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DEVELOPMENTAL TRENDS IN READING AND LANGUAGE SKILLS FOR WELFARE-INVOVLED CHILDREN

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Samantha Ellner

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The thesis of Samantha Ellner was reviewed and approved by the following:

Carlomagno C. Panlilio
Assistant Professor of Education
Thesis Advisor

Peggy N. Van Meter
Associate Professor of Education
Director of Graduate and Undergraduate Studies

Matthew T. McCrudden
Professor of Education
Professor in Charge, Educational Psychology

ABSTRACT

Background: Children with maltreatment histories often exhibit impaired reading abilities and will likely need special education (SPED) to support their learning. However, few studies have provided a nuanced understanding of children's reading-related processes to understand the interconnected and complex issues of reading impairments when assessing disability in a maltreated population.

Objective: The current study investigated the relationship between child maltreatment and reading impairments and intends to further unpack the specific mechanisms of reading that impact later skilled reading in a sample of children with allegations of maltreatment.

Method: The analytic sample was drawn from the wider sample of participants within the National Survey of Child and Adolescent Wellbeing (NSCAW) I study. Six separate hierarchical multiple linear regression models were employed to examine how demographic characteristics, risk of cognitive disability, and measures of language comprehension can predict later skilled reading in word-recognition and language comprehension.

Results: Findings suggest that language comprehension at age three predicted skilled reading across ages 8 through 11. Similarly, language comprehension at age six predicted skilled reading across ages 8 through 11. Finally, both *early* (age 3) and *later* (age 6) language comprehension skills significantly predicted skilled reading in *word*

recognition. However, only *later language comprehension* predicted *skilled reading* in *language comprehension*. Demographic characteristics (e.g., race/ethnicity characteristics, poverty level) predicted skilled reading throughout the models.

Conclusion: Given these findings, child welfare and school systems should take a more collaborative approach when assessing the learning needs (e.g., skilled reading) of maltreated students. Child welfare caseworkers and investigators should screen children for impairments to provide support for SPED practitioners and general educators attempting to provide intervention for these children. Limitations and future directions are reviewed.

Keywords: maltreatment, reading, reading development, language, disability

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Chapter 1

Developmental Trends in Reading and Language Skills for Welfare-Involved Children

Reading is a highly complex skill that is important for academic success (Herbers et al., 2012), especially for students who have experienced certain adverse events, like childhood maltreatment (Stone, 2007). *Skilled reading*, defined as the ability to read fluently and comprehend text, is particularly important for academic achievement (Scarborough, 2001). However, it has been well-documented that there is an association between early maltreatment and subsequent reading problems, (Fantuzzo et al., 2014; Maclean et al., 2016; Pillay, 2016). For example, students who experienced maltreatment demonstrated delayed reading skills as evidenced by lower vocabulary scores (De Bellis et al., 2009; Hong et al., 2018; Lum et al., 2015), impaired language structure knowledge such as knowledge of syntax or semantics (Lum et al., 2015; Sylvestre & Mérette, 2010), and impaired decoding abilities (Kinard, 2001; Mills et al., 2011). Taken together, these findings highlight the overall negative impact of maltreatment on developmental domains related to skilled reading, which, if not addressed, may carry long-term consequences in academic performance.

Indeed, reading impairments are often associated with lower overall academic achievement (York et al., 2015). For example, students who experience maltreatment earn lower grades (Slade & Wissow, 2007) and demonstrate lower achievement on standardized assessments, scoring in the 30th percentile on reading and math (Crozier & Barth, 2005; Ryan et al., 2018). Additional challenges faced by children in foster care,

such as school instability or placement instability, can further impact academic skills and cascade into a disability if left unaddressed (Stone, 2007). Given such concerns, there is a need to further understand how reading skills develop over time for children with maltreatment histories, and how these skills might be potentially implicated in later achievement (Eckenrode et al., 1993; Gutman et al., 2003).

Two roads to Special Education: Equifinality in Maltreatment and Disability

Maltreatment and disability share a complicated relationship in that children who have experienced maltreatment are more at risk for disabilities (Sobsey, 2002; Sullivan & Knutson, 2000), and children with disabilities are at higher risk of experiencing maltreatment (Corr & Santos, 2019; Sobsey, 2002). In terms of disability status as a risk factor, it has been shown that students with disabilities are almost four times more likely to experience maltreatment compared to typically developing peers (Brownlie et al., 2007; Sobsey, 2002; Sullivan & Knutson, 2000; Zeng & Hu, 2018), suggesting that these students are more likely to experience maltreatment directly related to their disability. Further, students with disabilities made up 31% of reported maltreatment cases, compared to only 9% of maltreatment cases in typically developing peers, highlighting the widespread reach of this problem (Maclean et al., 2016; Sullivan & Knutson, 2000). Altogether, these risk factors point to the added vulnerability inherent in experiencing maltreatment and having a disability.

Maltreatment is also a risk factor for a variety of disabilities (e.g., behavioral, physical, cognitive, and emotional) that negatively impact students' functioning across

many domains. For example, maltreated children demonstrate impairments in the domains of behavioral and emotional well-being, resulting in socioemotional challenges and disabilities (Eckenrode et al., 1993; Morrison et al., 1999). Further, maltreated children can exhibit poor physical health, which can lead to physical disabilities that restrict independent movement (Jonson-Reid et al., 2004; Suikkanen-Malin & Veistilä, 2016). In the domain of cognitive functioning, students who experience maltreatment are more likely to present with delays and impairments (Bruhn, 2003). This includes delays in visuospatial processing and its impact on how students perceive visual input (Pears & Fisher, 2005), which alters the way children physically move (Eden et al., 1995). Other cognitive delays include impairments across memory, executive functioning (Pears & Fisher, 2005), and spoken and written language (Jonson-Reid et al., 2004; Pears & Fisher, 2005; Sylvestre & Mérette, 2010). Within the area of mental health, maltreatment has also been associated with different anxiety disorders, such as post-traumatic stress disorder (Morrison et al., 1999), that further impair cognitive functioning (Pears & Fisher, 2005; Perry, 1994; Suikkanen-Malin & Veistilä, 2016).

Additionally, early cognitive delays resulting from maltreatment experiences during infancy or toddlerhood could cascade into a disability as children transition from preschool to formal schooling in kindergarten (Jonson-Reid et al., 2004; Masten & Cicchetti, 2010). For example, children with impaired early literacy skills may experience difficulty with reading comprehension later in development (Landry et al., 2006). These negative cascading effects may have a long-term impact on maltreated children's reading development (Masten & Cicchetti, 2010), which may require special education (SPED)

intervention (Larney, 2002). Taken together, these impairments place children with maltreatment histories at higher risk for needing academic support.

Supporting Disabilities in Maltreated Students

Students who have experienced maltreatment will likely need SPED support to address compounded impairments resulting from early adversities (Maughan & Cicchetti, 2002). Unfortunately, referral for SPED services has been considered a negative academic outcome, suggesting that maltreated students "drain" resources from the special education system (Stone, 2007, pg. 152). For example, SPED teachers may be inundated with such students in their classes because of the disproportionality in referrals for children with maltreatment histories (Hall-Lande et al., 2015; Lambros et al., 2010; Malmgren & Meisel, 2004; Miller & Santos, 2020). As a result, SPED teachers may be expected to go beyond their ability to provide intervention support for all students, including those who have been maltreated (Corr & Santos, 2019; Miller & Santos, 2020).

To date, students with maltreatment histories receive SPED services such as speech and language therapy and counseling (Casanueva et al., 2012; Ringeisen et al., 2009) at the same rates as non-maltreated children (Blackorby et al., 2010). However, there is evidence to suggest that children with maltreatment histories may need services such as counseling at higher rates to address behavioral and emotional needs (Lambros et al., 2010). This highlights the lack of capacity in schools to differentiate service identification and delivery for students with a history of maltreatment.

Issues in Special Education for Maltreated Children

Despite the benefits of receiving SPED, the identification and referral process as outlined earlier may be of concern, particularly within a maltreated population. For example, although early identification and referral for SPED services is particularly important for maltreated students in need of reading intervention (Larney, 2002), these children often do not receive SPED support until long after a maltreatment report occurs. Fewer than 10% of maltreated students are referred for SPED in the first year after the reported maltreatment, and it can take over four years for these students to receive services (Jonson-Reid et al., 2004), which drastically limits the window of opportunity for intervention.

