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**ADDRESSING THE READING NEEDS OF CHILDREN EXPOSED TO
MALTREATMENT: UNDERSTANDING THE RELATIONSHIP BETWEEN READING,
AND LANGUAGE IN THESE CHILDREN**

A Dissertation in
Education Psychology

by
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ABSTRACT

Maltreatment exposure has been shown to impact academic outcomes, which may subsequently affect reading needs in children. However, it is not clear what reading-related mechanisms influence these distal reading needs due to the long-term outcomes of such exposure. Therefore, this dissertation included three empirical investigations to elucidate possible mechanisms that related to reading and maltreatment (e.g., early language abilities and child- and context-level factors). Drawing from the Reading Systems Framework and Complex Dynamic Systems Theory (CDST) this dissertation conceptualizes the impact of maltreatment exposure on reading as an academic domain and language as a component of the reading system. Overall findings across the three investigations suggest that children exposed to maltreatment present with language needs, which have varying magnitudes of effect on reading needs later on. Further implications of these findings are discussed, including recommendations for future research and trauma-informed practices across education and child welfare disciplines. Finally, a conceptual model regarding the impact of maltreatment exposure on reading is proposed to guide future research.

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Dedication

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CHAPTER 1

Addressing the Reading Needs of Children Exposed to Maltreatment: Understanding the Relationship Between Reading, Language, and Behavior in These Children

Children exposed to maltreatment (i.e., real or perceived threats of physical, emotional, or mental abuse; Gee, 2020) can experience academic challenges, as evidenced by lower grades (Slade & Wissow, 2007) and lower scores on standardized assessments (Crozier & Barth, 2005; Ryan et al., 2018). Indeed, children exposed to maltreatment are at increased risk for developing specific learning disabilities (SLDs, i.e., meeting the criteria for diagnosis of disability within a particular domain; Lindstrom, 2019; Snowling & Hulme, 2021) and emotional disorders as a result of trauma (Kavanaugh & Holler, 2014). These children often require Special Education (SPLED) services at some point while in school (Cavanaugh, 2016; Jonson-Reid et al., 2004). Nevertheless, up to 50% of children in child welfare samples used for scientific investigations present with severe educational needs not addressed by SPLED (Lambros et al., 2010), emphasizing the absence of evidence-based, trauma-informed care.

Children who have been exposed to maltreatment often struggle academically, particularly in the area of reading. Since reading ability is essential to academic success (York et al., 2015) and because few studies have investigated the specific cognitive mechanisms affected by maltreatment that impact academic outcomes (Jackson, 2023), it is crucial to understand how maltreatment affects the reading system. Although it is not yet clear how maltreatment specifically impacts reading, gaining a deeper understanding of reading as a dynamic system can elucidate mechanisms affected by maltreatment and guide intervention for the reading needs of children exposed to it.

Theoretical Framework: Reading as a Dynamic System

To understand the reading needs of children exposed to maltreatment, it is first essential to understand reading, its relation to language, and how it functions as a dynamic system. The Reading Systems Framework (RSF) can be understood as a complex dynamic system to conceptualize better how maltreatment exposure affects academic and cognitive domains. Complex Dynamic Systems Theory (CDST) is a developmental metatheory that explains nonlinear changes in complex skills, specifically in social, cognitive, and emotional domains (Munakata, 2007; Overton, 2007). It frames complex behaviors or cognitive systems of self-organized processes that interact to create outcomes (Overton, 2007). Reading is one such cognitive domain that can be understood as a dynamic system for several reasons.

First, reading comprehension relies on the function and communication of interconnected knowledge and processes (Perfetti & Stafura, 2014). Indeed, the reading system comprises independent and interdependent components that work together to facilitate comprehension (Kintsch, 2005). Any unexpected changes in these components can impact the overall system, affecting reading abilities (McNamara & Magliano, 2009) and leading to varying reading outcomes (Hiver et al., 2022). Second, reading can be considered a dynamic system because reading abilities develop through dynamic interaction over time (Overton, 2007). Typical reading development occurs by generating more associations across the reading system as it is exposed to more complex texts over time (McNamara & Magliano, 2009). During this process, crucial reading components grow together in a self-organized manner (Perfetti & Stafura, 2014), resulting in a plateau in reading development.

