUENCE OF EARLY LANGUAGE ON READING ACHIEVEMENT, PROBLEM, AND PROSOCIAL BEHAVIOR IN ELEMENTARY SCHOOL

By

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The current study examined the link between early language ability and literacy and behavioral outcomes in children prenatally exposed to cocaine. Prenatal exposure to cocaine places children at risk for language delays and early language problems are linked to both literacy and behavior problems in elementary school. ((Bandstra, 2002; Beitchman et al., 2001; Cantwell & Baker, 1977). Participants included 141 primarily African-American children from low SES backgrounds who were enrolled in a birth through three intervention program. Children were followed through first and second grade to evaluate the impact early language ability had on literacy and behavior in elementary school.

Hierarchical regression analyses revealed that after controlling for gender, treatment group, cognitive ability, and behavior at age three, receptive language at age three was a significant predictor of picture vocabulary in elementary school ($F(4, 125)=6.76$, $p<.01$, $b_{Receptive}= .42$, $p<.01$). Receptive language was also a significant predictor of Parent-reported prosocial behavior ($F(7, 72) = 2.24$, $p<.05$, $b_{Receptive} =-.03$, $p<.05$). Contrary to previous findings, early language did not significantly predict parent reported problem behavior in elementary school in this high risk sample. Future studies should explore risk and resiliency in this sample, along with increasing sample size to

allow for more advanced statistical analyses. Findings support the importance of early language experiences on both later literacy and behavioral outcomes for children.

This thesis is dedicated to Marylou Faria, with love and admiration.

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Introduction

Prenatal exposure to cocaine places children at risk for pervasive language delays (Bandstra, 2002). Previous literature supports the stability of language ability from preschool to early elementary school in typically developing children (Baydar, Brooks-Gunn & Furstenberg, 1993; Felton, 1998). Deficits in language ability have also been correlated with concurrent increases in behavior problems in both preschool and school age children (Beitchman et al., 1996; Benasich et al., 1993; Caulfield et al., 1989). Some studies have provided evidence for a link between early language development and later clinical-level behavioral outcomes (Beitchman et al., 2001; Cantwell & Baker, 1977). However, the predictive relationship between early language ability and behavioral outcomes in elementary school has not been sufficiently explored in an at-risk population. The relationship between early language, school-age reading achievement, problem behavior, and pro-social behavior will be examined in this very high-risk sample of children prenatally exposed to cocaine.

Development of Language Delay

Language development in non-disabled children is predictable, with children reaching developmental milestones at approximately the same age. Newborns consistently vocalize through crying with the occasional speech-like sound when feeding (Owens, 2005). As children grow through infancy they increase verbal vocalization and use other non-verbal techniques to communicate, such as joint attention and gesturing. By age one, the typically developing child will begin using their first words, and mixing words with jargon (Owens, 2005). By early toddler hood, age twelve to twenty-four months, children typically have a vocabulary of 200 to 300 words, and can combine them

to create short, incomplete sentences (Owens, 2005). By age three, vocabulary sky-rockets with nearly 1,000 expressive words, and the use of 3 to 4 word sentences (Owens, 2005).

However, many children in the United States do not gain the necessary pre-literacy experiences during infancy and toddler hood that help support language development and become language delayed. There is contrasting data on the prevalence of language delay in the greater US population. In a 1989 study examining the prevalence of language delay in 2-year-olds, the percentage ranged from 7% to 18% depending on the criteria (Rescorla, 1989). If the definition of delay was less than 30 words, 7% of children were delayed. However if the definition of delay was expanded to include those children with less than 50 words at the age of 2-years, 18% were delayed (Rescorla, 1989). A second study, presented language delays in 13.5% of children 18 to 23 months of age and 17.5% of children 30 to 36 months of age (Horwitz et al., 2003), making language delay more prevalent than even emotional/behavioral problems in young children (Briggs-Gowan et al., 2000).

Previous literature suggests that early delays in language are stable across preschool and school age (Baydar, Brooks-Gunn, & Furstenberg, 1993; Felton, 1998) and are detrimental to later school success (Bishop & Adams, 1990; Butler, Marsh, Sheppard, & Sheppard, 1985). Children who are language delayed at an early age continue to be delayed through preschool and early elementary school.

Development of Problem Behavior

Behavior problems such as externalizing behaviors are also stable across the preschool to school age years (Rose, Rose, & Feldman, 1989). Early externalizing

behaviors are highly predictive of externalizing behaviors one or two years later (Campbell, Breaux, Ewing, & Szumowski, 1984) and are moderately predictive over longer periods of time (Campbell & Ewing, 1990). It is also true that fifty percent of preschool aged children with externalizing problems continue to display externalizing problem behavior in later childhood (Campbell & Ewing, 1990). Although absolute rates of externalizing behaviors decrease with children exhibiting the most behavior problems early on remaining as those with the most problem behavior later in school (Campbell, 1995).

Longitudinal analyses reveal that physical aggression during preschool years is as stable as it is during elementary school years (Cummings, Iannotti, & Zahn-Waxler, 1989; Hay et al., 2000; Keenan & Shaw, 1993; Olweus, 1979). Physical aggression in childhood is also a very strong predictor of future social-adjustment problems and aggressive behavior later in life (Fagot, 1984; Coie, Dodge, & Kupersmidt, 1990). Behavior problems such as externalizing behaviors and physical aggression are even more troublesome in very young children, because they are associated with increased risk for seriously antisocial outcomes (Moffitt, 1993) and later criminality (Broidy et al., 2003; Nagin & Tremblay, 1999).

Development of Prosocial Behaviors

There has been a recent shift in focus within the field of child development, away from studying negative factors that are detrimental to developmental trajectories, and toward the more positive factors involved in a child's life. Prosocial behavior is one of these factors that may influence a child's life trajectory in a positive way. Prosocial behavior is defined as a voluntary action intended to benefit another (Garner, 2006).

Behaviors included are cooperation, helpfulness, sharing, and empathy (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000).

Studies have begun to study prosocial behavior in children. In a recent cluster analysis, children who were lower on measures of prosocial behavior also displayed a profile of over activeness and more disruptive behavior (Mendez, Fantuzzo, & Cicchetti, 2002). One longitudinal study examined the stability of prosocial behavior or personality over the course of the first 25 years of life and concluded that reports and observations of prosocial behavior in preschool were related to prosocial dispositions in early adulthood (Eisenberg et al., 1999). There were consistent individual differences in prosocial disposition and behavior over the first 25 years of life, suggesting the stability of prosocial behavior over time (Eisenberg et al., 1999).

Developing more prosocial behaviors can also curb more aggressive tendencies (Bandura, 1999; Bandura, Barbaranelli, Caprara, & Pastoirelli, 1996). Prosocial skills are also linked with more positive academic outcomes and increased positive peer relationships in early adolescence (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000). In general, children who display more prosocial behavior are more likely to achieve higher on academic outcomes (Wentzel & Asher, 1995). Therefore it is important to understand what factors influence the development of more prosocial behaviors early on in childhood.

The Relationship between Language Ability and Future Behaviors

Language and Reading Skills. Reading is a complex process where children must combine many difference skill sets to reach the end result of comprehension and reading for meaning (Adams, 1990). Some skills included in the reading process are: recognition

of individual letters, translating these letters to sounds, combining sounds to create words, determining the meaning of a word, and understanding the text as a whole (Adams, 1990). These skills work fluidly together in the literate child or adult, however they are not fully integrated in a pre-literate child.

According to the emergent literacy theory, (Whitehurt & Lonigan, 1998; Storch & Whitehurst, 2002) reading development occurs well before a child enters a standard classroom. Whitehurst and Lonigan (1998) define emergent literacy as the skills, knowledge, and attitudes that are developmental precursors to reading and writing. Becoming literate is a fluid process made up of many varied experiences prior to school that can either hinder or help a child's later reading ability. The literate child slowly evolves from a non-reader to a reader, mastering key skills along the way. Phonemic awareness, letter-word identification, oral language, and print knowledge are the main precursors of decoding skills necessary for proficient reading ability (Whitehurst & Lonigan, 1998).

In a retrospective study of children with developmental dyslexia and dysgraphia conducted in 1963, early oral language delay was sited as a prominent historical item (Ingram). The role of oral language in later reading ability has been well documented, beginning with Chall's 1967 review. More recent reviews have confirmed the need for attention to language early in childhood along with early literacy instruction, such as phonics, to improve children's reading abilities later in life (Adams, 1990).

Due to the link between oral language and reading ability, children with early language delay may also exhibit problems in literacy and reading ability (Storch & Whitehurst, 2002). Research has also shown correlations and longitudinal relationships

between individual differences in early language skills and later reading achievement (Storch & Whitehurst, 2002). In some longitudinal studies, early language delay has pervasive effects on academic achievement throughout school, even into adolescence (Aram et al., 1984; Baker and Cantwell, 1987; Beitchman et al., 1996; Rescorla, 2000). Oral language problems were also found to be a significant risk factor for reading disability during the elementary school years, and continuing through life (Catts, 1993; Roth & Spekman, 1994).

Evidence suggests that simple letter knowledge at the entry of kindergarten was related to later reading ability, such that correlations between the number of letters known at school entry and high school reading achievement was as high as .52 (Stevenson & Newman, 1986). Longitudinal data following children who were speech and language delayed and who were low in academic performance at age five indicates that these children continued to perform lower than peers at age 12 (Beitchman et al., 1996). Also, of the children who performed in the low range on all speech and language tests at age five, 64% received special education services at age 12, while 50% of children who performed low on language comprehension were receiving services, and 47% of children who initially performed low on articulation were receiving services (Beitchman et al., 1996). However, zero children who scored in the average range on all speech and language tests at age five were receiving special education services at age 12 (Beitchman et al., 1996). Through this data, it is clear that early delays in speech and language in the preschool and kindergarten years have serious effects on academic outcomes in later schooling.

Language and Problem Behavior. It is also known that language ability is negatively correlated with problem behaviors such as physical aggression and anti-social behavior (Arnold, 1997; Hinshaw, 1992). The comorbitity of language disability and problem behaviors is well documented, drawing from epidemiological studies that report general population rate of language delay as 3% to 15%, while rates increase to 24% to 65% when sampling children exhibiting disruptive behaviors (Benasich, Curtiss, & Tallal, 1993). Similarly, 59% to 80% of children with language delays also exhibit disruptive behaviors compared to 20% in the general population (Beitchman et al., 1996; Brinton & Fujiki, 1993).

Caulfield et al., compared groups of children who were expressive language delayed with those who were typically developing, and using observational data found that those with language delay exhibited more problem behavior than their typically developing peers. (Caulfield, Fischel, DeBaryshe, & Whitehurst, 1989). The sample of 68 children were between the ages of two and three years, 95% from middle to upper middles class families, and 97% Euro-American.