Another issue with SPED identification is that practitioners rely on observable signs of disability (e.g., behavior outbursts or observable cognitive delays) to categorize students because of the difficulty of this task (Lambros et al., 2010; Malmgren & Meisel, 2004). Therefore, students who have experienced maltreatment with observable impairments are more likely to receive services (Lambros et al., 2010; Malmgren & Meisel, 2004) compared to students with less obvious symptoms of disability (Vig & Kaminer, 2002). These less obvious manifestations may include a specific language impairment (Selin et al., 2019) that will also require behavioral and emotional intervention (Lambros et al., 2010). However, as mentioned previously maltreated children often receive speech and language services at the same rate as non-maltreated children (Blackorby et al., 2010; Casanueva et al., 2012; Ringeisen et al., 2009), suggesting a disconnect between research and current practice.

Issues such as these expose how SPED teachers are typically ill-equipped to work with welfare-involved students and their families (Corr & Santos, 2019) despite position statements from the Division for Early Childhood (DEC) and Council for Exceptional Children (CEC) calling for better SPED teacher preparation (DEC, 2016). Specifically, SPED teachers are often not prepared to encounter the difficulty and hardship these children experience (Corr & Santos, 2019). Further, many teachers are not made aware of students' maltreatment histories (Corr & Santos, 2017), which makes it challenging to support maltreated students' academic needs. Teachers may "miss" a disability in a student who has experienced maltreatment because of their lack of understanding of maltreatment and delays associated with adversity. Therefore, it is possible that there is a proportion of maltreated students with reading needs who are missed because they have milder, or less obvious, reading impairments that are more difficult to identify (Vig & Kaminer, 2002).

Framing Reading Disabilities Within a Maltreated Population

Despite the relationship between maltreatment and disability, there is a lack of framing around reading challenges for maltreated students. Further, there is little focus on how reading challenges may change and shift over time as these children develop. Therefore, there is a need for an interdisciplinary approach that draws from developmental and learning sciences to understand developmental trends in reading. To this end, Scarborough's (2001) Reading Rope framework can be used to explain the interconnected and complex issues of reading impairments, which are particularly

important when assessing disability in a maltreated population.

In this framework, reading difficulties can result from impairments in two key reading abilities: word recognition and language comprehension. *Word recognition* refers to the ability to decode words and understand letters, while *language comprehension* is the ability to comprehend spoken and written language (Scarborough, 2001). Word recognition and language comprehension are complementary mechanisms in that as a reader becomes more fluent in word recognition, a typical reader's language comprehension becomes more strategic (Scarborough, 2001). Students with reading disabilities can present with various needs over time in either of these skills, but because of this interdependent relationship, it can be difficult to identify an underlying condition when a reader presents with a reading disability (Scarborough, 2001). Further, *skilled reading* is an ability that develops over time and depends on strong foundational reading skills in word recognition and language comprehension to be successful (Larney, 2002).

The reading mechanisms that encompass word recognition include *phonological awareness*, *decoding*, and *sight recognition*, which are interconnected to support skilled reading development (Scarborough, 2001). For example, typical readers become increasingly automatic at phonological awareness, decoding, and sight recognition, and are then able to improve their fluency (Rasinski, 2014). A reader who has sufficient word recognition is then likely to access the text enough to apply their knowledge of language comprehension (Cunningham et al., 2011; Scarborough, 2001). However, if a disabled reader has a word recognition impairment, their ability to process written text may limit to access to text/content, which may affect their comprehension.

Language comprehension is comprised of five mechanisms: *background*

knowledge, vocabulary knowledge, language structures knowledge, verbal reasoning, and *literacy knowledge* (Scarborough, 2001). These skills, just like word recognition skills, are complementary with each other and required for language comprehension to occur (Scarborough, 2001). For example, readers can better comprehend a text if they are able to discern the content and context of the words, which relies on background and vocabulary knowledge (Adams & Bertram, 1982). Further, readers can discern context from the syntax and grammatical choices, which rely on language structures and literacy knowledge (Brimo et al., 2018).

A key component of language comprehension is the ability to understand and produce spoken words (Scarborough, 2001; Verhoeven & van Leeuwe, 2008). Oral language abilities, such as verbal memory, listening comprehension, and vocabulary knowledge, can explain and predict later reading comprehension abilities (Hoover & Gough, 1990; Verhoeven et al., 2011; Verhoeven & van Leeuwe, 2008), and contribute to comprehension. There is also evidence to suggest that background knowledge and vocabulary knowledge are gathered through verbal communication and processing (Hoffman et al., 2014). Therefore, according to this framework, reading comprehension difficulties are, in essence, “oral language difficulties” (Scarborough, 2001; pg. 171), and measures of oral language, particularly over time, can help unpack issues with reading comprehension.

Word Recognition In Maltreated Students

There is some evidence that students who experience maltreatment have impaired decoding and phonological skills compared to non-maltreated peers (Pillay, 2016; Salzinger et al., 1984). Further, these children can be nearly two grade levels below peers in word recognition skills (Salzinger et al., 1984), and often score below the clinical cutoff (Kinard, 2001; Pears et al., 2011; Thompson & Whimper, 2010), suggesting that they may require SPED services to support word recognition needs at some point. For example, Mills et al. (2011) used a long-term prospective birth cohort of over 7,000 Australian children to determine the effects of maltreatment on word recognition abilities. At age 14, children were asked to about their life experiences, including experiences of child maltreatment, and completed the WRAT-III reading subscale. The authors found that over 11% of the children in the original sample reported experiences of maltreatment and exhibited lower reading scores compared with non-maltreated in the sample (Mills et al., 2011). Despite the important findings of such studies, however, use of standardized measures of reading as a distal outcome do not provide more fine-grained information regarding the individual mechanisms that are impaired as a result of maltreatment. Further, given the developmental nature of growth in skilled reading, there is a need to account for the impact of maltreatment on relevant reading mechanisms across time.

Language Comprehension and Maltreatment

There is considerable evidence that children with maltreatment histories have impairments in language comprehension mechanisms (i.e., vocabulary, syntax, and oral

language) (Eigsti, 2011; Eigsti & Cicchetti, 2004; Julien et al., 2019; Merritt & Klein, 2015). As with word recogntion, children with maltratment histories score below the clinical cuttoff for certain language comprehension abilities (Julien et al., 2019; Pears et al., 2011). In addition, there is some evidence that these children specifically demonstrate vocabulary impairments (De Bellis et al., 2009; Hong et al., 2018) although why this is the case is not entirely clear. Assessment of language comprehension skills focuses particularly on how oral language abilities are impaired due to maltreatment (Allen & Oliver, 1982). For example, many foster children have impaired expressive language skills (Culp et al., 1991; Eigsti & Cicchetti, 2004; Merritt & Klein, 2015; Stacks et al., 2011; Sylvestre & Mérette, 2010), suggesting that maltreatment may further impair students' vocabulary (Griolametto et al., 2001) and syntax abilities (Eigsti & Cicchetti, 2004).

As with word recognition, research regarding language comprehension in maltreated populations follow a similar pattern. For example, Lum et al. (2015) conducted a meta-analysis and concluded that maltreated children scored lower on measures of vocabulary and language comprehension when compared with non-maltreated children, even after controlling for the effects of SES and highlighting the unique detrimental effects of maltreatment on reading. Despite such gains in our understanding of these detrimental relationships, assessment methodologies remain problematic. Specifically, research on language comprehension has been unclear with the selected domains. For example, studies have used expressive and receptive language and vocabulary domains as proxies for language comprehension (Lum et al., 2015; Stacks et al., 2011; Sylvestre & Mérette, 2010). This highlights the importance of clearly defining

comprehension as a construct that can inform a more consistent assessment. Similar to research regarding word recognition, language comprehension was typically included as a distal outcome (Eckenrode et al., 1993; Herbers et al., 2012; Kinard, 2001; Ryan et al., 2018), which masks the developmental nature of growth in these skills and highlight what specific mechanisms might affect later reading, particularly as a result of maltreatment.

Developmental Trends In Reading

The Reading Rope Framework also considers how children's reading abilities develop and change over time and how those compounded changes may be reflected in reading disabilities (Scarborough, 2001). Even when accounting for differences in children's reading abilities, there are times when students' learning undergo a spurt or plateau in development. A *spurt* is defined as a time when students demonstrate rapid growth in reading ability, seemingly at the same time (Scarborough, 2001). On the other hand, a *plateau* is a time when many students appear to not be making quick gains in reading ability (Scarborough, 2001). Therefore, it is important to understand individual students' developmental trends and accounting for spurts and plateaus when assessing reading-related needs.