Third, understanding reading as a dynamic system considers child- and context-level factors that can result in unstable reading skills. Child factors include those that are internal to

the reader. For example, a reader's working memory can impact the reading system by affecting one's ability to maintain the previously read text in memory and build an accurate mental model by maintaining multiple memories in working memory at the same time (Kintsch, 2005; McNamara & Magliano, 2009). Context-level variables, factors outside of reader characteristics, can also impact the reading system. Context-level factors can be positive. Indeed, evidence suggests that direct reading intervention can improve reading outcomes (Connor, 2016). However, negative context-level factors, such as maltreatment exposure, may directly or indirectly impact reading by disrupting the system reading (Overton, 2007).

Finally, some reading systems are more stable than others, depending on the individual and the environment (Witherington, 2007). Dynamic change from child- or context-level factors at different times can affect the reading system, resulting in reading instability, such that some children may show short- or long-term reading affected reading abilities (Connor, 2016). Understanding reading as a dynamic system allows for variation reading stability in development due to such factors.

The Reading Systems Framework

The RSF comprises many *knowledges* and *processes* that act independently and interconnectedly to support reading (Perfetti & Stafura, 2014). The framework components include three knowledges: linguistic, orthographic, and general knowledges (Perfetti & Stafura, 2014). *Linguistic knowledge* comprises sentence structure knowledge (e.g., grammar and syntax knowledge; Tunmer & Chapman, 2012) and is used for making inferences and discerning meaning from text (McNamara & Magliano, 2009). *Orthographic knowledge* is spelling knowledge at the word level and of sentence conventions (e.g., capitalization and spacing) at the sentence level (Perfetti, 2010). *General knowledge* refers to knowledge about the text (e.g., text

structure) and content knowledge (e.g., text-specific vocabulary knowledge, general knowledge; McKeown et al., 2009). These knowledges are the foundation for reading as they are activated throughout reading processes to access and derive meaning from text (Perfetti & Stafura, 2014).

Reading begins with bottom-up processing through sensory input (i.e., seeing text to activate the system; Kintsch, 2005). Reading is characterized by two processes: word identification and reading comprehension (Perfetti & Stafura, 2014). During *word identification*, words are broken down into orthographic (i.e., spelling) and phonological (i.e., sound/symbol connection) parts to reveal semantic (i.e., language) units (Perfetti & Stafura, 2014). The lexicon then acts as a bridge between word identification and comprehension processes as a series of “sublexical visuophonological connections” (Tunmer & Chapman, 2012; p. 45) in which units of text connect with memories. *Word comprehension*, “the output of the word identification system and the input of the comprehension system” (Perfetti & Stafura, 2014; p. 33), is then constructed reciprocally between word units and the lexicon (Connor, 2016). Specifically, text units passively draw upon long-term memories, which “resonate” with the identified word (Perfetti & Stafura, 2014; p. 33) and automatically activate many *mental models* or mental images generated from text information and inferences (McNamara & Magliano, 2009). Thus, lexical quality dictates comprehension accuracy (Perfetti & Stafura, 2014). Readers with “high-quality” lexicons have adequate word reading and learning, orthographic skills, and vocabulary knowledge (Perfetti & Stafura, 2014; p. 26). Once a word has been identified, the reader engages in *word-to-text integration* (Perfetti & Stafura, 2014), a reading comprehension process that links semantic units with passively activated memories. This process results in a *sentence representation* (i.e., a mental model of an entire sentence) that interacts with and refines the overall mental model (Perfetti & Stafura, 2014). During *construction-integration*, many mental models are activated

through memory, and then incorrect or irrelevant mental models are dismissed, leaving the reader with a comprehension of the text (Kintsch, 2005).