In a large random sample of three-year olds, Stevenson and Richman (1976) found a link between expressive language delay and behavior problems. Fifty-nine percent of children who were expressively language delayed exhibited serious problem behaviors, while only 14% of children who were not delayed exhibited similar problem behaviors. In a bilingual sample in Canada, the relationship between expressive language ability and aggressive behavior in 19-month old twins was explored. They found a modest correlation between physical aggression and expressive vocabulary at this age (Dionne, Tremblay, Boivin, Laplante, & Perusee, 2003).

In an observational pilot study, examining non-clinical levels of problem behavior and the link with language ability, Fujiki et al. (2001) compared eight children with language impairment (LI) to eight with typical language development and found that LI children interacted less with their peers. However, no difference was found in peer-directed aggression, victimization, and other behaviors. Because there were so few children involved in this sample, these findings need to be interpreted with caution.

In a community based sample, it was found that by 30 months of age, children who were language delayed were four times as likely to have parents who reported externalizing behavior problems when compared to peers with typically developing language skills (Horwitz, et al., 2003). In studies working with low SES, at risk children, such as those enrolled in Head Start, it was found that boys with problem behaviors were more likely to have lower language scores than boys without problem behaviors (Kaiser et al., 2000). For example, of all the boys with clinical levels of internalizing problem behavior, 46% were language delayed, while only 33% of boys without language delays exhibited internalizing problem behavior (Kaiser et al., 2000). There were similar findings when comparing groups of boys with and without externalizing problem behavior.

It is clear that there is a concurrent relationship between language delay and problem behavior. However, there are fewer longitudinal studies concerning the predictive relationship between early language ability and later behavior, especially those studying at-risk populations. Richman, Stevenson, and Graham (1982) used three year old language scores along with behavior measures to predict IQ and behavioral outcomes, however only relationships between behavior at age three predicting IQ and reading

outcomes at age eight were reported. Jorm, Share, Mathews & Maclean (1986) examined the link between learning disabilities, such as generally reading backwards (GRB) and reading retarded (SRR), and behavior outcomes in first and second grade. However, mostly concurrent information was reported, with generally reading backwards (GRB) children significantly higher on antisocial behavior, inattention, and hyperactivity than reading retarded (SRR) children or control children in first and second grade.

One longitudinal study did link language in infancy to later antisocial trajectories of violent behavior in a Swedish sample (Stattin, & Klackenberg-Larsson, 1993), suggesting that early language plays an important role in the development of problem behavior. A longitudinal study conducted in Canada displayed a relationship between language-impaired children and psychiatric problems in young adulthood. (Beitchman et al., 2001). Children with language-impairment identified at age five had significantly higher rate of anxiety disorder at age 19 than non-impaired children (Beitchman et al., 2001). There were also trends approaching significance between language-impairment and antisocial personality disorder rates (Beitchman et al., 2001). This study supports the relationship between early language delay and later problem behavior.

The direction of the causal relationship between language delays and problem behavior is still being explored. One hypothesis is that a deficit in language ability limits communication, and disruptive behavior is used to compensate for the lack of language. Conversely, children with increased verbal ability may develop pro-social behaviors and thus steer away from antisocial trajectories. (Dionne, Tremblay, Boivin, Laplante, & Perusse, 2003). There is face validity with this specific hypothesis concerning the

direction of the relationship between language ability and behavior outcome simply because language delays typically precede behavior problems.

Fagan and Iglesias (2000) examined the role of fathers in Head Start children, focusing on their language interactions. They researched the association between father-child communication and later problem behaviors using structural equation modeling, and determined that parent communication contributed to child communication, which then lead to child behavior problems, further supporting the language-to-behavior hypothesis. In the sample of 65 head start children and their fathers, children with higher language ability had less externalizing problem behaviors. Also, over the course of the school year, children with higher language skills at the onset of the school year had fewer internalizing problem behaviors at the end of the school year.

Language and Prosocial Behavior. On the reverse side of the language-problem behavior relationship is that of language and prosocial behavior. Language in and of itself is a very social behavior. Previous research has shown positive associations between prosocial behavior, social skills, and academic achievement (Caprara, Barbaranelli, Pastorelli, Bandura, & Zimbardo, 2000; Chen, Rubin, & Li, 1997) However, there is a substantial gap in the literature when discussing the link between language and more positive behavioral outcome such as sharing and cooperation. One study, examining language delay in young children did find a link between language delay in very young children, ages 12 to 17 months, and parent reports of low prosocial peer interaction (Horwitz, et al., 2003).

Some research has focused on the link between language ability and social interactions or social skills. Children with delayed or disordered language are at a

disadvantage in social arenas because successful social interactions depend on good communication skills. Because language skills are so critical to social interaction, children with language delays are at risk for social failure (Goldstein & Gallagher, 1992).

Recent studies have documented this link in children diagnosed with Specific Language Impairment (SLI). Children with SLI encounter different social experiences in the classroom when compared to their typically developing peers, both quantitatively and qualitatively. Compared with typically developing peers, children with SLI spend less time interacting with their peers in social interactions, and more time engaged in non-social behaviors such as walking around the room or using toys in nonsocial ways (Roth & Clark, 1987). Typically developing children are also less likely to interact with, initiate conversation with, or play with a language delayed child in an integrated preschool classroom (Rice, Sell, & Hadley; 1991). Also, children with SLI are much less likely to initiate conversation or play with their peers, and more likely to initiate social behavior with an adult in the classroom (Rice, Sell, & Hadley; 1991). More specifically, Hadley and Rice concluded that both unintelligible speech patterns, and poor grammar skills were both predictors of failure in social interaction for children as young as preschool (1991). To quote the researchers, "preschoolers behave as if they know who talks well and who doesn't, and they prefer to interact with those who do" (Hadley & Rice, 1991, p. 1315). All of these findings support the notion that children with language delay have less opportunity to engage in social behavior with their peers, and build upon their repertoire of social skills, and are therefore at-risk for social failure.

Language ability in school age children, such as the child's ability to ask appropriate questions and initiate conversations with others, has also been linked to peer

acceptance, an integral part of social competence. (Asher, Olden, & Gottmanm 1977; Asher & Renshaw, 1981). Research has also examined the link between language delay and clinical levels of problems in social interaction. Problems with social interaction are common in children with language delay or disorders (Aram, Ekelman, & Nation, 1984).

Development in at-risk populations

Effects of cocaine exposure. In the late 1980s and early 1990s, cocaine exposure exploded as a hot topic in the popular media. "Crack babies" were receiving large media attention and research was conducted to investigate the negative effects of prenatal exposure to cocaine. Many believed that cocaine had direct neuro-biological influences on the developing fetus, much like fetal alcohol syndrome (Chasnoff & Griffith, 1989). However, research studies have not supported this hypothesis.

Studies conducted to assess the outcomes for cocaine-exposed children compared to non-cocaine exposed children raised in similar environments yielded interesting results. Although there were no differences in outcomes between the cocaine-exposed and non-cocaine exposed children, both groups displayed negative developmental outcomes (Hurt, Malmud, Betancourt, Bordsky, & Giannetta, 2001; Phelps, Wallace, & Bontrager, 1997). A meta-analysis of the effects of cocaine exposure reveal that effects of cocaine are more subtle than originally hypothesized, but remain negative (Kester, LaGasse, & Seifer, 1998). Outcomes such as low IQ scores and delayed language are consistent (Chapman, 2000; Lester, LaGasse, Seifer, 1998).

It is true that prenatal exposure places these children at risk for language delays (Bandstra, 2002). However, it is now thought that rather than teratogenic effects of cocaine exposure in-utero, prenatal exposure is more a marker for environmental factors,

such as low SES, increased custodial changes, or low maternal education that influence a child's language development, rather than the drug exposure itself (Frank, Augustyn, Grant, Knight, Pell, & Zuckerman, 2001).

Cocaine exposure can also lead to poor socio-emotional outcomes for children. Children prenatally exposed to cocaine display more problematic behavior in toddler hood such as poor impulse control, poor emotion regulations, and poor attention skills, when compared to non-exposed peers. (Bendersky & Lewis, 1998; Mayes et al., 1998; Richardson, 1998). A longitudinal study of 95 infants prenatally exposed to cocaine, and 75 non-exposed comparison children, found that although cocaine exposure had no direct effect on cognitive outcomes at age six, there were direct effects on behavior for children ages four to six (Chasnoff, Anson, Hatcher, Stenson, Iaukea, & Randolph, 1998). Children exposed to cocaine exhibited increases in externalizing problem behaviors in toddler hood and early childhood (Chasnoff, Anson, Hatcher, Stenson, Iaukea, & Randolph, 1998). Prenatal exposure can also lead to poor self-regulation. In a study with four year old children, those exposed to cocaine were quicker to express frustration and were more disruptive than their non-exposed peers (Dennis, Bendersky, Ramsay, & Lewis, 2006).

Effects of Living in Poverty. As of 1998, there were over 14.1 million children living in poverty in the U.S. (U.S. Bureau of the Census 1998). In a study conducted to examine the prevalence of children living in poverty, it was found that as many as 33% of American children live below the poverty line for one year or more, and 18% will live in extreme poverty (Rank & Hirschl, 1999). Preschool children living in poverty are at risk for language delays, poor academic outcomes such as school failure, and behavior

problems (Duncan, Brooks-Gunn & Klebanov, 1994; Hester & Kaiser, 1998; Kaiser & Delaney, 1996; McLoyd, 1998; Bradley, Corwyn, Burchinal, McaDoo, & Garcia Coll, 2001; Arnold & Doctoroff, 2003). Because the effects of living in poverty are most profound during a child's earliest years, it is even more problematic that younger children are more likely to experience poverty (Bronfenbrenner, 1996; Bradley et al., 2001). Low-income children are also documented to enter school at a disadvantage in both cognitive and social domains, when compared to their higher SES peers (Baker, 1998; Stipek & Ryan, 1997). Low SES children are also disadvantaged in their home experiences that foster later academic success. A staggering finding is that children from low-SES families typically receive 25 hours of one-on-one book reading hours before school entry, compared with 1000 or 1700 hours of one-on-one book reading hours received by their high-SES peers (Adams, 1990). With such varied home experiences, it is no wonder that children enter school with such discrepant skill sets.

In a report published in 2002, more than 25% of three-year-old children enrolled in Head Start (N = 604) had language scores more than 1.3 standard deviations below the norm (Kaiser, Cai, Hancock, & Foster, year). Once these children enter elementary school they continue to experience academic difficulties. At kindergarten entry, only 19% of children whose families were receiving public assistance had requisite pre-literacy skills (National Center for Education Statistics (NCES), 2000). These effects continue into the later elementary years, with only 2% of fourth graders who are eligible to receive lunch subsidies scoring as advanced readers on the Nation's Report Card reading tests, and only 12% scoring as proficient readers in the 1999-2000 school year. (National Assessment of Educational Progress (NAEP), 2001).

The Proposed Study

This study intends to shed light into a lesser studied population of low SES, non-clinical children. Examining the relationship between language delays, academic performance, and social-emotional abilities in this population is important to help support future intervention programs for high-risk, low SES children.