Using developmental trends to track students at risk for developing disabilities may provide more insight into what symptoms children present with, when, and how those impairments affect later reading abilities. For example, children enter kindergarten with varying preschool experiences, affecting students' readiness to transition from preschool into formal schooling (Panlilio et al., 2018), making it a difficult time to

accuretly assess children's reading abilities. Assessing reading abilities longitudinally from preschool instead of kindergarten may account for school readiness and other experiences prior to entering formal schooling and may offer better opportunities to predict skilled reading later in elementary school (Scarborough, 2001).

Accounting For Developmental Trends

Although using developmental trends in reading can help inform later reading needs, there are several mistakes that can be made. First, as mentioned above, it may be more effective to determine a student's risk for developing a reading disability using assessments administered in preschool, specifically between ages 3 and 5 (Larney, 2002), as they can reveal patterns in reading development that may indicate increased risk of later reading disability (Scarborough, 2001). However, data collected in schools begin in kindergarten, offering an incomplete or inaccurate picture of children's reading development (Larney, 2002; Scarborough, 2001). Therefore, incorporating preschool data in developmental reading assessments may provide more information as to how early challenges in reading, especially in the context of maltreatment, might lead to reading disabilities later in life.

One such example is a late-emerging reading disability (LERD). A LERD has been defined as a reading disability that seemingly does not develop until later in a student's elementary education, typically by fourth grade when curricula transition from "learning to read" to "reading to learn" (Hilliard & Wilson, 1936; Leach et al., 2003). Investigations into LERD have primarily used kindergarten data to assess whether

children presented delayed reading symptoms. For example, Leach et al. (2003) used school records and previously completed reading assessments to determine if children presented with reading needs from kindergarten through third grade. Leach et al. (2003) and others (Catts et al., 2012; Compton et al., 2008; Etmanskie et al., 2016; Leach et al., 2003; Lipka et al., 2006) have concluded that LERD students do not show symptoms of a reading impairment earlier in their elementary education, until fourth grade when they suddenly scored on par with reading-disabled peers. However, more recent literature has revealed that students considered LERD may have presented with word recognition issues in preschool that may have remitted and reemerged (Catts et al., 2012; Etmanskie et al., 2016; Larney, 2002), suggesting that these students might not have been identified earlier with impairments.

The Current Study: Predicting Skilled Reading Development Using Language Comprehension

The current study intends to use language comprehension measures (e.g., oral language skills, vocabulary knowledge) to predict later reading ability in maltreated children and to move away from historical studies that relied heavily on reading achievement as a distal outcome. Furthermore, the current study aims to address challenges with single point in time measures that do not provide a larger picture of how reading impairments develop, which is necessary to inform appropriate reading intervention for children with maltreatment histories. These goals will be pursued through the following research questions.

First, to what extent can early language comprehension at age 3 predict skilled

reading in word-recognition and language comprehension at ages 8 through 11? Currently, students are more likely to be categorized as at-risk for a reading disability if they demonstrate obvious signs of need earlier in their education (Lambros et al., 2010; Malmgren & Meisel, 2004), typically kindergarten. If symptoms of a disability are not present or not detectable, students are less likely to receive SPED services (Jonson-Reid et al., 2004), meaning they can be missed by the identification process and continue without support. Using preschool data to predict later risk may streamline the SPED referral processes because students would be appropriately and unbiasedly flagged as at risk of developing a reading disability later in their education (Scarborough, 2001).

Next, our second research question is to what extent can language comprehension at age 6 predict skilled reading in word-recognition and language comprehension at ages 8 through 11? So far, it is unclear if preschool or kindergarten is a better time to assess maltreated children for possible reading needs. Using measures of reading collected earlier in elementary school to predict later skilled reading may help provide clarity as to which age better explains skilled reading later in development.

Our final research question is to what extent does early (age 3) and later (age 6) language comprehension predict skilled reading in word-recognition and language comprehension at ages 8 through 11? This question highlights the need to investigate the overall developmental trends in reading, particularly whether a relative amount of variability in later skilled reading can be explained by preschool and early elementary linguistic processes. In order to assess developmental shifts over time, it is important to understand how reading ability, measured at different time points during development, can help predict skilled reading later in life.

Chapter 2

Methods

Participants

The analytic sample consisted of 262 participants. At Wave 1 participants' ages ranged between 3 to 3.92 years old (*M* = *3*.46 years; *SD* = 3.26 months). At Wave 4 participants were between 6 to 6.83 years old, (*M* = 6.26 years; *SD* = 2.36 months). At Wave 5 participants were between 8.16 to 11.5 years old (*M* = 9.16 years old, *SD* = 8.86 months). In the sample, 56.9% of participants identified as male (*n* = 149) and 43.1% identified as female (*n* = 113).

See Table 2-1 for descriptives. Regarding participants' racial and ethnic backgrounds, 46.18% of participants identified as White/non-Hispanic (*n* = 121). The remaining 53.82% identified as White/Hispanic (8.02%; *n* = 21), Black/non-Hispanic (30.92%; *n* = 81), Black/Hispanic (2.67%; *n* = 7), American Indian/non-Hispanic (7.20%; *n* = 11), American Indian/Hispanic (.38%; *n* = 1), Asian/Hawaiian/Pacific Islander/non-Hispanic (1.53%; *n* = 4), Other/non-Hispanic (1.15%; *n* = 3), and Other/Hispanic (4.96%; *n* = 13). No participants identified as Asian/Hawaiian/Pacific Islander/Hispanic.

Of the 262 participants, 43.51% (*n* = 114) reported being above the federal poverty line, and 45.42% (*n* = 119) reported being below. Twenty-nine participants did not have sufficient data to determine whether they were above or below the poverty line

(i.e., they were unable to answer questions about their income or how many people lived in their household). Over half (55.34%; *n* = 145) of participants were at risk for having a cognitive disability; 44.66% (*n* = 117) participants were not at risk for a cognitive disability.

Table 2-1: Child Demographic Characteristics (n = 262)

Demographic Characteristics	*n*	%
Gender		
Female	113	43.1
Male	149	56.9
Race/Ethnicity		
White/non-Hispanic	121	46.18
White/Hispanic	21	8.02
Black/non-Hispanic	81	30.92
Black/Hispanic	7	2.68
American Indian/non-Hispanic	11	4.20
American Indian/Hispanic	1	.38
Asian/Hawaiian/Pacific Islander/non-Hispanic	4	1.53
Other/non-Hispanic	3	1.15
Other/Hispanic	13	4.96
Maltreatment Subtypes		
Physical maltreatment	67	25.67
Sexual maltreatment	30	11.55
Emotional maltreatment	14	5.34
Physical Neglect	41	15.65
Neglect – no supervision	81	30.92
Abandonment	8	3.05
Moral/legal treatment	2	.76
Other	5	1.9
Missing	14	5.34
Family Income		
<5,000	12	4.58
5K – 9,999	44	16.79
10K – 14,999	18	18.32
15K – 19,999	21	8.02
20K – 24,999	29	11.07
25K – 29,999	17	6049
30K – 34,999	13	4.96
35K – 39,999	16	6.12
40K – 44,999	6	2.29
45K – 49,999	6	2.29
>50K	22	8.40
Missing	28	10.69

Poverty Level		
Above poverty line	114	43.51
Below poverty line	119	45.42
Missing	29	11.17
Risk of Cognitive Disability		
No risk (-.98 SD and above)	117	44.66
Risk (-2 to -1 SD)	145	55.34

Procedures

The current study used longitudinal data from the first cohort of the National Survey of Child and Adolescent Well-Being (NSCAW-I) study (NSCAW; 2008a), conducted between November 1999 and December 2007 to assess the long-term well-being of a nationally representative sample of child welfare-involved children. The full NSCAW sample consisted of all children and families across the U.S. whom CPS investigated for alleged maltreatment (n = 5,501) across the study period. Please see Appendix A for a complete description of the NSCAW study's complex sampling design and weighting strategies, as well as information about the analytic sample for the current study.