Language as a Central Component of the Reading System

Language is an essential component of the reading system (Kendeou et al., 2009; Kim, 2020) that contributes to word identification and reading comprehension processes (Tunmer & Chapman, 2012). Word identification relies on linguistic and orthographic knowledges (Perfetti & Stafura, 2014); specifically, adequate knowledge of phonology, morphology, and syntax ensure readers can correctly decode and identify words (Connor et al., 2016; Tunmer & Chapman, 2012). Comprehension utilizes inferences from language to form accurate mental models and readers utilize syntax knowledge to form well organized and coherent sentence representations (Kintsch, 2005). Vocabulary knowledge also contributes to word identification and reading comprehension by supporting the automatic activation of word meanings from memory (Perfetti, 2010; Tunmer & Chapman, 2012). Indeed, strong vocabularies, or lexicons, support accurate word recognition (Perfetti & Stafura, 2014), improving comprehension. Language skills also contribute to development of background knowledge, in that discourse about the text can improve a reader's comprehension (McKeown et al., 2009). Thus, language's influence on the reading system highlights its impact and the dynamic nature of reading.

Reading and Language Need Profiles

Considering reading as a dynamic system assumes variability in developing skills because individual components within the reading system could be affected throughout the system (Masten & Cicchetti, 2010). Such differences in reading can be organized into different profiles of impairments among children with reading needs. Students may exhibit a variety of differences in reading and language, which can lead to diverse profiles of academic needs (see

Appendix A for a detailed depiction of the following profiles).

Reading Disability Profiles.

Overall poor reading. A reader can have both word identification and reading comprehension needs (Catts et al., 2014), which represent the most typical reading disability profile. These readers may have text-related components that are individually and transactionally affected throughout the system (McNamara & Magliano, 2009), demonstrating an overlap in language and reading needs. These readers may also have affected cognitive skills, such as decreased working or long-term memory capacities (McNamara & Magliano, 2009), which are vital to support all the skills necessary for reading and can affect reading comprehension outcomes.

Poor comprehenders. Readers with compromised comprehension may access text fluently but have language needs impacting comprehension (Catts et al., 2014; Tunmer & Chapman, 2012). They may present with decreased verbal working memory (Kelso et al., 2022) and other cognitive needs, impacting their reading outcomes. These readers can be the most challenging to identify and support (Hogan et al., 2014) because they have difficulty with “higher-level” comprehension processes (Kelso et al., 2022, p. 539). They may form sketchy, incomplete, or inaccurate mental models (Kintsch, 2005) that may be undetectable to observers, making reading comprehension needs difficult to identify and diagnose (Catts et al., 2005). These readers may also be unaware of their lack of comprehension (McNamara & Magliano, 2009), further complicating this issue.

Dyslexia. Readers can have impaired decoding and intact language skills (Catts et al., 2014; Tunmer & Chapman, 2012), symptoms associated with the criteria for dyslexia (Lindstrom, 2019). These readers present with significantly lower scores on word identification

assessments, specifically on word reading, pseudoword reading, text reading, reading comprehension, and spelling assessments (Catts et al., 2005; Reis et al., 2020) that persist into adulthood (Reis et al., 2020) without other language needs (Lindstrom, 2019). These readers can often access and comprehend text once they receive intervention specific to their word identification needs (Connor et al., 2016).

Developmental Language Disorders. Developmental Language Disorders (DLDs) are language disorders that impact children’s language knowledge and processing (Adlof et al., 2022; Catts et al., 2005). DLD includes all language impairments, including general language impairments, possibly with other cognitive needs, such as affected executive functioning (Adlof et al., 2022; McGregor et al., 2020). DLD is a general diagnosis that includes children with a variety of language needs (Adlof et al., 2022; Catts et al., 2014), though this definition still excludes children with language needs associated with specific developmental disorders (e.g., language impairments as a result of autism spectrum disorder or Down’s Syndrome; (McGregor et al., 2020). When children with DLD present language difficulties, their symptoms are a heterogeneous variety of language impairments (Tomblin et al., 2000) and often present with impaired grammatical knowledge, specifically tense and agreements, and can demonstrate impaired orthographic learning (Adlof et al., 2022).