Applying previous literature to this at-risk population, several hypotheses were presented. First it was hypothesized that language ability would be stable from age three to early elementary school, and that language ability at age three would predict reading achievement in early elementary school. Second, it was hypothesized that delayed language at age three would be related to concurrent problem behaviors such as externalizing and internalizing behaviors, and would also predict problem behavior in early elementary school. Third, it was expected that early language ability would be related to concurrent prosocial behaviors and would predict prosocial behavior in early elementary school.

Method

Participants

In the current study, participants were sampled from a population of children attending a birth-to-three intervention for prenatal exposure to cocaine in Miami, Florida. The sample was primarily African-American (79%) and also primarily low SES, with 82% of the sample receiving at least partial public aid. In the first wave of data collection children ranged from 34 to 37 months and in the second wave of data collection, children ranged from six to eight years and were in first or second grade.

The overall sample included 141 children, however due to missing data the literacy analyses were conducted with a subsample of 125 children, the parent behavior analyses were conducted with a subsample of 102 to 104 children, and the teacher behavior analyses were conducted with a subsample of 62 children.

Measures

Measures included standardized assessments at age three and follow up assessments that were conducted when the child was in either first or second grade and between the ages of six and eight. Questionnaires focusing on behavior were also collected from both parents and teachers at both time points.

Age three measures. Standardized assessments at age three included the Bayley Scales of Infant Development (BSID-II) (Bayley-II; Bayley, 1993), the Reynell Developmental Language Scale (RDLS; Reynell & Gruber, 1990) as well as parent and teacher reports of behavior, including the Child Behavior Problem Checklist (CBCL/2-3)

(Achenbach, 1992), and the Adaptive Social Behavior Inventory (ASBI) (Hogan, Scott, Bauer, 1992).

The Bayley Scales of Infant Development Mental Scale (Bayley-II; Bayley, 1993) measures cognitive development at 36 months. The BSID-II yields a mental age score and a standardized score, the Mental Development Index (M=100; SD=15) and is typically used with infants ranging in age from 1 to 42 months. Typical assessments last for 30 minutes for only the cognitive tasks, and 45 minutes including the motor tasks.

The Reynell Developmental Language Scales (RDLS) was also administered as a standardized assessment of receptive and expressive language at age three. Using 118-items it yields separate quotients for receptive (RQ) and expressive (EQ). The RDLS is normed with a sample from an American population. This version of the RDLS is a valid and reliable measure of early language (Reynell & Gruber, 1990).

Parent questionnaire measures were also collected at age three on problem behavior and pro-social behavior. The CBCL, a widely used paper and pencil measure was used as a measure of problem behavior. The questionnaire asks parents to rate a behavior as "very true", "somewhat true", or "not true" of their child, and consists of 99 items yielding subscales of internalizing and externalizing behavior, as well as a total problem behavior score. This assessment is reliable and valid to use with a minority sample (Achenbach, 1992).

Another questionnaire measure of behavior used was the Adaptive Social Behavior Index (ASBI) (Hogan, et al., 1992). Rather than measuring an absence of problem behavior the ASBI measures pro-social behavior. The 30-item questionnaire was developed to work with diverse racial populations and is appropriate to use with

preschool age children. The questionnaire is comprised of three subscales; a Comply scale and an Express scale, both measuring pro-social behavior, and a third Disrupt scale measuring disruptive behavior. Combining the Comply and Express scales yields a pro-social score for each child. The psychometric properties of the ASBI have been investigated, with estimates of internal consistency (coefficient alpha) for the Comply, Express, and Disrupt scales reported as .79, .79 and .71, respectively (Hogan et al., 1992).

Early Elementary School Measures. Children's language achievement in first and second grade was measured via the Woodcock Language Proficiency Battery-Revised (WLPB-R; Woodcock, 1991) and behavioral outcomes were measured through both parent and teacher reports using the Social Skills Rating System (SSRS; Gresham & Elliot, 1990) and the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992) providing cross-situational information on children's behavior.

The Woodcock Johnson (WLPB-R) is a widely used standardized measure of language, applicable from age two years to adult. It is a valid and reliable measure that has been standardized and normed on 6,359 individuals. The four subscales used with school age children are Oral Vocabulary, Picture Vocabulary, Word Attack, and Letter Word Identification. Combining the Word Attack and Letter Word Identification yields a Basic Reading Skills score appropriate for early elementary school children, while the Oral Vocabulary and Picture Vocabulary scales combined yield information about a child's vocabulary level.

Teacher and parent reports on the Social Skills Rating System (SSRS) and the Behavior Assessment System for Children (BASC) were used to assess behavioral outcomes (Reynolds & Kamphaus, 1992). The SSRS measures problem behavior, pro-

social behavior, and academic competencies (Gresham & Elliott, 1990). The teacher form is a 57-item paper and pencil instrument used to rate the behavior of children from kindergarten to grade six. It is a valid and reliable measure, standardized on over 4,000 children rated by over 250 teachers. The subscales included were Assertion and Self-Control measuring prosocial behavior, along with Externalizing, Internalizing, and Hyperactivity measuring problem behavior. The parent form is very similar, with 55 versus 57 items, and yielding subscales of Social Skills and Problem Behavior. There is no parent form subscale of Academic Competence.

The parent ratings and teacher ratings on the Behavior Assessment System for Children (BASC) (Reynolds & Kamphaus, 1992) were also used to assess behavior in early elementary school. The BASC is an advantageous questionnaire to use in this study because it not only includes information on problem behavior symptomology, but also yields information on more positive behavioral outcomes such as social skill development, and school competence. It is an appropriate questionnaire to use with the parents and teachers of children ages 4 to 18. The teacher form consists of 147 items for children ranging in age from 6 to 11 years. The parent form captures information for the same age range, and includes 138 items. Both subscales are typically completed in 30 minutes. The parent and teacher ratings on the Behavior Symptom Index (BSI) and Adaptive Composites, along with teacher ratings on the School Problems subscale were used in this study.

Procedure

Recruitment. Participants were recruited using a combination of previously collected data available at the Linda Ray Intervention Center (LRIC), in addition to

collecting follow-up data on children who completed intervention services at the LRIC. Families were contacted when their child was between the age of six and eight years old and were asked to bring their child to the Linda Ray Intervention Center (LRIC) for assessment. Through reunions at the LRIC we attempted to stay in contact with current graduates and their families to ease tracking. Transportation to and from the Center was also offered to help increase participation in follow up assessments. Families received a $50 gift along with a small toy for participating as an incentive, while teachers received a $10 gift for each child they rated.

Assessment. All assessments during the course of intervention and at follow-up were conducted at the LRIC site by trained research assistants. Three-year assessments were conducted within two months of the participants' third birthday, while follow up assessments were conducted for children between the ages of six and eight years who were currently enrolled in first or second grade.

Standardized assessments and questionnaires were administered at the time of follow up assessment. Permission to contact schools and teachers was also obtained from parents at this time. Teachers were then contacted to collect questionnaire data concerning the child's behavior at school. Collection of teacher reports involved first contacting the child's school via the vice principal and obtaining consent at the administrator level, and then contacting the teacher individually. Hard copies of all questionnaires were faxed or mailed to teachers, along with self-addressed, stamped envelopes, in order to facilitate increased returned materials.

Results

Factor Analyses

To include cross-situational information from multiple sources and to reduce the redundancy of the behavior questionnaires included in the study, two factor analyses were performed. Principal component analyses (PCA) were performed on: 1) parent ratings of behavior in early elementary school and 2) teacher ratings of behavior in early elementary school. Factors with eigenvalues greater than 1.0 were retained (Kaiser, 1960). Varimax rotation (Kaiser, 1960) was used for both PCA analyses to maintain simpler structure while still creating independent factors, and allow for more interpretable loadings. Varimax rotation is used in the PCA to maximize the sum of the variances of the factor loadings. A factor loading of .40 was used as the criterion for determining substantial cross-loadings and scales with cross-loadings were removed from further analyses (Appelbaum & McCall, 1983). Component scores were computed for every subject as a new composite variable, to be used in later regression analyses.

Early Elementary School Parent-Reported Behavior. The first principal components analyses included the variables of parent- reported behavior early elementary school, including parent Social Skills and Total Problem Behavior scales of the SSRS, along with the parent Social Skills, Externalizing behavior, and Internalizing behavior scales of the BASC.

Two factors were retained with eigenvalues greater than 1.0 (Factor 1=2.40, Factor 2=1.39), accounting for 75 percent of the variance. Factor1, renamed Parent Problem Behavior, had strong positive loadings with the SSRS Parent Total Problem Behavior, BASC Parent Externalizing, and BASC Parent Internalizing scales, ranging

from .76 to .86 (see Table 9). Factor 2, renamed Parent Prosocial Behavior, had strong positive loadings with the SSRS Parent Total Social Skills and the BASC Parent Social Skills scales, with loadings of .89 and .92 respectively (see Table 9). Component scores on these two factors were used in later regression analyses as the outcome variables of parent reported behavior at age six.

Early Elementary School Teacher Reported Behavior. The second principal component analyses included the variables of teacher-reported behavior in early elementary school, including teacher forms of the Social Skills and Total Problem Behavior scales of the SSRS, along with the teacher forms of the Social Skills, Externalizing behavior, and Internalizing behavior scales of the BASC. One factor was retained with an eigenvalue of 3.39, accounting for 67 percent of the variance. The teacher behavior factor had strong positive loadings of the SSRS teacher Total Problem Behavior subscale, BASC Teacher Externalizing, and BASC Teacher Internalizing ranging from .71 to .92, and strong negative loadings of the SSRS Teacher Social Skills and the BASC Teacher Social Skills scales, -.88 to -.72 respectively (see Table 10).

Group Differences

Preliminary analyses were conducted to assess demographic differences such as gender, race, and treatment group for age three predictors and early elementary school outcomes.

Gender. Analyses of variance (ANOVA) analyses were conducted to determine if boys differed from girls on any of the predictors at age three or outcome variables in early elementary school. Girls performed significantly higher on cognitive measures (Bayley-II) (M_{Girls} =91.62, SD=10.58, M_{Boys}=86.81, SD=10.88, $F(1,134)=6.77$, $p<.05$; see

Table 2) and expressive language (RDLS) at age three (M_{Girls} =83.2, SD=13.5, M_{Boys}=78.2, SD=11.7, $F(1,134)=5.10$, $p<.05$; see Table 2). There were also gender differences in teacher ratings of behavior in early elementary school. Girls had positive scores while boys had negative scores on the teacher behavior component created by combining teacher ratings of problem and prosocial behavior (see Table 2). Thus, gender was statistically controlled for in later regression analyses.