Measures

Children's Demographics

All demographic information was self-report collected at Wave 1. Age, recorded in months, was operationally defined as when participants entered the welfare system. Participants identified as either male (1) or female (2); the survey did not include

additional gender options to participants who identified as nonbinary, trans, or other genders.

Participants self-reported their race (i.e., White, Black, American Indian, Asian/Hawaiian/Pacific Islander, or other) and ethnicity (i.e., Hispanic or non-Hispanic) (NSCAW; 2008c). Participants' responses were then recoded to reflect their racial background and ethnicity in a single variable (e.g., White/non-Hispanic, White/Hispanic, Black/non-Hispanic, Black/Hispanic) using White/non-Hispanic as the reference group.

Participants' poverty level was computed using the number of people in the household and the yearly household income, as reported by participants' parents. Poverty line cutoff was determined using the HHS poverty estimation guidelines for the years specified (Panlilio et al., 2018). Participants' household income level was then compared to the HHS poverty estimation guidelines, and a dichotomous variable was computed indicating whether the participant was above (1) or below (0) the poverty line at the time of data collection.

Risk of Cognitive Disability

The BDI was used to determine whether participants presented with symptoms of a cognitive disability. As a screener, the BDI can provide insight into whether a child may be at risk for having a cognitive disability (Behl & Akers, 1996). BDI subscales were scored with a 2 (i.e., milestone achieved), 1 (i.e., milestone emerging), or 0 (i.e., milestone not yet evident) and then converted into z-scores by the NSCAW research team. For this investigation, participants with a standard score of -2 to -1 were classified

as at risk for a cognitive disability. In contrast, participants with a standard score of -.92 or above were classified as not at risk for a cognitive disability.

Early Language Comprehension

Language comprehension was measured at Wave 1 using the Preschool Language Scale-3 (PLS-3) for children age 3. The PLS-3 includes two language subscales–the Auditory Comprehension (A.C.) and Expressive Communication (E.C.) subscales–which together assess prelinguistic (i.e., attention, vocal development, and social communication) and language skills (i.e., syntax, morphology, vocabulary, and concept development; NSCAW; 2008a). Items on these subscales were scored as correct (1) or incorrect (0); raw scores were then converted into a standardized score for each subscale. Test-retest reliability for both subscales across the full sample was high, as reported in the NSCAW manual for this sample (EC subscale: r = .82-.92; AC subscale: r = .89-.90; NSCAW; 2008b).

Later Language Comprehension

Language comprehension at age six was measured using the Kaufman Brief Intelligence Test (K-BIT) at Wave 4. The K-BIT includes a vocabulary subscale, which assesses children's expressive vocabulary knowledge and understanding of vocabulary definitions (Bain & Jaspers, 2010). Items on this subscale were scores as either correct (1) or incorrect (0), and raw scores were then summed and standardized by the NSCAW

research team using the American Guidance Services (NSCAW; 2008c). Internal consistency for the vocabulary subscale across the analytic sample was high (Cronbach's $\alpha = .84$).

Skilled Reading In Word Recognition and Language Comprehension

The Woodcock Johnson-III (WJ-III) was used to determine skilled reading (i.e., proficient word-recognition and language comprehension) in children ages 8 to 11 at Wave 5. It included letter-word identification (decoding and phonological processing) and passage comprehension (reading comprehension) subscales (Kirsch, 2011; Wendling et al., 2007). Items on both subscales were scored as either correct (1) or incorrect (0). These answers were summed as a raw score and then converted to standardized scores using Riverside Publishing's MBA scoring software by the NSCAW research team (NSCAW; 2008b). Internal consistency for the reading subscale across the analytic sample for letter-word identification was high (Cronbach's $\alpha = .79$), and passage comprehension was acceptable (Cronbach's $\alpha = .63$).

Analytic Plan

The current study employed six separate hierarchical multiple linear regression models assessing the extent to which demographic characteristics, risk of cognitive disability, and measures of language comprehension can predict later skilled reading in word-recognition and language comprehension. In each model, Block 1 included

demographic variables (i.e., age, gender, race/ethnicity, and SES), and Block 2 included risk of cognitive disability to control for these variables. To address the first research question, Models 1 and 2 included measures of early language comprehension in the third block. Model 1 predicted skilled reading in word-recognition, and Model 2 predicted skilled reading in language comprehension.

The second research question was addressed by Models 3 and 4, which included demographic information and risk of cognitive disability in the first and second blocks and later language comprehension in Block 3. Model 3 predicted skilled reading in word-recognition, and Model 4 predicted skilled reading in language comprehension. Models 5 and 6 each included four blocks to address the final research question. Analyses again included demographic variables and risk of cognitive disability in Blocks 1 and 2. Block 3 included measures of early language comprehension, and Block 4 included the measure of later language comprehension. Two regressions were run using these blocks; Model 5 predicted skilled reading in word-recognition, and Model 6 predicted skilled reading in language comprehension.

Chapter 3

Results

Preliminary Analyses

See Appendix B for information regarding selection of the analytic sample. Missing data were missing completely at random (χ^2 (11) = 16.267, p = .131). Participants who were older were associated with improved early language comprehension (r = .18, p = .004). Participants who identified as female were associated with improved early language comprehension at age 3 (r = .17, p = .005; r = .17, p = .005). Risk of cognitive disability was negatively correlated with early language comprehension at age 3 (r = -.14, p = .02). There were also some associations between participants' reported race/ethnicities and reading scores. In particular, children who identified as Black/non-Hispanic, when compared to children who identified as White/non-Hispanic, were associated with significantly lower early language comprehension at age 3 (r = -.17, p = .01) and age 6 (r = -.18, p = .03), as well as lower skilled reading across ages 8 through 11 (letter-word identification: r = -.19, p = .008; passage comprehension: r = -.22, p = .002). In addition, children who identified as Other/Hispanic were associated with significantly lower language comprehension at ages 3 and 6 respectively (r = -.12, p = .04; r = -.20, p = .02). Children who identified as Asian/Hawaiian/Pacific Islander/non-Hispanic were associated with significantly improved skilled reading scores (letter-word identification: r = .19, p = .009; passage comprehension: r = .17, p = .02) when compared with the White/non-Hispanic reference

group. See Table 3-1 for full correlations table. Overall, 50% of participants scored at least one standard deviation below the mean for early language comprehension at age 3, while around 20% of participants were at least one standard deviation below the mean for later language comprehension at age 6 and skilled reading at ages 8 through 11.

Table 3-1: Descriptive Statistics and Correlations Between Main Study Variables (n = 262)

Study Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Age in months	41.52	0.26	1															
2. Gender [a]	–	–	-.08	1														
3. White (Hispanic)	–	–	.05	-.06	1													
4. Black (Non-Hispanic)	–	–	-.09	-.03	-.20**	1												
5. Black (Hispanic)	–	–	-.01	.05	-.05	-.11	1											
6. American Indian (non-Hispanic)	–	–	.002	.05	-.06	-.14*	-.04	1										
7. American Indian (Hispanic)	–	–	.03	-.05	-.02	-.04	-.01	-.01	1									
8. Asian/ Hawaiian/ Pacific Islander (non-Hispanic)	–	–	-.07	-.05	-.04	-.08	-.02	-.03	-.01	1								
9. Other (non-Hispanic)	–	–	.07	-.09	-.03	-.07	-.02	-.02	-.01	-.01	1							
10. Other (Hispanic)	–	–	.06	.01	-.07	-.15*	-.04	-.05	-.01	-.03	-.03	1						
11. Below/ Above Poverty Line [a]	0.49	0.50	.04	.001	.04	.03	-.03	-.08	-.06	-.06	-.09	-.02	1					
12. Risk of Cognitive Disability [a]	0.55	0.50	-.02	-.04	.01	.02	-.04	.07	.06	.05	.03	.06	.02	1				

13. PLS-3 Auditory Comprehension	84.23	18.04	.18**	.17**	-.10	-.17**	-.03	-.02	-.06	.07	-.08	-.12*	.01	-.14*	1		
14. PLS-3 Expressive Communication	86.32	19.69	.02	.17**	.03	-.12	-.04	.02	-.04	.09	-.09	-.12	-.03	-.08	.63**	1	
15. K-BIT Vocabulary Subscale	95.57	13.67	-.14	-.13	-.004	-.18*	.01	.01	-.02	.04	-.12	-.20*	.02	-.13	.37**	.34**	1
16. W-J Letter-Word Identification	96.85	17.32	.10	.07	-.03	-.19**	-.08	.04	-.11	.19**	-.09	.09	-.10	-.04	.38**	.24**	.41**	1
17. W-J Passage Comprehension	90.32	15.12	-.06	.08	-.02	-.22**	-.06	.03	-.13	.17*	-.10	-.07	-.05	.-.02	.33**	.25**	.44**	.72**

*p<.05,**p<.01

[a] Marked correlations are Spearman and all others are Pearson.