The identifier “DLD” is intended to be used a diagnosis. Just as “language” is a broad skill, this title is also broad to encompass all of the ways in which language can be affected (McGregor, 2020). A strength of this classification is that it offers children a clear diagnosis and the opportunity to services for a specific language impairment or specific learning disability, instead of the various labels being used (McGregor, 2020). These children then can receive support based on their individual language needs (McGregor, 2020). However, this general

diagnosis is not often known of or used in settings such as schools (McGregor, 2020) and can remove the nuance of identification and intervention, leaving children filed into similar buckets despite the attempt to individuate them. In addition, a very general diagnosis adds inaccuracy and unnecessary nuance to causal pathway research. Thus, this identification has its benefits and drawbacks.

Overlap in Language and Reading Profiles. Children with DLD who overcome their phonological awareness and language issues by preschool (Adlof et al., 2022) are at reduced risk of developing reading needs later (Snowling & Hulme, 2021). Though, many children present with reading impairments later in elementary school (Catts et al., 2012), suggesting that overlap in these needs occurs often. Indeed, children with DLD can be indistinguishable from children with DLD and dyslexia (DLD+dyslexia) in some reading skills (Adlof et al., 2022). Children with DLD+dyslexia have phonological awareness issues that persist throughout preschool into the school-aged years and affect children's ability to comprehend text (Adlof et al., 2022; Snowling & Hulme, 2021). Thus, reading comprehension symptoms in children with DLD+dyslexia are likely evidence of poor word reading and comprehension (Snowling & Hulme, 2021).

The Relationship Between Maltreatment Exposure, Reading, and Language Needs

Reading Needs in Children Exposed to Maltreatment

Omnibus reading tests suggest that exposure to maltreatment during early childhood impacts later reading ability, as evidenced by lower reading achievement scores on standardized assessments (e.g., Woodcock Johnson-III; De Bellis et al., 2013; Nooner et al., 2018; Pillay, 2016) and state reading assessments (J. Fantuzzo et al., 2012; Kiesel, 2016; Rouse et al., 2011),

relative to non-maltreated peers. In addition, children exposed to maltreatment also present with impairments in reading processes. Indeed, children exposed to maltreatment demonstrate impairments in specific word identification skills, as demonstrated by lower scores on phonological awareness and decoding assessments (Mills et al., 2011; K. C. Pears et al., 2011). Children exposed to maltreatment may also present with affected comprehension, resulting in lower scores on passage comprehension assessments (A. A. Scarborough & McCrae, 2010) and may use fewer comprehension strategies when reading (Hong et al., 2018). However, PTSD may mediate these findings. Specifically, trauma symptoms have explained maltreatment's negative effect on reading (Mullins & Panlilio, 2021, 2023), suggesting that factors associated with maltreatment may be more impactful on reading needs long after maltreatment exposure. Thus, understanding the impact of maltreatment on reading requires further attention.

Language Impairments in Children Exposed to Maltreatment

Children exposed to maltreatment are at an increased risk of developing language disorders (C. Selin et al., 2022). These children have a history of affected expressive and receptive language skills (J. A. G. Lum et al., 2015; Sylvestre et al., 2016) that persist over time after maltreatment exposure (Eigsti & Cicchetti, 2004). Evidence suggests that adversity impacts grammar knowledge (C. Selin et al., 2022), such that children exposed to maltreatment also demonstrate shorter and less complex utterances and make more grammatical errors in language use (Alvarado et al., 2023). Despite these results, findings on grammar skills in children exposed to maltreatment have been mixed (Alvarado et al., 2023). Some findings suggest that these may not score lower than non-maltreated peers on measures of grammar and syntax (Eigsti, 2011), even for those with severe emotional behavior disorders (Eadie et al., 2021). These findings may be due to accurate null results or inaccurate measurement of the relationship between

maltreatment exposure and language needs (Alvarado et al., 2023), highlighting the need for improvement in research regarding language needs and their impact on these children. Further, the evidence is mixed as to whether child- or context-level factors play a role in the relationship between language needs and maltreatment exposure. Indeed, PTSD mediates the relationship between maltreatment and language outcomes (Alvarado et al., 2023; Beers & De Bellis, 2002; De Bellis et al., 2013), suggesting that other factors associated with maltreatment may also be important to the relationship between these languages and maltreatment.