Race. To analyze the impact of racial group membership, analysis of variance (ANOVA) were conducted. Due to an over-sampling of African-Americans and an under sampling of all other races (N_{Total}=141, $n_{African\text{-}American}$=109) two groups were created; one including African-American participants and a second group comprised of Hispanic-Non-Black participants, Caucasian participants, and all other participants. Group differences existed in early elementary school literacy skills such that, African-American children scored lower in oral vocabulary subscales of the Woodcock Johnson ($M_{African\text{-}American}$=88.1, SD=15.4, M_{Other}=95.4, SD=10.7, $F(1,130)=5.44$, $p<.05$; see Table 3) when compared with other participants. There was also a trend approaching significance in reading skills in early elementary school, such that African-American participants scored lower on basic reading skills, such as letter-word-identification and word attack, when compared to all other participants ($M_{African\text{-}American}$ =96.2, SD=17.4, M_{Other}=103.5, SD=18.6, $F(1,129)=3.74$, p=.055; see Table 3). Thus, race was statistically controlled for in later regression analyses involving oral vocabulary.

Treatment Group. Analyses of variance (ANOVA) were also conducted to examine group differences due to level of intervention received. Previous studies have documented the positive impact that early intervention can have for children prenatally

exposed to cocaine (Black et al., 2004; Bono, Sheinberg, Scott, Claussen, 2007). The intervention program at the Linda Ray Intervention Center was developed from a public health persepective. It was a full-service intervention fro infants exposed t cocaine in utero from a low SES innter-city neighborhood, and served children from birth to age three. Children were randomly assigned into Center- or Home-based groups with Primary Care group enrooled subsequently from the same referral sources.

All intervention treatment groups, center-, home-, and primary care received medical care, social services, family education, support services, and transportation. The Center-based intervention consisted of a preschool like experience for five hours per day, five days per week. The center-based group also received nutritional support through both breakfast and lunch served at the center daily. A curriculum targeting language, cognitive, and motor development was implemented by teachers daily, with teacher to child ratios of 1:3. The home-based intervention involved the same curriculum implemented one on one in the home. Participating children received 2 home visits per week lasting one and a half hours each. The primary-care level of intervention did not receive the center or home based curriculum, but did receive regular social services and assessments.

In this study, sixty children were enrolled in the center-based intervention, fifty-three were enrolled in the home-based intervention, twenty-two were enrolled in the primary-care intervention, and one participant was a sibling of a center-based child. Previous analyses display differential outcomes at age three due to treatment-group level with moderate to large effects of the center and home-based interventions on cognition, receptive and expressive language, and gross motor development at 36 months, as well as

small effects on behavior problems (Bono, Dinehart, Claussen, Scott, Mundy & Katz, 2004; Claussen et al., 2004) when compared to the primary care/comparison group. Because of these differences, treatment group differences were analyzed in this follow-up subsample.

Significant intervention group differences were found such that children enrolled in the center or home intervention scored significantly higher than those enrolled in a the primary care intervention on three year cognitive assessments (M_{Center}=90.37, *SD*=11.4, M_{Home} =90.21, *SD*=10.1, $M_{PrimaryCare}$ =83.36, *SD*=11.0; see Table 4). There were also treatment group effects on expressive language ability, such that children in the center and home-based intervention scored higher on expressive language than those enrolled in primary care (M_{Center}= 83.56, *SD*=13.2, M_{Home}= 79.71, *SD*=12.2, $M_{PrimaryCare}$= 75.43, *SD*=12.1; see Table 4). These differences were also considered in later analyses involving these predictors.

Teacher Cohort. Because of the large amounts of missing data, analyses of variance (ANOVA) were also conducted to examine group differences due to having a completed teacher battery or not. There were no demographic differences in children, such as race or gender that defined if teachers completed the questionnaires (see Table 5). Similarly there were no statistically significant differences on predictors at age three or outcomes in early elementary school when applying the Bonferroni correction for multiple pairwise comparisons (see Table 6).

Correlations

To examine the relationship between measures at age three and outcomes in early elementary school, bivariate correlations between all predictors and outcome variables were computed.

Concurrent correlations. Receptive and expressive language at age three were significantly and positively correlated with cognitive ability at age three (see Table 7). Early language was also significantly and positively correlated with factors of prosocial behavior at age three, such that receptive and expressive language were correlated with parent reported prosocial behavior ($r_{Receptive}$=.22, p<.05; $r_{Expresive}$=.28, p<.01). Receptive language was also significantly and negatively correlated with concurrent problem behavior (r=-.27, p<.01; see Table 7). However, language at age three was not correlated with teacher reported prosocial behavior (see Table 8).

Correlations between age Three and Early Elementary School . Both receptive and expressive language at age three were significantly and positively correlated with all of the subscales of the Woodcock Johnson in early elementary school, supporting a relationship between early language and literacy in early elementary school (see Table 7).

Both receptive and expressive language at age three were also significantly and positively correlated with the of parent prosocial behavior in early elementary school ($r_{Receptive}$=.32, p<.01 $r_{Expressive}$=.32 p<.01; see Table 8). However only receptive language was significantly correlated with teacher reported behavior in early elementary school ($r_{Receptive}$=.34, p<.01). There were no significant correlations between early language and parent reported problem behavior in early elementary school (see Table 8).

Regressions

To examine the predictive effect that early language had on early elementary school reading skills, vocabulary skills, problem behavior, and pro-social behavior, hierarchical linear regression analyses were conducted. Models controlling for cognitive ability, gender differences, race differences, treatment group, and behavior at age three were conducted, with expressive and receptive language at age three predicting language abilities and behavior in early elementary school.

Model 1 included the control variables of gender and race, Model 2 included gender, race, and treatment group, Model 3 included gender, race, treatment group, cognitive ability at age three, and factors of behavior at age three while Model 4 introduced the predictor of language ability at age three, along with the control variables included in the previous three models (see Figure 1). However, where there was no group difference found due to predictors, these variables were dropped from the model.

Early Language Predicting Basic Reading Skills. To analyze the influence of early language on basic reading skills in early elementary school, the hierarchical model previously discussed was applied with the outcome of Basic Reading Skills from the Woodcock Johnson. In Model 3, the Bayley was a significant predictor of basic reading skills in early elementary school ($F(4, 124)=4.01$, $p<.01$, $c_{ognition}= .46$, $p<.01$). However when language was added in model 4, neither cognition nor language were significant predictors ($F(5, 124)=3.60$, $p<.01$, $b_{Cognition}= .28$, $p=.052$, $b_{Expressive}=.16$, $p=.31$, $b_{Receptive}=.23$, $p=.18$; see Table 11). Therefore, cognitive ability seems to predict later reading skills, such that children with higher cognitive scores at age three have higher

reading skills in early elementary school. However, when accounting for language, this effect of cognitive ability disappears.

Early Language predicting Oral Vocabulary Skills. Regression analyses were also conducted to analyze how language at age three predicted oral vocabulary skills in early elementary school. Language at age three was not a significant predictor of oral vocabulary in early elementary school, however racial group membership did significantly predict oral vocabulary in early elementary school ($F(4, 124)=4.74$, $p<.01$, $b_{race}= -6.23$, $p<.05$). African-American children were again at a disadvantage in oral vocabulary skills in early elementary school (see Table 12).

As with basic reading skills, cognitive ability was a significant predictor of oral vocabulary skills in Model 3 ($F(4, 124)=5.35$, $p<.01$, $b_{cognition}= .44$, $p<.01$), however when language is entered in Model 4, neither cognitive ability nor language at age three significantly predicted oral vocabulary skills in early elementary school ($F(5, 124)=4.74$, $p<.01$, $b_{cognition}= .29$, $p=.07$, $b_{Expressive}=.14$, $p=.26$, $b_{Receptive}=.20$, $p=.15$; see Table 12).

Early Language Predicting Picture Vocabulary Skills. Unlike basic reading skills and oral vocabulary, receptive language at age three was a significant predictor of picture vocabulary skills in early elementary school ($F(4, 125)=6.76$, $p<.01$, $b_{Receptive}= .42$, $p<.01$), such that higher receptive language ability at age three predicted higher picture vocabulary skills in early elementary school. In this same model, gender was also a significant predictor of picture vocabulary ($b_{Gender} = 7.1$, $p<.05$) such that being female placed children at an advantage in vocabulary skills in early elementary school (see Table 13).

In the model including expressive language as a predictor, cognitive ability significantly predicted picture vocabulary ($F(4, 125)=5.01$, $p<.01$, $b_{Cognition}= .37$, $p<.05$), while expressive language did not. Therefore, higher cognitive scores at age three also predicted higher picture vocabulary scores in early elementary school (see Table 13).

Early Language Predicting Early Elementary School Behavior. A second series of regression analyses were conducted to examine the relationship between language at age three and both problem and prosocial behavior in early elementary school. With similar models used in the literacy analyses, hierarchical linear regression analyses were conducted on the components created in the earlier principal components analysis.

Model 1 included gender, Model 2 included gender and treatment group, Model 3 included gender, treatment group, and factors of behavior at age three, while Model 4 introduced the predictor variable of language ability, controlling for gender, treatment group, and behavior at age three. Race was not included as a control variable in these analyses because there were no group differences in any of the predictors or outcomes variables due to racial group membership (see Figure 2).

Parent Rated Problem Behavior. Contrary to the hypothesized relationship between early language ability and later problem behavior, neither expressive nor receptive language significantly predicted parent-rated problem behavior in early elementary school, when controlling for gender, treatment group, race, cognition and problem behavior at age three ($F(5, 105) = 3.28$, $p=.01$, $b_{Receptive} =-.01$, $p=.28$, $b_{Expressive}= -.01$, $p=.71$; see Table 14).

However, parent reported problem behavior at age three was a significant predictor of parent reported problem behavior in early elementary school ($F(5, 105) =$

3.28, p=.01, $b_{ParentProblemBehavior}$ =-.04, p<.01; see Table 14), suggesting the stability of parent reports of problem behavior from age three to six.

Parent Rated Prosocial Behavior. Receptive language at age three was a significant predictor of parent-reported prosocial behavior in early elementary school (F(5, 101) = 3.89, p<.01, $b_{Receptive}$ =-.03 , p<.01, F(5, 101) = 3.46, p<.01, $b_{Expressive}$ =-.03, p<.05; see Table 15), above and beyond the effects of gender, treatment group, cognitive ability and behavior at age three. These results support the hypothesis that language ability at age three influences positive behaviors in early elementary school.

Behavior also remained a significant predictor in models including language, suggesting the stability of prosocial behavior at age three to prosocial behavior in early elementary school (F(5, 101) = 3.89, p<.01, $b_{ProsocialBehaviorAge3}$ =-.07 , p<.05; see Table 15)

Teacher Rated Behavior. Contrary to the hypothesized relationship between early language and later behavior, expressive and receptive language ability were not significant predictors of teacher-rated behavior in early elementary school (F(5, 62) = 2.02, p=.09, $b_{Receptive}$ = -.03, p<.05, (F(5, 62) = 0.85, p=.52, $b_{Expressive}$= -.01, p=.77; see Table 16)

Discussion

In this study, regressional analyses revealed an interesting pattern of results. Contrary to the hypothesized relationship, language at age three did not significantly predict parent reported problem behavior in early elementary school (see Table 14). Rather, parent reported problem behavior at age three significantly predicted parent reported problem behavior in early elementary school (see Table 14). However, language at age three was a significant predictor of parent reported prosocial behavior in early elementary school, supporting the hypothesized influence of early language on later behavior. These findings do not translate to teacher reported behavior in early elementary school, where language at age three was not a significant predictor of teacher reported behavior in early elementary school

Factor Structure

The creation of multiple factors of child behavior was instrumental in combining information from differing sources and reducing redundancy between similar measures in this study.