Main Analyses

Model 1: Early Language Comprehension Predicting Skilled Reading In Word Recognition

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant (r^2 = .285 F(14, 170) = 4.44, p < .001), wherein children's demographic information, risk of cognitive disability, and early language comprehension at age 3 explained 28.5% of the variance in skilled reading in word-recognition at ages 8 through 11 (see Table 3-2). The first block included race/ethnicity characteristics, which significantly predicted skilled reading in word-recognition. Specifically, participants who identified as Black/non-Hispanic (β = -.19, p = .01) or Other/non-Hispanic (β = -.24, p = .001) scored lower on skilled reading in word-recognition when compared to the White/non-Hispanic reference group. In comparison, participants that identified as Asian/Hawaiian/Pacific Islander/non-Hispanic (β = .18, p = .02) scored higher on skilled reading in word-recognition when compared to the White/non-Hispanic reference group. In the second block, the race/ethnicity characteristics remained significant as in Block 1. Inclusion of risk of cognitive disability, however, was not significant (β = -.12, p = .10) in predicting skilled reading in word-recognition. In the final block, only two race/ethnicity characteristics remained significant, where participants who identified as Other/non-Hispanic (β = -.17, p = .02) scored lower, while participants who identified as Asian/Hawaiian/Pacific Islander/non-Hispanic (β = .16, p = .03) scored higher in word recognition when compared with the

White/non-Hispanic reference group. Inclusion of early language comprehension in this final block significantly predicted skilled reading in word-recognition ($\beta = .29$, $p = .001$), above and beyond age, gender, most race/ethnicity characteristics, SES, and risk of cognitive disability.

Table 3-2: Hierarchical Regression Analyses: Early Language Comprehension Predicting Skilled Reading

Predictor Variables	Skilled Reading in Word Recognition and Language Comprehension					
	WJ-III Letter-Word ID			WJ-III Passage Comprehension		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Block 1: Demographic Characteristics						
Age in months	.66	.39	.13	-.06	.34	-.01
Gender (1 = male, 2 = female)	1.90	2.54	.06	.44	2.25	.02
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-3.85	4.60	-.06	-5.19***	4.08	-.10
Black/non-Hispanic	-7.00*	2.81	-.19	-8.68	2.48	-.27
Black/Hispanic	-8.00	8.04	-.07	-3.30	7.11	-.03
American Indian/non-Hispanic	-1.28	6.25	-.02	-3.16	5.54	-.04
American Indian/Hispanic	-30.92	15.87	-.14	-33.00*	14.05	-.17
Asian/Hawaiian/Pacific Islander/non-Hispanic	19.72*	8.10	.18	12.60	7.17	.13
Other/non-Hispanic	-37.25**	11.41	-.24	-35.88***	10.10	-.26
Other/Hispanic	2.82	6.34	.03	-9.99	5.61	-.13
Below Poverty Line (yes or no)	-3.79	2.46	-.11	-3.60	2.18	-.12
R^2		.17			.19	
F		3.02**			3.40***	
Block 2: Risk of Cognitive Disability						

BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-4.12	2.45	-.12	-1.37	2.18	-.046
R^2		.19			.19	
ΔR^2		.02			.002	
ΔF		2.82			.40	
Block 3: Early Language Comprehension						
PLS-3 Auditory Comprehension	.26**	.08	.29	.17*	.07	.21
PLS-3 Expressive Communication	.07	.08	.08	.08	.07	.10
R^2		.29			.26	
ΔR^2		.10			.06	
ΔF		10.64***			6.77**	

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Model 2: Early Language Comprehension Predicting Skilled Reading In Language Comprehension

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant ($r^2 = .257$ $F(14, 1170) = 3.85$, $p < .001$), wherein children's demographic information, risk of cognitive disability, and early language comprehension at age 3 explained 25.7% of the variance in skilled reading in language comprehension at ages 8 through 11 (see Table 3-2). The first block included race/ethnicity characteristics, which significantly predicted skilled reading in language comprehension. Specifically, participants who identified as Black/non-Hispanic ($\beta = -.27$, $p < .001$), American Indian/Hispanic ($\beta = -.17$, $p = .02$) and Other/non-Hispanic ($\beta = -.26$, $p < .001$) scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. In the second block, race/ethnicity characteristics remained significant as in Block 1. Inclusion of risk of cognitive disability

was not significant (β = -.05, p = .53) in predicting skilled reading in language comprehension. In the final block, two of the race/ethnicity characteristics remained significant, where participants who identified as Black/non-Hispanic (β = -.22, p = .005) and Other/non-Hispanic (β = -.20, p = .005) scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. Inclusion of participants' early language comprehension in this final block significantly predicted skilled reading in language comprehension (β = .21, p = .02) above and beyond age, gender, SES, most race/ethnicity characteristics, and risk of cognitive disability.

Model 3: Later Language Comprehension Predicting Skilled Reading in Word-Recognition

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant (r^2 = .377, F(13, 105) = 4.27, p <.001), wherein children's demographic information, risk of cognitive disability, and later language comprehension at age 6 explained 37.7% of the variance in skilled reading in word-recognition at ages 8 through 11 (see Table 3-3). The first block included demographic characteristics, which significantly predicted skilled reading in word-recognition. Specifically, participants who identified as Black/non-Hispanic (β = -.23, p = .03), American Indian/Hispanic (β = -.19, p = .04), and Other/non-Hispanic (β = -.31, p = .001) scored lower on skilled reading in word-recognition when compared to the White/non-Hispanic reference group. In addition, being below the poverty line (β = -.21, p = .03) also predicted lower skilled reading in word-recognition. In the second block, all

demographic characteristics remained significant as in Block 1. Inclusion of risk of cognitive disability, however, was not significant (β = -.13, p = .18) in predicting skilled reading in word-recognition. In the final block, two of the demographic characteristics remained significant where participants who identified as Other/non-Hispanic (β = -.23, p = .009) scored lower when compared to the White/non-Hispanic reference group and participants below the poverty line (β = -.23, p = .01) also scored lower on skilled reading in language comprehension when compared to participants above the poverty line. Inclusion of later language comprehension in this final block significantly predicted skilled reading in word-recognition (β = .41, p < .001) above and beyond age, gender, most race/ethnicity characteristics, and risk of cognitive disability.

Table 3-3: Hierarchical Regression Analyses: Later Language Comprehension Predicting Skilled Reading

Predictor Variables	Skilled Reading in Word Recognition and Language Comprehension					
	WJ-III Letter-Word ID			WJ-III Passage Comprehension		
	B	*SE B*	β	*B*	*SE B*	β
Block 1: Demographic Characteristics						
Age in months	.09	.70	.01	-1.54*	.64	-.23
Gender (1 = male, 2 = female)	2.55	3.29	.07	-.80	3.01	-.03
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-8.22	6.50	-.12	-4.60	5.94	-.07
Black/non-Hispanic	-8.01*	3.58	-.23	-9.98**	3.27	-.30
Black/Hispanic	-14.64	16.06	-.09	-.30	14.68	-.002
American Indian/non-Hispanic	-4.57	7.56	-.06	-3.15	6.91	-.04
American Indian/Hispanic	-33.13*	15.86	-.19	-34.79*	14.50	-.22
Asian/Hawaiian/Pacific Islander/non-Hispanic	3.05	15.95	.02	-5.86	14.58	-.04
Other/non-Hispanic	-38.31**	11.45	-.31	-34.72**	10.46	-.31
Other/Hispanic	2.85	6.41	.04	-9.48	5.86	-.15

Below Poverty Line (yes or no)	-7.14*	3.28	-.21	-3.16	3.00	-.10
R^2		.23			.25	
F		2.51**			2.83**	
Block 2: Risk of Cognitive Disability						
BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-4.19	3.12	-.13	-2.38	2.87	-.08
R^2		.24			.25	
ΔR^2		.02			.01	
ΔF		1.80			.69	
Block 3: Later Language Comprehension						
K-BIT Vocabulary Subscale	.50***	.11	.41	.39***	.11	.34
R^2		.38			.35	
ΔR^2		.14			.09	
ΔF		19.90***			13.16***	

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Model 4: Later Comprehension Predicting Skilled Reading In Language Comprehension

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant ($r^2 = .348$, $F(13, 105) = 3.77$, $p < .001$), wherein children's demographic information, risk of cognitive disability, and later language comprehension at age 6 explained 34.8% of the variance in skilled reading in language comprehension at ages 8 through 11 (see Table 3-3). The first block included demographic characteristics, which significantly predicted skilled reading in language comprehension. Age ($\beta = -.23$, $p = .02$) was a significant predictor, in that older participants also scored lower on skilled reading in language comprehension when compared to younger participants. In addition, participants who identified as Black/non-Hispanic ($\beta = -.30$, $p = .003$), American Indian/Hispanic ($\beta = -.22$, $p = .02$) and

Other/non-Hispanic (β = -.31, p = .001) also scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. In the second block, the race/ethnicity characteristics remained significant as in Block 1. Inclusion of risk of cognitive disability in the second block was not significant (β = -.08, p = .41) in predicting skilled reading in language comprehension. In the final block, some race/ethnicity characteristics remained significant, where participants who identified as American Indian/Hispanic (β = -.19, p = .03) and Other/non-Hispanic (β = -.24, p = .008) scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. Inclusion of later language comprehension significantly predicted skilled reading in language comprehension (β = .34, p < .001) above and beyond age, gender, most race/ethnicity characteristics, SES, and risk of cognitive disability.

Model 5: Early and Later Language Comprehension Predicting Later Skilled Reading In Word Recognition

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant (r^2 = .418, F(15, 105) = 4.30, p < .001), wherein children's demographic information, risk of cognitive disability, early language comprehension at age 3, and later language comprehension at age 6 explained 41.8% of the variance in skilled reading in word-recognition at ages 8 through 11 (see Table 3-4). The first block included demographic characteristics, which significantly predicted skilled reading in word-recognition. Specifically, participants who identified as Black/non-Hispanic (β = -.23, p = .03), American Indian/Hispanic (β = -.19, p = .04) and

Other/non-Hispanic (β = -.32, p < .001) scored lower on skilled reading in word-recognition when compared to the White/non-Hispanic reference group. In addition, participants below the poverty line recognition (β = -.21, p = .03) scored lower on skilled reading in word-recognition when compared to participants above the poverty line. In the second block, some of the demographic characteristics remained significant as in Block 1. Inclusion of risk of cognitive disability was not significant (β = -.13, p = .18) in predicting skilled reading in word-recognition. In the third block, some demographic characteristics remained significant as in Blocks 1 and 2. Inclusion of early language comprehension in the third block significantly predicted skilled reading in word-recognition (β = .28, p = .02) above and beyond age, gender, most race/ethnicity characteristics, and risk of cognitive disability. In the final block, some of the demographic characteristics remained significant where participants who identified as Other/non-Hispanic (β = -.20, p = .03) scored lower when compared to the White/non-Hispanic reference group and participants below the poverty line (β = .24, p = .007) scored lower when compared to participants above the poverty line. Inclusion of later language comprehension in this final block significantly predicted skilled reading in word-recognition (β = .37, p = .004) above and beyond age, gender, some race/ethnicity characteristics, risk of cognitive disability, and early language comprehension. Inclusion of early language comprehension in the final block was no longer significant (β = .19, p = .11).

Table 3-4: Hierarchical Regression Analyses: Early and Later Language Comprehension Predicting Skilled Reading

Predictor Variables	Skilled Reading in Word Recognition and Language Comprehension					
	WJ-III Letter-Word ID			WJ-III Passage Comprehension		
	B	*SE B*	*β*	*B*	*SE B*	*β*
Block 1: Demographic Characteristics						
Age in months	.09	.70	.01	-1.54*	.64	.23
Gender (1 = male, 2 = female)	2.55	3.29	.07	-.80	3.01	.03
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-8.22	6.50	-.12	-4.60	5.94	.07
Black/non-Hispanic	-8.01*	3.58	-.23	-9.98**	3.27	.30
Black/Hispanic	-14.64	16.06	-.09	-.30	14.68	.002
American Indian/non-Hispanic	-4.57	7.56	-.06	-3.15	6.91	.04
American Indian/Hispanic	-33.13*	15.86	-.19	-34.79*	14.50	.22
Asian/Hawaiian/Pacific Islander/non-Hispanic	3.05	15.95	.02	-5.86	14.58	.04
Other/non-Hispanic	-38.31**	11.45	-.31	- 34.72**	10.46	-.31
Other/Hispanic	2.85	6.41	.04	-9.48	5.86	-.15
Below Poverty Line (yes or no)	-7.14*	3.28	-.21	-3.16	3.00	-.10
R^2		.23			.25	
F		2.51**			2.83**	
Block 2: Risk of Cognitive Disability						
BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-4.19	3.12	-.13	-2.38	2.87	-.07
R^2		.24			.25	
ΔR^2		.02			.006	
ΔF		1.80			.69	
Block 3: Early Language Comprehension						
PLS-3 Auditory Comprehension	.24*	.11	.28	.20	.10	.24
PLS-3 Expressive Communication	.11	.10	.13	.06	.09	.08

R^2		.36			.33	
ΔR^2		.12			.08	
ΔF		8.44***			5.16**	
Block 4: Later Language Comprehension						
K-BIT Vocabulary Subscale	.37**	.12	.30	.29*	.12	.25
R^2		.42			.37	
ΔR^2		.06			.04	
ΔF		8.85**			6.05*	

Note: $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

Model 6: Early and Later Language Comprehension Predicting Later Skilled Reading In Language Comprehension

All assumptions were within acceptable limits (see Appendix C). The overall hierarchical regression model was statistically significant ($r^2 = .372$, $F(15, 105) = 3.56$, $p < .001$), wherein children's demographic information, risk of cognitive disability, early language comprehension at age 3, and later language comprehension at age 6 explained 37.2% of the variance in skilled reading in language comprehension at ages 8 through 11 (see Table 3-4). The first block included demographic characteristics, which significantly predicted skilled reading in language comprehension. Age ($\beta = -.23$, $p = .02$) was a significant predictor of skilled reading in language comprehension, meaning that older participants scored lower. In addition, participants who identified as Black/non-Hispanic ($\beta = -.30$, $p = .003$), American Indian/Hispanic ($\beta = -.22$, $p = .02$) and Other/non-Hispanic ($\beta = -.31$, $p = .001$) scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. In the second block, all of the demographic relationships remained significant. Inclusion of risk of cognitive disability was not significant ($\beta = -.08$, $p = .41$)in predicted skilled reading in language

comprehension. In the third block, some demographic characteristics remained as in Blocks 1 and 2. Inclusion of early language comprehension in the third blocks was not significant (β = .24, p = .05; β = .08, p = .52) in predicting skilled reading in language comprehension. In the final block, some demographic characteristics remained significant where older participants (β = -.22, p = .02) scored lower on skilled reading in language comprehension when compared to younger children. In addition, participants who identified as Other/non-Hispanic (β = -.21, p = .02) scored lower on skilled reading in language comprehension when compared to the White/non-Hispanic reference group. Inclusion of later language comprehension in this final block predicted skilled reading in language comprehension (β = .25, p = .02) above and beyond gender, most race/ethnicity characteristics, SES, and risk of cognitive disability.

Chapter 4

Discussion

Findings from the current study contribute to the current literature that children who have experienced maltreatment demonstrate lower language comprehension (Eigsti, 2011; Eigsti & Cicchetti, 2004; Lum et al., 2015; Merritt & Klein, 2015; Pears et al., 2011; Stacks et al., 2011; Sylvestre et al., 2016) and impaired reading abilities (Eigsti, 2011; Eigsti & Cicchetti, 2004; Maclean et al., 2016; Merritt & Klein, 2015; Mills et al., 2011; Pears et al., 2011; Pillay, 2016; Stacks et al., 2011; Sylvestre et al., 2016). Descriptively, a large percentage of children in our study sample demonstrated below average language comprehension at ages 3 (i.e., early language comprehension; over 50%) and 6 (i.e., later language comprehension; over 20%), as well as impaired skilled reading between 8-11 years of age (over 20%), highlighting the risk of cascading negative effects in academic performance (Masten & Cicchetti, 2010). Unfortunately, these scores are on par with children who have been referred for SPED services (Prewett, 1992, 1995) or diagnosed with impairments across language (Chin et al., 2001; Jacks et al., 2000) or reading (Benson & Taub, 2013) domains.