It was originally hypothesized to include a PCA on age three behavior, however due to an attempt to increase the sample size; the component scores for age three were dropped. After running a PCA for all three year behavior, the scales loaded systematically by informant and by questionnaire such that the Parent-Reported Problem behavior factor only included information from the parent CBCL, while the Parent-Reported Prosocial behavior factor only included information from the parent ASBI, and the Teacher-Reported Prosocial behavior factor only included information from the teacher ASBI. Also, because the sample included thirty-eight children who did not have

a teacher ASBI, by including the teacher ASBI in the PCA, those thirty-eight children were automatically excluded from the factor analysis, and did not have corresponding age three component scores to be used in future analyses. As a result, component scores were dropped and scale t-scores were used in their place.

PCAs were still conducted on measures of six year behavior, one for parent reported behavior and one for teacher reported behavior. However, the factors created loaded differently than originally hypothesized. Originally, two factors of behavior for each informant was hypothesized, one explaining problematic behavior, and a second explaining the separate construct of prosocial behavior. This hypothesis held true with the parent behavior factor analysis where two separate components for problem and prosocial behaviors were retained. However, for the PCA of teacher-reported behavior, one global teacher report factor was retained, with problem behavior scales loaded strongly and positively while prosocial scales loaded strongly and negatively (see Table 10).

Parents and teachers rate children in very different ways when asked the same questions. Teachers tend to rate children more globally than parents. A child with high teacher-reported levels of problem behavior will also have low levels of teacher-reported prosocial behavior. Therefore the two constructs were not independent of each other, rather they are inversely related; such that as teachers' ratings of problem behavior increased, teacher ratings of prosocial behavior for the same child decreased.

The two separate parent factors revealed that parent ratings of prosocial and problem behavior are distinct and unique, suggesting that parents can bring to mind examples of sharing and cooperation in a child that may also be rated high in levels of externalizing behavior. The two sets of behaviors are not mutually exclusive, that is to

say that a child high on internalizing behavior may also be rated as high on helping behaviors by parents.

Group Differences

Gender. Gender differences revealed that girls performed significantly higher on cognitive measures (Bayley-II) and expressive language (RDLS) at age three (see Table 2). This early advantage in expressive language for girls is consistent with previous literature in typically developing samples on gender differences in language development (Leaper & Smith, 2004). A recent meta-analysis of gender effects in language revealed that girls were significantly more talkative than boys when examined across 73 independent samples with a total sample of 3,303.

However, these differences in expressive language may not be due to biological differences, rather may be better explained through the different socialization processes young girls and boys experience (Maccoby, 1998). Girls are often engaged in more verbal activities with smaller groups of peers at the preschool age, while boys tend to engage in larger groups with less one-on-one verbal interaction (DiPietro, 1981; Belle, 1989; Fabes, Martin, & Harnish, 2003) This preference for verbal usage during play for girls may explain the higher expressive language ability scores for girls in this sample when compared to their boy peers. It is important to note that within this sample of children prenatally exposed to cocaine, from low SES, and primarily African-American, the data supports this relationship.

Within this high-risk sample, gender differences were also found in teacher reported behavior in early elementary school such that boys had higher scores on the overall teacher behavior factors than girls (see Table 2). Boys and girls had different

valances on their teacher overall behavior component scores, with boys having positive scores and girls having negative scores. Considering the valences of the subscales that loaded onto the teacher overall behavior factor, with problem behaviors loading positively and prosocial behaviors loading negatively, the differences in valence suggest that teachers rated boys as having more problem behavior and less social skills than their girl peers.

In a recent review of the literature on gender differences in behavior problems within preschool children from low-income families, only five out of the sixteen studies included in the review reported significant gender differences (Huaqing-Qi & Kaiser, 2003). However, when gender differences were present, boys were consistently rated or observed to engage in more problematic behaviors (Huaqing-Qi & Kaiser, 2003; Kiaser et al., 2000; Randolph et al., 2000). These findings support the differences in behavior between boys and girls in early elementary school.

Race. Group differences existed among racial groups on early elementary school literacy skills such that African-American children scored lower in oral vocabulary subscales of the Woodcock Johnson, when compared with other participants (see Table 3). Again these findings are most likely not biological in nature, but more a result of environmental factors impacting the African-American children included in this study. There is much debate in the current field of education about minority achievement gaps, and such policy initiatives as No Child Left Behind have been instituted in part due to these achievement gaps. This racial group difference, although disturbing is unfortunately consistent with the current findings in minority education in America.

Minority status is considered a risk factor for many academic outcomes, but can be explained in terms of the relationship between being African-American and academic success. Fordham and Ogbu (1986) and Fordham (1988) describe the poor academic outcomes of African Americans in terms of the social influences they experience during their school careers; such as social stratification, being marginalized, and system-wide racism. Because of the constant inequality African-American children experience in school, academic success becomes an unattainable goal, which leads children to reject academic success in school (Ogbu, 1978, 1982).

Another possible explanation for the low performance of African-American children in this sample could be explained through stereotype-threat (Steele, 1997). It is true that the African-American children within this sample live in poverty, are prenatally exposed to cocaine, have high numbers of custody changes, and live in violent communities. However, the remaining members of the sample are also facing these same risk factors. Risk factors alone there fore cannot explain the racial group differences in literacy achievement in early elementary school. What African-American children do have uniquely is their racial group membership. The negative stereotypes surrounding African-Americans and schooling have been documented to influence achievement, and even explain the residual variance when controlling for other influential risk factors such as poverty, negative parenting, and poor socialization in explaining the race achievement gap (Steele, 1997). Perhaps this explains the poor performance of African-American children in this sample when compared to their non-African American peers.

Treatment Group. Group differences also existed in treatment group levels such that children enrolled in the center or home intervention scored significantly higher than those enrolled in the assessment only group on three year cognitive assessments and expressive language ability (see Table 4). These differences are best explained by treatment effects of attending the center or home based level of intervention at the Linda Ray Intervention Center. Previous studies have documented the positive impact that early intervention can have for children prenatally exposed to cocaine (Black et al., 2004; Bono, Sheinberg, Scott, Claussen, 2007). These findings support the beneficial impact that attending the Linda Ray Intervention Center has on the cognitive and language development of participants. Children who experience high quality, consistent early childcare that is targeted at improving both cognitive and language ability can have an impact on children's individual level outcomes in both domains.

Teacher Cohort. Chi Square and General Linaer Model analyses were also performed to answer the question "Are children with teacher completed questionnaires qualitatively different from those without teacher completed questionnaires?" There were no demographic differences in children, such as race or gender that defined if teachers completed the questionnaires (see Table 5). Similarly there were no differences in age three predictors or outcome variables in early elementary school (see Table 6). Therefore these two groups of children, those with and those without teacher data are performing similarly on all predictors and outcome variables, and can be compared as members of a similar sample.

Language at age Three and Basic Reading Skills in Early Elementary School

Both correlation and regression analyses were conducted to examine the relationship between language ability at age three and later literacy in early elementary school. Consistent with previous findings, early language ability was significantly and positively correlated with reading skills in the early elementary school years (see Table 7). Cognitive ability at age three was also positively and significantly correlated with later elementary school reading skills and vocabulary skills. (see Table 7).

When examining the predictive relationship between language at age three and later reading achievement, early language was not a significant predictor of basic reading skills in early elementary school (see Table 11). In Model 3, which included the predictors of gender, race, treatment group, and cognitive ability; cognitive ability was a significant predictor of basic reading skills, such that children with higher Bayley scores at age three had subsequent higher basic reading skills such as word-attack or letter-word-identification skills in early elementary school**.** However in Model 4, which included the predictor of language at age three, cognitive ability no longer predicted basic reading skills (see Table 11).

The Bayley measure of cognitive ability is very language based at age three, and is highly correlated with both receptive and expressive language measures at levels greater than .63, suggesting the Bayley and the Reynell may be too highly correlated to produce significant and independent effects in regression analyses on later reading skills. This covariance could explain the drop in significance for cognitive ability at age three predicting basic reading skills when language is entered in the model, and also explain

why neither receptive nor expressive language were significant predictors of later reading skills.

Also, models containing the Bayley as a predictor explain significantly more variance in literacy than those only including gender, race, and treatment group (see Table 11). However, adding language as a predictor does not explain more variance in basic reading skills (see Table 11). The covariance between the Bayley and the Reynell at age three may explain the lack of significance in the relationship between early language and reading achievement in elementary school.

Language at age Three and Oral Vocabulary in Elementary School

Both correlational and regression analyses were also conducted to examine the relationship between early language ability and later vocabulary skills in elementary school. Oral vocabulary was significantly and positively related with both receptive and expressive language with correlations of 0.34 and 0.27 respectively (see Table 7).

When examining the predictive relationship between early language ability and later oral vocabulary, a similar pattern with basic reading skills emerged. Although early language was not a significant predictor of oral vocabulary, there were interesting effects of cognitive ability at age three (see Table 12). Again in Model 3, which included the predictors of gender, race, treatment group, and cognitive ability; cognitive ability was a significant predictor of oral vocabulary in first and second grade, however, when entering language into the model cognitive ability was no longer a significant predictor of oral vocabulary in early elementary school (see Table 12). Again the high covariance between early measures of cognitive ability and early language measures may explain

this change in predictor status, as well as why language is not a significant predictor of oral vocabulary skills in these models.

Race did remain a significant predictor of oral vocabulary in Model 4; such that African-American children were at a disadvantage on measures of oral vocabulary in early elementary school (see Table 12). These findings, similar to the racial group differences in basic reading skills in elementary school, are consistent with literature on the minority achievement gap. African-American children may be at a disadvantage on literacy and vocabulary skills in elementary school due to the negative effects of growing up with prejudice and negative stereotypes concerning the academic performance of African-Americans in the United States (Steele, 1997).

Language at age Three and Picture Vocabulary in Early Elementary School

Both correlational and regression analyses were also conducted to examine the relationship between language ability at age three and picture vocabulary skills in early elementary school. Picture vocabulary was significantly and positively related with early receptive and expressive language with correlations of 0.36 and 0.25 respectively (see Table 7). These findings support the theory that early language ability is related to language in early elementary school.

In examining the predictive relationship between language ability at age three and later picture vocabulary, similar patterns with cognitive ability emerged. Cognitive ability was a significant predictor in Model 3; including covariates of gender, race, and treatment group (see Table 13). However, when language was entered in Model 4 the predictive effect of cognitive ability at age three washed out (see Table 13). Gender and receptive language both remained significant predictors in the final model (See Table 13).