These findings show that maltreatment may be associated with learning disabilities later in development, which are just as important as our understanding of other developmental sequelae of maltreatment, such as socioemotional challenges (Morrison et al., 1999), physical disabilities (Jonson-Reid et al., 2004; Suikkanen-Malin & Veistilä, 2016), and cognitive functioning (Bruhn, 2003; Eden et al., 1995; Pears &

Fisher, 2005). Results further indicate that maltreated children may need SPED intervention at higher rates than non-maltreated children (Hall-Lande et al., 2015; Lambros et al., 2010; Malmgren & Meisel, 2004; Miller & Santos, 2020), which may explain the overrepresentation of maltreated children in SPED (Stone, 2007).

Early Language Comprehension Predicting Skilled Reading Development

The current study found that early language comprehension significantly predicted overall skilled reading by later elementary age. Overall, these findings are consistent with the Reading Rope framework (Scarborough, 2001), in that earlier impairments in language comprehension affected the overall "strength" of the skilled reading abilities in maltreated children later in their elementary education. As demonstrated, children with strong language comprehension at age 3 were also likely to be skilled readers later in their development. However, consistent with previous research, children who had impaired early language comprehension were also likely to have impaired reading later on, which may indicate long-term detrimental academic effects after experiences of maltreatment (Holmes et al., 2018).

Further, the early language skills of maltreated children in this sample were similar to those of children who have been diagnosed with language impairments (Bishop & Snowling, 2004; Catts et al., 2005; Pennington & Bishop, 2009), which can lead to long-term problems with skilled reading (Oakhill & Yuill, 1996). For children with diagnosed language impairments, they are six times more likely to have reading needs when compared to children without language impairments (Tomblin et al., 2000). More

specifically, these children may have impaired language comprehension abilities, such as poor oral language skills and impaired listening comprehension (Cain & Oakhill, 2009), which can affect their ability to comprehend text (Cain & Oakhill, 2009; Nation, 2005). Unfortunately, the cumulative effects of both language impairments and consequences of maltreatment, as evidenced in the current study, show significantly worse problems in skilled reading later on, consistent with previous findings that children with maltreatment histories may experience downstream effects (Holmes et al., 2018; Masten & Cicchetti, 2010; McKean et al., 2017; Scarborough, 2001).

In addition to reading-related factors, demographic characteristics also predicted skilled reading. For example, identifying as Black/non-Hispanic or Other/non-Hispanic predicted lower skilled reading in word recognition and language comprehension, which was in line with past research (Graves & Nichols, 2016; Reynolds & Suzuki, 2003). In contrast, children who identified as Asian/Hawaiian/Pacific Islander/non-Hispanic outperformed the White/non-Hispanic reference group, which was also in line with prior work (Graves & Nichols, 2016; Reynolds & Suzuki, 2003).

Caution should be exercised when interpreting these because there could be many reasons for differences in language and reading scores. For example, standardized assessments have been known to be biased (Reynolds & Suzuki, 2003) towards White, middle-class children. There is also a history of using inappropriate methods to assess racial-ethnic minority groups, including improper sampling, inaccurate measurement, or incorrect data adjustments (Graves & Nichols, 2016). There is additional evidence to suggest that the PLS-3 in particular has several items that are not culturally sensitive for racial-ethnic minority groups (Qi et al., 2003), further supporting the idea that the

relationships between race/ethnicity characteristics and language and reading scores may be biased, or at a minimum need to be further assessed.

Later Language Comprehension Predicting Skilled Reading Development

Beyond early language comprehension skills in preschool, inclusion of later comprehension skills at kindergarten within the current study was also found to be important for later skilled reading. Indeed, we found that maltreated children's language comprehension at age 6 was a significant predictor of overall skilled reading at ages 8 through 11, meaning that children with impaired language comprehension in kindergarten also had impaired reading later in their elementary education. Although these findings are consistent with the Reading Rope framework (Scarborough, 2001), there remains a question about the specific age group (i.e., preschool vs. kindergarten) within this developmental period.

Therefore, adding to the need for a more developmental focus, results of the current study suggest that kindergarten, instead of preschool, may be a better time to assess children for later reading impairments. This study found that later language comprehension alone was able to explain additional variance in skilled reading when compared to early language comprehension alone, lending more clarity to ongoing questions about preschool versus kindergarten trajectories of academic development (Holmes et al., 2018; McKean et al., 2017). Researchers will need to revisit the theoretical framing of skilled reading in students who have histories of maltreatment to explain why age 6 may be a better predictor.

Similar to findings earlier, children who identified as Other/non-Hispanic or American Indian/Hispanic had lower reading scores compared to the White/non-Hispanic reference group. Children below the poverty line also demonstrated lower reading scores compared to children living above the poverty line. Unfortunately, as with certain race/ethnicity characteristics, children in poverty have historically underperformed on standardized tests (Reynolds & Suzuki, 2003). This discrepancy may be the result of certain factors that play into experiencing poverty, such as food (Coleman-Jensen et al., 2019) and (Cutts et al., 2011) home insecurity, which can affect children's academic performance (Alaimo et al., 2001; Cutts et al., 2011).

Early and Later Language Comprehension Predicting Skilled Reading Development

The current study investigated developmental shifts in language and reading abilities where early and later language comprehension together significantly predicted variability in later skilled reading. This study found that both *early* and *later language comprehension* significantly predicted skilled reading in *word recognition*. However, only *later language comprehension* predicted *skilled reading in language comprehension*. Although findings associated with significance of early language comprehension on word recognition is consistent with the Reading Rope framework (Scarborough, 2001), the current study adds to growing evidence that language abilities in elementary school may be more stable (Catts et al., 2005; Holmes et al., 2018; McKean et al., 2017).

Implications for Supporting Maltreated Children

Given the relevance of early maltreatment experiences, children in our study appear to evidence unmet needs given the ongoing language- and reading-related challenges. Therefore, child welfare and school systems should take a more collaborative approach when assessing the educational needs of maltreated students. Specifically, child welfare caseworkers and investigators should screen children for language impairments concurrently with academic and safety needs once screened in. Of particular concern is that some specific language impairments may not be evident upon first contact and can only be recognized through formal language screening (Nation, 2005, 2009; Selin et al., 2019). This is important because caseworkers are at the forefront of assessing and identifying children's developmental and academic needs, especially in relation to reading. Actions such as these may jumpstart academic success for maltreated children even before the initiation of SPED services (Jonson-Reid et al., 2004).

Further, universal language screenings for maltreated children by caseworkers could provide the necessary insight for SPED practitioners and general educators to provide the necessary language and reading interventions for these children upon school entry. SPED services can use language screenings to flag maltreated children who are at risk for developing a reading impairment, which could streamline the referral process and address the overrepresentation of maltreated children in SPED (Stone, 2007). Such approach may also create the opportunity for a more focused and targeted language and reading intervention, particularly for children involved in welfare. Understanding how the relationship between maltreatment and specific reading mechanisms may help SPED provide better intervention services intended to target both language and reading needs in

maltreated in addition to behavioral supports.

In addition, using an objective referral method may reduce teacher bias when identifying maltreated children who need SPED support. Given the complexity of referring children for SPED, teachers typically rely on class disruptions for identification, which is fraught with subjective biases (Abidin & Robinson, 2002; Shinn et al., 1987; Ysseldyke et al., 1983). Further, there is evidence to suggest that maltreated children with language impairments are under-identified compared to maltreated children with observable impairments (Zhang & Tomblin, 2000) because of the nature of their language impairments. Instead, maltreated children are identified for behavior such as over reactivity (Lambros et al., 2010; Morrison et al., 1999), and may not be receiving the full services they require to address an underlying language or reading problem. Maltreated children with language and reading impairments also experience emotional disorders that may require intervention (De Bellis et al., 2009; Tomblin et al., 2000) and become the sole initiating event for SPED services and ignoring language- and reading-related impairments. Given that general education teachers are often the first set of eyes on these children, the importance of objective processes for identification and referral cannot be stated enough and that such procedures may give them the tools necessary to support maltreated children (Lloyd et al., 1991).