Girls were at an advantage in picture vocabulary skills, such that being female predicted higher picture vocabulary scored in early elementary school. This finding was again consistent with previous literature surrounding the effects of gender on language and literacy in childhood (Snow et al., 1998). When gender effects are present, girls are consistently favored to have better literacy outcomes in elementary school. It is interesting to note that the relationship between gender and literacy exists in this high risk sample, as well as the well-studied typically developed samples.

This increase in vocabulary may be linked to play patterns that are different between girls and boys. Girls and boys have different early linguistic experiences which impact later vocabulary skills. Mothers are more talkative when interacting with their daughters, as compared with sons (Leaper, Anderson, & Sanders, 1998). Over time this increase in conversation with mothers may explain the increases in vocabulary skills found in girls when compared to boys.

Receptive language also influenced picture vocabulary in elementary school such that children with higher scores on the receptive scales of the Reynell predicted higher scores of the Woodcock Johnson picture vocabulary scales (see Table 13). Most previous literature has documented the link between oral or expressive language and later literacy (Whitehurst& Lonigan, 1998; Snow, Tabors, & Dickinson, 2001; Scarborough, 2001). However, our study provides support for the need for receptive language skills for later vocabulary skills. In our sample, receptive ability such as understanding the language environment at age three, as opposed to verbal production had a greater influence on increases in vocabulary in early elementary school than expressive language at age three.

The findings support Whitehurst's theory of emergent literacy, which states that learning to read is process that begins long before a child enters a standard kindergarten or first grade classroom (Whitehurst & Lonigan, 1998). It is a fluid process made up of many varied experiences prior to school that can either hinder or help a child's later reading ability. (Storch & Whitehurst, 2002). Oral language, phonological processing abilities, and print knowledge are all precursors to emergent literacy (Whitehurst & Lonigan, 1998). Because receptive language develops before expressive language these data support an even earlier beginning to the emergent literacy continuum involving receptive language as a precursor to oral language and a predictor of vocabulary ability in early elementary school.

Language at age Three and Parent Reported Problem Behavior in Early Elementary School

The relationship between early language and parent reported problem behavior in early elementary school was also analyzed through correlation and hierarchical linear regression analyses. Receptive language ability at age three was significantly correlated with problem behaviors at age three, but not correlated with problem behaviors in early elementary school (see Table 8).

Contrary to previous findings linking expressive language and problem behavior, these data demonstrated a correlation between receptive ability and behavior problems. Children with lower receptive language ability at age three had significantly higher reports of problem behavior in early elementary school. An inability to understand language may lead to an inability to understand expectations of the environment, such as classroom routines, or parent demands. Some children who do not comply with parent or

teacher requests may not be explicitly "breaking rules", but simply not understand the expectations of behavior, and therefore be rated as more problematic by parents.

Regression analyses revealed that neither receptive nor expressive language at age three were significant predictors of parent-reported problem behavior in early elementary school, above and beyond gender, race, treatment group, cognitive ability and behavior at age three (see Table 14). Because the cognitive assessment used at age three (Bayley) is so language based at this age, it may in fact mask the effects of language on behavior. Models containing the Bayley as a predictor explained significantly more variance in problem behaviors, than those only including sex, race, and treatment group (see Table 14). However, adding language as a predictor did not explain more variance in parent report of problem behavior.

Considering that children in this high risk sample displayed average scores of problem behavior, while their language abilities remained more than one SD below the mean on both receptive and expressive language ability, this could explain the lack of relationship between language and problem behavior (see Table 1). These children were substantially language delayed; however, they displayed relatively normative levels of problem behavior, contrary to previous hypothesis linking language delay with problematic behavior. Perhaps constructs of resilience within this sample need to be further examined to understand how the risk of language delay did not result in increased problematic behaviors in this high-risk sample.

Problem behavior is also influenced by the presence of prosocial behavior, such that increases in prosocial behavior may help to decrease more problematic behaviors such as aggression (Bandura, 1999; Bandura, Barbaranelli, Caprara, & Pastoirelli, 1996).

Perhaps the presence of prosocial behaviors in this sample helped to ameliorate the negative effect that language delay has on behavior.

Another possible explanation is that of measurement problems. The CBCL is a widely used clinical tool, and is valid and reliable to use with clinical minority samples. This sample, however, was not clinical in nature. The CBCL therefore may not be an ideal tool to use to measure children's problem behavior. Mean scores on the CBCL were below the clinical cut off score of 65 (M_{CBCL}=52.3, SD=10.6), with only 13 out of 124 participants with completed CBCL-P questionnaires receiving scores in the clinical range. Therefore, this questionnaire may not capture non-clinical examples of problem behavior. Anecdotally, when speaking with teachers in the intervention problem there are many problem behaviors displayed by children on a daily basis, yet they may not be severe enough in nature to be picked up by a clinical questionnaire.

Also related to the problem of measurement is informant bias. Relying on parent report in this very high-risk sample may not yield accurate information on children's behavior. The parents in this sample may not have a 'normative' idea of behavior, and therefore may not be able to accurately rate their own child's behavior. What is common behavior to a parent of a child prenatally exposed to cocaine may be uncommon to a parent of a typically developing child.

Parents in this sample also tend to express that their children are displaying no problems when there are documented issues such as developmental delay, or language problems. This inability to ascribe negative attributes to their children may also be present in questionnaires about problem behavior in their children. Therefore, parent

ratings of children's behavior in this sample need to be interpreted carefully and within this specific context.

Language at age Three and Parent Reported Prosocial Behavior

Both expressive and receptive languages were significantly correlated with concurrent parent reported prosocial behavior and parent-reported prosocial behavior in elementary school (see Table 8). Both receptive and expressive language at age three were significantly correlated with parent reported prosocial behavior in early elementary school, with correlations ranging from .31 to .35 (see Table 8). These data support the hypothesis that early language is related to later prosocial behaviors such as cooperation and sharing in early elementary school.

To better understand this relationship, regression analysis were conducted. While behavior alone predicted parent reported problem behavior, both behavior at age three and early language predicted parent reported prosocial behavior in early elementary school, above and beyond the effects of gender, race, treatment group, and cognitive ability (see Table 15). Both receptive and expressive language predicted later prosocial behavior, such that children with higher receptive and expressive language at age three had higher prosocial behavior in early elementary school (see Table 15).

These data support the hypothesis that early language ability facilitates social interactions, which in turn facilitate socially adaptive behaviors, such as sharing and cooperation in elementary school. The predictive ability of early receptive language to later prosocial behavior suggests an influential pathway to prosocial behavior through the understanding of language and verbal production. A child's receptive language facilitates understanding of expectations at home. This understanding may lead to increases in

compliance with rules and routines, leading to more pro-social behavior such as cooperation and sharing. Increases in receptive language may facilitate the understanding of what is expected of children in different environments, leading to more pro-social behavior.

Conversely, expressive language is also related to prosocial behavior through verbal interactions. Language is the basis for most human social behavior. Expressive verbal skills are a necessary tool for successful social interactions. Children typically express needs or wants through the ability to verbally explain their feelings to others. Through this avenue, more advanced social interactions such as helping behaviors and sharing are also developed. Children who have greater verbal abilities will have greater opportunities to practice these social interactions and will engage in more prosocial behaviors, while children with language delay will be at a disadvantage in social situations because of their lack of language. Overall the data support the predictive influence that early language ability has on later positive behavior, such as prosocial behavior, in elementary school.

Language at age Three and Teacher Reported Behavior in Early Elementary School

Because the teacher principal components analysis (PCA) yielded only one factor, both problem behavior and prosocial behavior ratings were collapsed into one component. This one component was a global rating of children's behavior, with influences from both prosocial and problem behavior ratings.

Early language was significantly correlated with teacher ratings of children's behavior in early elementary school such that receptive language at age three was

significantly correlated with the teacher behavior factor (see Table 8). This correlation supports the relationship between early language and later teacher-reported behavior.

However, hierarchical regression analyses revealed that language was not a significant predictor of teacher rated behavior when controlling for gender, treatment group, cognitive ability at age three, and behavior at age three (see Table 16). Models including receptive and expressive language, and controlling for gender, treatment group, cognitive ability and behavior at age three were not significant models in explaining teacher reported behavior in early elementary school (see Table 16).

Because problem and prosocial behaviors were not separate in the teacher ratings, it was more difficult to analyze the specific relationships hypothesized in this study. Rather than examining the specific link between early receptive language and later teacher reported prosocial behavior, the analysis would only allow for a regression with an outcome of the global teacher rated behavior component. As a result, specificity decreased, which could have influenced the lack of significant findings in the analyses.

Also, because of the large amount of missing data involved in this study, the sample included in teacher analyses was less than half of the overall sample (N_{Total}=141, $n_{Teacher}$=63). Due to the decrease in power directly influenced by sample size, this could also explain the lack of relationship between early language and teacher-rated behavior.

Cross-situational ratings. The differences in predictive ability between sources of information, parent versus teacher reports, may be due to the different demands of children's environments when interacting with parents versus teachers. Teachers and parents may have different expectations of what is problematic or prosocial behavior, and

may actually be thinking of different types of behavior when answering questionnaires about the same child.

Also, reference-point is an important factor influencing both parent and teacher reports of behavior. Teachers typically interact with more children than parents. As a result, when rating a child's behavior teachers generally have more experience with varied types of children as compared to parents. Teachers therefore may draw upon many more comparison children when rating an individual child. Parents however, may have a limited number of comparison children to use as a reference point when rating their own child's behavior. These differences in exposure to varied types of children and behaviors may influence the types of ratings a teacher and parent give about the same child. What a parent views as normative, a teacher may view as excessive, or vice versa. However, it is important to mention again that due to the large amount of missing data that only involved the teacher analyses, generalizations between the two sets of analyses need to be made with caution.

Implications

Finding that early receptive language predicts later teacher ratings of prosocial behavior supports the need for high quality language experiences for children as young as age three for their later success in elementary school. Pro-social behaviors such as cooperation and sharing are integral skills needed by children in our school systems. Without such skills later success is difficult. Investing in a child's early language environment has significant impact on their later behavior in schools and at home. Therefore there is a need for high quality literacy environments for young children, to help facilitate their prosocial behaviors later in their academic careers.

Limitations

Recruitment. The families involved in this sample were very mobile and were difficult to track. Following up three years post-graduation with families from very low SES proved difficult for recruitment purposes. If researchers were able to contact families, almost all families contacted agreed to participation and were happy to visit with their child's past school. However, disconnected phone lines, unknown addresses, and, at times, changed custody situations lead to the loss of many families. As is common in most voluntary studies, families willing to participate may be qualitatively different from those opting not to participate. Therefore, to avoid any potential biases by excluding families that were more difficult to contact, new recruitment processes should be created to increase the representativeness of this follow up study.