Limitations and Future Directions

One limitation of the current study is that several of these measures have questionable cultural sensitivity. As mentioned previously, Native American, Black, and Hispanic children tend to underperform in skilled reading when compared to a White/non-Hispanic reference group. Particularly the PLS-3 and the WJ-III have questionable cultural appropriateness and may inaccurately underestimate scores for individuals of Color (Dale et al., 2011; Qi et al., 2003). Caution must be exercised when interpreting and applying the findings above given that these measures may be biased assessments of certain participants. To address this, future researchers should ensure that the measures they employ are culturally sensitive for the selected target population, or multiple measures of similar constructs, to ensure that these individuals are properly assessed.

Another limitation of current study that Reading Rope framework explained only a portion of the results. As mentioned previously, language comprehension at age 6 was a better predictor of later skilled reading, suggesting that kindergarten may be a better time to assess children for later reading needs. Further, instances of maltreatment can occur at any point in development, meaning that it could disrupt a developmental reading trajectory unexpectedly. Therefore, it may be more difficult to track maltreated children's reading development compared to non-maltreated children with diagnosed disabilities. Future researchers should collect data from children at multiple timepoints and continue testing the relationship between language comprehension and reading ability in maltreated.

A final limitation of this study was that the current methodology may not have captured the full complexity of children's experiences. Now that there is more information regarding the relationship between language and reading for children maltreatment histories, future researchers should apply novel methodologies to investigate this relationship further. For example, structural equation modeling, such as latent path or class analyses, could provide more insight into language, reading, and behavioral profiles or trajectories these children. Such investigations may help provide more targeted intervention.

Conclusion

Despite the limitations, these findings contribute to the substantial evidence that children who have experienced maltreatment demonstrate lower language comprehension and impaired reading. These findings also provide additional evidence that children with maltreatment histories may experience downstream effects that may result in language and reading needs. Previous studies have assessed overall academic and reading trajectories, but this investigation specifically assess how language plays an important role in the reading development of maltreated children. Children with maltreatment histories may be at risk for developing language and reading impairments. As a community of researchers, welfare providers, and educators, it is our responsibility to provide expert care and treatment for these children so that they may enter an improved developmental trajectory throughout their remaining education.

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Appendix A

NSCAW Participant Sampling

According to the NSCAW manual, children were selected from one of the Primary Sampling Units (PSUs) in 97 counties around the United States (NSCAW; 2008a). The PSUs were created in a series of stages. In Stage 1, nine strata were identified, eight of which made up the states with the largest child-welfare loads (California, Florida, Illinois, Michigan, New York, Ohio, Pennsylvania, and Texas), and the last strata included the remaining 38 states and Washington D.C. Four states were excluded that did not allow for an NSCAW representative to make first contact with the CPS-involved family (NSCAW; 2008a). In Stage 2, 100 possible PSUs were formed from the strata by dividing areas by CPS agency and then randomly selecting PSUs, emphasizing PSUs with larger caseloads. In Stage 2, smaller PSUs were collapsed to form larger PSUs, and sites were contacted to determine if they were interested and eligible for participation. At the end of both Stages, 92 PSUs were interested and eligible for inclusion in NSCAW data collection (NSCAW; 2008a).

Despite these restrictions, the sample still represented the overall target population. Excluded child-welfare agencies with too few maltreatment investigations made up less than 3% of the target population (NSCAW; 2008a). In addition, the population that was not reached because of the restriction that CPS had to contact prior to NSCAW made up a small percentage of the target population.

Children referred for CPS were then sampled from the PSUs. In a 15-month process, families were contacted to determine if they were eligible and interested in

participating in the project (NSCAW; 2008a). Children and their families were included in the sample if the reported maltreatment occurred between October 1999 and December 2000 and if the alleged maltreated child was between birth and 14 years of age at the time of contact. Children were excluded if they were a sibling of another child participating in the study or if the child themself was under investigation as a possible abuser (NSCAW; 2008a).

Weights and Waves

Baseline, or wave 1, data collection occurred two to six months after a maltreatment investigation was closed, between November 1999 and April 2001 (NSCAW; 2008a). A 12-month phone call, or wave 2 data collection, occurred between October 2000 and March 2002. Data collected at wave 2 was collected over the phone and consisted of different measures than those used in all other waves. The 18-month follow-up, or wave 3 data collection, occurred between April 2001 and September 2002. Wave 4 data collection occurred 36 months after maltreatment investigations closed, between August 2002 and February 2004. Wave 5 data collection occurred between 59 and 97 months after the close of a maltreatment investigation, between September 2005 and December 2007 (NSCAW; 2008a).

Throughout the data collection process, researchers oversampled for infants and child sexual abuse cases. Therefore, the data needs to be adjusted to better fit nationally representative distributions of ages and types of maltreatment during data analysis. These adjustments are hereinafter referred to as Weights. The NANALW345 weight will be used in this proposed investigation to adjust the data to depict a nationally representative

sample of substantiated and unsubstantiated child maltreatment cases in all waves that included the full battery of assessments (waves 1, 3, 4, and 5; NSCAW; 2008c).

Appendix B

Analytic Sample

The original NSCAW Wave 1 dataset was reduced to only children who were between the ages of 3 and 5 to form the analytic sample. This resulted in a sample of 833 participants. Preliminary investigations into the sample revealed that many of the data were missing, particularly for the PLS and the BDI. Subsequent investigation revealed that much of the PLS missingness was explained (NSCAW; 2008b). However, much of the BDI data were still missing without explicit reason. Therefore, the original sample of 833 was reduced to 262 participants, including only participants with complete BDI scores. A missing data analysis demonstrated that 95%of the data were missing on the PLS. Knowing this, the NSCAW research team included a flagged variable that provided more insight into why some participants were missing data. Particularly with the PLS, the NSCAW research team reported that some children reached their intellectual ceiling earlier than most and could no longer answer any questions because they were too complex and beyond the scope of their abilities (NSCAW; 2008b). The flagged variable detailed whether the participant was missing more than 20% of their data and whether that data were clustered at the ceiling (i.e., the participant was no longer able to continue because the assessment had become too challenging) (NSCAW; 2008b). The flagged variable explained the majority of the missingness of the PLS.

Appendix C

Assumptions

Model 1

Residuals were independent, as assessed by a Durbin-Watson statistic of 2.117. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no indication of multicollinearity. Tolerance values were all well above .1 (tolerance ranged between .57 - .98), and VIF values were all below 5 (VIF ranged between 1.02 -1.74; Shrestha, 2020). The residuals appear to be normally distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot.

Model 2

Residuals were independent, as assessed by a Durbin-Watson statistic of 2.165. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no indication of multicollinearity. Tolerance values were all well above .1 (tolerance ranged between .57 - .98), and VIF values were all below 5 (VIF ranged between1.02 -1.74; Shrestha, 2020). The residuals appear to be normally distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot.

Model 3

Residuals were independent, as assessed by a Durbin-Watson statistic of 2.026. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no indication of multicollinearity. Tolerance values were all well above .1 (tolerance ranged between .82 - .98), and VIF values were all below 5 (VIF ranged between 1.04 - 1.24; Shrestha, 2020). The residuals appear to be normally distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot.

Model 4

Residuals were independent, as assessed by a Durbin-Watson statistic of 1.988. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. There was no indication of multicollinearity. Tolerance values were all well above .1 (tolerance ranged between .82 - .98), and VIF values were all below 5 (VIF ranged between1.04 - 1.24; Shrestha, 2020). The residuals appear to be slightly non-normal distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot of the standardized residuals.

Model 5

Residuals were independent, as assessed by a Durbin-Watson statistic of 2.164. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Tolerance values were all

well above .1 (tolerance ranged between .46 - .98), and VIF values were all below 5 (VIF ranged between 1.04 - 2.17; Shrestha, 2020). The residuals appear to be slightly non-normal distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot of the standardized residuals.

Model 6

Residuals were independent, as assessed by a Durbin-Watson statistic of 2.024. Linearity and homoscedasticity were assessed by visual inspection of a plot of studentized residuals versus unstandardized predicted values. Tolerance values were all well above .1 (tolerance ranged between .46 - .98), and VIF values were all below 5 (VIF ranged between 1.04 - 2.17; Shrestha, 2020). The residuals appear to be slightly non-normal distributed as assessed by a histogram of the standardized residuals and a Normal P-P plot of the standardized residuals.