Missing Data. Once families were recruited, missing data was a large limitation of the current study. Lack of teacher participation limited the samples that could be included in the regressions of teacher reported behavior. Less than half of the original sample was included in the teacher-reported behavior analyses. Increases in compensation for participation could be reviewed to help increase teacher participation. Long term changes in terms of University-community partnerships should also be focused upon to help increase the number of principals interested in participating in University run research programs.

Future Directions

Observational Data. The current study relied solely on teacher and parent report of child behavior. Future studies should include direct observational techniques that increase the validity of ratings of children's behavior. Error is always introduced when

asking a teacher or parent to rate a child, rather than directly assessing that child's interactions. Therefore observational techniques will be introduced in future research projects investigating the link between language and behavior.

Structural Equation Modeling. Sample size was also a limitation of this study, with a sample of under 150 children it is difficult to conduct more sophisticated statistical analyses. Increasing sample size and applying more advanced statistical techniques, such as structural equation modeling, would allow researchers to better understand the How? rather than the simple What? questions surrounding the link between language and later social skills. What variables mediate or moderate this relationship? And how can we better facilitate both early language experiences and early behavior experiences within an intervention setting? These questions are interesting and important future directions of this research.

Resiliency. Also, considering the lack of a relationship between early language and problem behavior, resilience factors need to be explored in this high risk sample. An investigation of what child or family characteristics lend a child to be resilient in the face of multiple risk factors for developing problem behavior would shed light on the differing impact of variables in a child's life. More research on the development of prosocial behavior, and its link with language also needs to be conducted in high-risk populations, with an eventual application of research findings on intervention programs.

Mediation. Future analyses will be explored within this sample to better understand the underlying relationship between language and behavior. Perhaps one explanation for the lack of a significant relationship between early language and later problem behavior is due to the mediation effects of behavior at age three. Perhaps

language influences concurrent behavior, which then in turn predicts future behavior. This mediation hypothesis is one possible avenue for future analysis that I would like to explore with this sample and data.

Clinical vs. Non-Clinical Measures. Also, in this study we combined the SSRS and BASC to create large factors of behavior. I would like to look at the different relationships that may be present between the two questionnaires. The SSRS is used more in non-clinical settings while the BASC is a structured interview that can be used for diagnostic purposes. I would like to explore the differences that may be present when using one or another of these questionnaires in isolation to measure problem behavior.

Inclusion of new variables. I would also like to explore the elementary school data and gain a better understanding of the concurrent relationship between reading and problem behavior in elementary school. This data set includes much information from the Woodcock Johnson, but there is also information on children's cognitive abilities in elementary school, such as spatial abilities, pattern construction, and matrices. I would like to explore the links between behavior in elementary school and academic outcomes such as reading and more mathematically related skills.

Conclusion

Overall this data highlighted the importance of early behavior and literacy experiences for high risk children, and the impact that behavior and language in preschool have on both academic and social outcomes in early elementary school. Both cognition and language at age three had a significant impact on literacy outcome such as vocabulary and basic reading skills in early elementary school. These early abilities in cognition and language have a lasting effect into a child's academic career.

Behavior at age three was also significant predictor of problem behavior in early elementary school. With the current emphasis of literacy outcomes in education, social-emotional domains are often forgotten. However, this study supports the need for high quality social experiences for children, with the effects of early problem behavior at age three lasting through the early elementary school years.

Also, cross-domain studies need to be examined closely to understand the dynamic relationship between social experiences and academic outcomes. In this study, behavior as well as language at age three were both significant predictors of prosocial behavior in early elementary school. Both social experiences and literacy experiences combine in this study to impact later socially adaptive skills such as sharing and cooperation in early elementary school. This relationship between experiences at age three and outcomes in early elementary school highlights the need for high quality preschool experiences in both academic and social domains for all children.

Tables and Figures

Table 1. Descriptive Statistics of Language at age Three and Problem Behavior in Elementary School.

Variables	M	(SD)
3 yr Reynell- Receptive	82.23	12.97
3 yr Reynell - Expressive	82.6	12.50
6 yr SSRS- P Total Problem	100.11	13.46
6 yr SSRS- T Total Problem	107.98	16.66
6 yr BASC- P Externalizing	50.12	11.01
6 yr BASC- T Externalizing	55.73	13.37
6 yr BASC- P Internalizing	44.35	11.01
6 yr BASC- T Internalizing	52.11	12.18

Note. $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 2. Gender Differences in Cognition, Language, and Behavior.

	Girls	Boys		
	M(SD)	M(SD)	df	F
3 yr Bayley	91.6(10.6)	86.8(10.8)	(1, 133)	6.77**
3 yr Reynell- Expressive	83.2(13.5)	78.2(11.7)	(1, 128)	5.10*
6 yr Teacher Behavior	-0.22(1.0)	0.21(0.96)	(1,92)	4.19*

Note. *p<.05; ** p<.01 (2-tailed)

Table 3. Racial Group Differences in Literacy in Elementary School.

	African- American	Other		
	M(SD)	M(SD)	df	F
6 yr WJ- Oral Vocabulary	88.1 (15.4)	95.4 (10.7)	(1,130)	5.44*
6 yr WJ- Basic Reading	96.2 (17.4)	103.5 (18.6)	(1,129)	3.74^{+}

Note. $^{+}p<.06$, $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 4. Treatment Group Differences in Cognition and Language.

	Center-Based	Home-Bound	Primary Care		
	M(SD)	M(SD)	M(SD)	df	F
3 yr Bayley	90.3(11.3)	90.2(10.1)	83.3(10. 4)	(2,132)	3.83*
3 yr Reynell-Expressive	83.5(13.2)	79.7(12.2)	75.4(12.1)	(2,127)	3.47*

Note. $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 5. Chi Square analysis of Demographic Differences due to Completed Teacher Questionnaires vs. Incomplete Teacher Questionnaires.

	Complete Battery	Incomplete Battery		
	n	n	df	χ^2
Gender				
Male	27	21	(1)	.34
Female	47	45		
Race				
African-American	72	37	(1)	.03
Other	20	11		
Treatment Group				
Center	36	26	(1)	2.89
Home/ Primary Care	56	22		

Note. $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 6. Group Differences due to Teacher Completed Questionnaires vs. Teacher Incomplete Questionnaires.

	Complete Battery	Incomplete Battery	Difference Score
	M(SE)	M(SE)	Diff(SE)
3 yr Bayley	88.26(1.6)	92.64(2.4)	-4.37
3 yr Reynell – Exp	80.90(1.9)	83.77(2.8)	-2.88
3 yr Reynell- Rec	81.31(1.8)	84.82(2.7)	-3.51
3 yr CBCL- P	52.16(1.3)	50.23(1.9)	1.94
3 yr ASBI- P	27.18(0.6)	28.21(0.8)	-1.02
3 yr ASBI- T	25.72(0.8)	27.18(1.2)	-1.46
6 yr Oral Vocab	89.39(2.3)	80.14(3.5)	9.25
6 yr Picture Vocab	86.43(2.4)	85.77(3.6)	0.66
6 yr Letter Word ID	97.04(2.6)	99.14(3.9)	-2.01
6 yr Word Attack	94.57(2.1)	95.46(3.2)	-0.88
6 yr Parent Problem	-0.01(0.1)	0.10(0.2)	0.11
6 yr Parent Prosocial	0.01(.14)	-.15(0.2)	0.16

Note. No significant differences found when the Bonferroni adjustment for multiple pairwise comparisons was applied.

Table 7. Correlations between Early Language Ability and Literacy In Elementary School

	1	2	3	4	5	6	7	8
1. 3 yr Reynell- R	1							
2. 3 yr Reynell- E	.63	1						
3. 3 yr Bayley	.69	.63	1					
4. 6yr WJ-PV	.36	.25	.27	1				
5. 6yr WJ-OV	.34	.27	.31	.45	1			
6. 6yr WJ-LWI	.33	.26	.29	.38	.52	1		
7. 6 yr WJ-WA	.28	.25	.26	.31	.45	.87	1	
8. 6 yr WJ-BRS	.32	.26	.30	.36	.51	.98	.95	1

Note. All correlations are significant at the $p<.01$ level.

Table 8. Correlations between Language Ability and Behavior

	1	2	3	4	5	6	7	8	9
1. 3 yr Reynell- R	1								
2. 3 yr Reynell- E	.63**	1							
3. 3 yr Bayley	.69**	.63**	1						
4. 3 yr CBCL- P	-.27**	-.16	-.25**	1					
5. 3 yr ASBI-P	.22*	.28**	.18	-.31**	1				
6. 3 yr ASBI-T	.07	.17	.21*	-.10	.12	1			
7. 6 yr Parent Problem	.02	-.01	-.02	.34**	-.11	-.13	1		
8. 6 yr Parent Prosocial	.32**	.32**	.13	-.20*	.31**	.01	0	1	
9. 6 yr Teacher Behavior	-.34**	-.13	-.16	.06	-.19	.11	.22*	-.17	1

Note. *p<.05; **p<.01 (2-tailed)

Table 9. Factor Analysis of Parent Behavior at Age Six.

	Factor 1 Parent Problem	Factor 2 Parent Prosocial
SSRS- P-Social Skills-	-.16	.89*
BASC- P- Social Skills	-.05	.92*
SSRS- P Total Problem	.76*	-.29
BASC- P Externalizing	.86*	-.20
BASC- P- Internalizing	.80*	.12

Note.: * indicates subscales that significantly contributed to specific Factor

Table 10. Factor Analysis of Teacher Behavior at Age Six.

	Factor 1 Teacher Behavior
SSRS- Social Skills	-.88
BASC- Social Skills	-.72
SSRS- Total Problem	.92
BASC- Externalizing	.88
BASC- Internalizing	.71

Table 11. Language at age three Predicting Elementary School Basic Reading Skills .

	(df) F	ΔF	R^2	b
Model 1				
Gender	(2, 122) 2.38	2.38^{+}	.04	-3.02
Race				-7.55
Model 2				
Gender	(3, 121) 1.86	0.37	.04	-2.96
Race				-7.86*
Treatment Group				1.96
Model 3				
Gender	(4,124) 4.45**	10.53**	.12	-0.88
Race				-7.24
Treatment Group				0.91
Cognitive Ability				0.46**
Model 4a				
Gender	(5,124) 3. 4260**	1.04	.13	-0.68
Race				-7.11
Treatment Group				0.35
Cognitive Ability				0.35
Expressive Language				0.15
Model 4b				
Gender	(5,124) 3. 60**	1.86	.13	-0.68
Race				-7.11
Treatment Group				0.35
Cognitive Ability				0.35
Receptive Language				0.16

Note. *p<.05; ** p<.01 (2-tailed)

Table 12. Early Language at age three Predicting Elementary Oral Vocabulary

		(df) F	ΔF	R^2	b
Model 1					
	Gender	(2, 122) 2.98	2.98^{+}	.05	0.52
	Race				-7.77*
Model 2					
	Gender	(3, 121) 2.01	0.12	.05	0.52
	Race				-7.90 *
	Treatment Group				0.94
Model 3					
	Gender	(4,124) 6.87**	14.67**	.15	2.45
	Race				-7.20*
	Treatment Group				-0.06
	Cognitive Ability				0.44**
Model 4a					
	Gender	(5,124) 4.54**	1.28	.16	2.63
	Race				-7.08*
	Treatment Group				-0.58
	Cognitive Ability				0.34*
	Expressive Language				0.14
Model 4b					
	Gender	(5,124) 5.99**	4.74**	.17	2.46
	Race				-6.23*
	Treatment Group				-0.40
	Cognitive Ability				0.29
	Receptive Language				0.20

Note. *p<.05; ** p<.01 (2-tailed)

Table 13. Early Language at age three Predicting Elementary School Picture Vocabulary

Model	(df) F	ΔF	R^2	b
Model 1				
Gender	(1, 125) 2.61	2.61	.02	4.18
Model 2				
Gender	(2, 125) 1.36	0.12	.02	4.76
Treatment Group				-1.06
Model 3				
Gender	(3,125) 6.04**	15.09**	.13	7.03*
Treatment Group				-2.19
Cognitive Ability				0.51**
Model 4a				
Gender	(4,125) 5.01**	1.78	.14	7.26*
Treatment Group				-2.84
Cognitive Ability				0.37*
Expressive Language				0.19
Model 4b				
Gender	(4, 125) 6.76**	7.90**	.18	7.08*
Treatment Group				-2.18
Cognitive Ability				0.21
Receptive Language				0.37*

Note. Race was excluded from these models because there were no significant group differences due to racial group membership on any predictors or outcome measures included in the analyses.
$^{+}p<.10$, $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 14. Early Language at age three Predicting Parent Reported Problem Behavior in Elementary School.

Model	(df) F	ΔF	R^2	b
Model 1				
Gender	(1, 105) 0.01	0.01	.00	0.02
Model 2				
Gender	(2, 105) 0.04	0.01	.01	0.02
Treatment Group				-0.06
Model 3				
Gender	(4, 105) 3.80**	7.54**	.13	-0.01
Treatment Group				-0.03
Cognitive Ability				0.01
CBCL- Parent				0.04**
Model 4a				
Gender	(5,105) 3.28**	1.18	.14	-0.01
Treatment Group				-0.02
Cognitive Ability				0.02
CBCL- Parent				0.04**
Expressive Language				-0.01
Model 4b				
Gender	(5,105) 1.67	1.11	.14	0.01
Treatment Group				-0.05
Cognitive Ability				0.01
CBCL- Parent				0.04**
Receptive Language				0.01

Note. $^{+}p<.10$, $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 15. Early Language at age three Predicting Parent Reported Prosocial Behavior in Elementary School.

Model	(df)	F	ΔF	R^2	b
Model 1					
Gender	(1, 101)	0.76	0.76	.01	-0.18
Model 2					
Gender	(1, 101)	0.39	0.03	.01	-0.18
Treatment Group					-0.04
Model 3					
Gender	(1, 101)	2.57*	4.73*	.10	-0.06
Treatment Group					-0.02
Cognitive Ability					0.01
ASBI- Parent					0.08**
Model 4					
Gender	(5,101)	3.46**	6.42*	.15	-0.05
Treatment Group					-0.12
Cognitive Ability					-0.01
ASBI - Parent					0.06*
Expressive Language					0.03*
Model 4b					
Gender	(5,101)	3.89**	8.38**	.17	-0.03
Treatment Group					-0.04
Cognitive Ability					-0.02
ASBI - Parent					0.07*
Receptive Language					0.03**

Note. $^{+}p<.10$, $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Table 16. Early Language at age three Predicting Teacher Reported Behavior in Elementary School.

Model	(df)	F	ΔF	R^2	b
Model 1					
Gender	(1, 62)	1.79	1.79	.03	0.37
Model 2					
Gender	(2, 62)	1.02	0.28	.03	0.35
Treatment Group					-0.15
Model 3					
Gender	(4, 62)	1.06	1.06	.07	0.29
Treatment Group					-0.15
Cognitive Ability					-0.02
ASBI- Teacher					0.03
Model 4					
Gender	(5,62)	0.85	.09	.07	0.29
Treatment Group					-0.11
Cognitive Ability					-0.01
ASBI- Teacher					0.03
Expressive Language					-0.01
Model 4b					
Gender	(5,62)	2.02	5.54*	.15	0.33
Treatment Group					-0.01
Cognitive Ability					0.01
ASBI- Teacher					0.01
Receptive Language					-0.03

Note. $^{*}p<.05$; $^{**}p<.01$ (2-tailed)

Figure 1. Regression Model of Continuity of Language Ability from preschool to early elementary school.

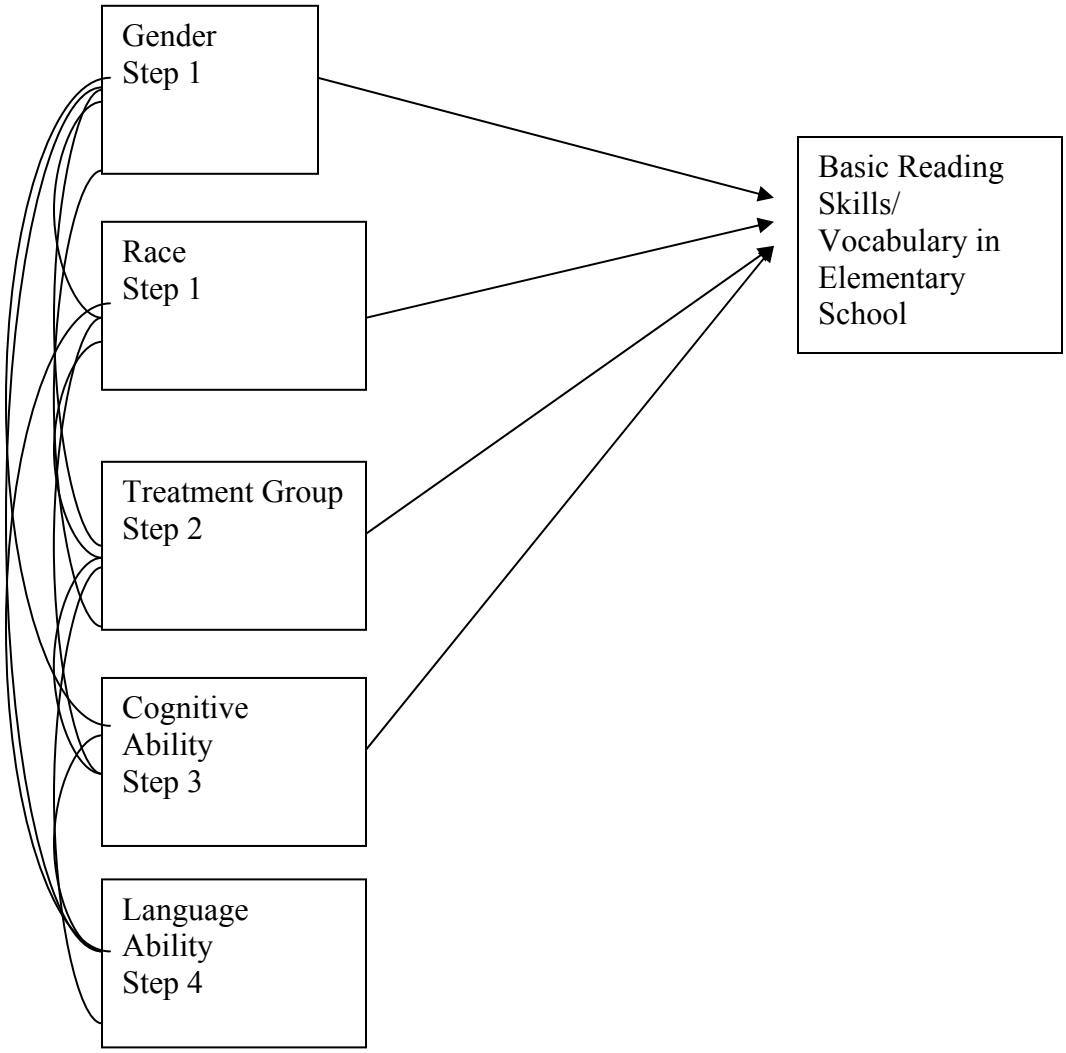
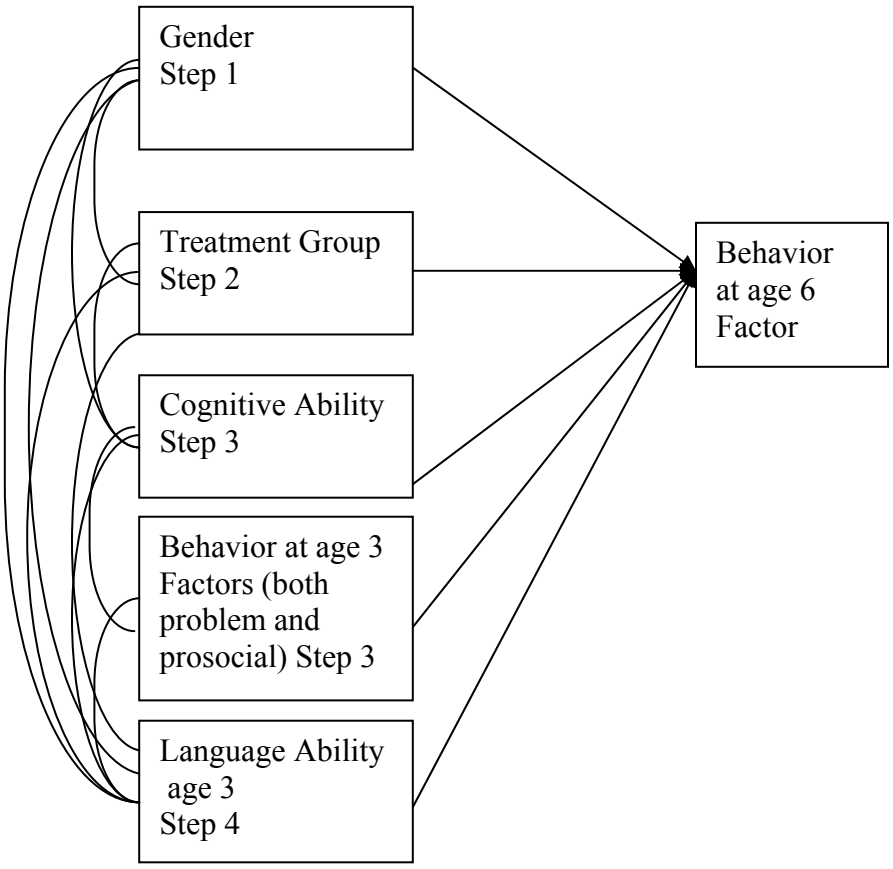


Figure 2. Regression Model of Predictive relationship between early language and school age behavior



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