Conceptualizing the Effect of Maltreatment on Reading

First, understanding reading as a dynamic system helps to conceptualize the relationship between language skills and the reading system in children exposed to maltreatment. The reading system relies heavily on language to support word identification and comprehension processes (Perfetti & Stafura, 2014). Despite being separate domains (Snowling & Hulme, 2021), many language disorders overlap with reading disorders (Snowling et al., 2020), highlighting how impairments in language may affect reading processes. It may be that maltreatment specifically impairs language as a reading-related process, resulting in weaknesses in both language and reading skills over time.

Conceptualizing reading as a dynamic system also helps explain how maltreatment can impact reading development. Indeed, evidence suggests that children exposed to maltreatment during early childhood demonstrated stable, though significantly lower, reading ability compared to non-maltreated children, while those exposed to maltreatment within several months of a reading assessment demonstrated irregular reading development (Hong et al., 2018). Such findings highlight how dynamic change from adverse context-level factors at different times can affect the reading system (Connor, 2016) and the instability maltreatment may introduce to a

system irrespective of timing during development. Understanding reading as a dynamic system allows for variation in developmental patterns in reading and language due to exposure to maltreatment as an outside factor. It also considers the importance of the timing of maltreatment when assessing its impact on reading development.

Finally, understanding reading as a dynamic system considers the impact maltreatment exposure can have as a context-level factor, specifically that the reader is likely generally impacted by maltreatment exposure. Children exposed to maltreatment are likely exposed to many biological, cognitive, and environmental risk factors (Snowling & Hulme, 2021) that can disrupt the reading system overall as well as individual components within the system (Overton, 2007). Indeed, these children demonstrate evidence of other compromised processes, including increased internalizing and externalizing behaviors (Cavanaugh, 2016; Masson et al., 2015) resulting from affected emotion regulation (Panlilio et al., 2018) and issues with engagement and motivation (Mullins & Panlilio, 2021), which can impact a child's ability to access text (McNamara & Magliano, 2009) or opportunities to receive support (Bell et al., 2021; Loomis & Panlilio, 2022). Thus, understanding reading as a dynamic system can help conceptualize how maltreatment may directly and indirectly impact the system as a context-level factor.

Remaining Empirical Questions About the Relationship Between Maltreatment Exposure, Language, and Reading

It has not yet been empirically tested if children exposed to maltreatment with reading needs also present with language needs. As outlined earlier, children exposed to maltreatment with language needs could exhibit heterogeneity in reading skills. Indeed, despite the common overlap, reading and language disorders are distinct (Snowling et al., 2020), such that there are

children with language disabilities who do not have reading disabilities and vice versa (Adlof et al., 2022; Catts et al., 2005; Snowling et al., 2020). Maltreatment may have a different impact on reading and language needs in these children, resulting in distinct disability profiles within this population. Thus, it should be investigated whether children exposed to maltreatment present with varying profiles of reading and language needs.

Furthermore, the relationship between maltreatment exposure, reading, and language is complicated by the fact that it remains unclear whether all of these impairments occur due to impacted cognitive functioning. Unfortunately, children exposed to maltreatment present with differential intellectual functioning (Young-Southward et al., 2020; Zhang et al., 2023) that commonly explains children's performance on other cognitive tasks such as memory and processing speed, as well as associated reading tasks, such as verbal comprehension (Su et al., 2019a). Reading knowledge and processes can be affected by resources in long-term memory (Perfetti & Stafura, 2014) and other cognitive skills, such as metacognitive awareness and motivation (McNamara & Magliano, 2009). Such findings, coupled with the knowledge that these children present with language and reading needs, suggest that many cognitive domains may be affected by the overall implications of maltreatment. Thus, investigations should ascertain whether affected reading and language abilities result from affected cognitive abilities or are independent of such needs.

Finally, empirical research would benefit from unpacking the effect of trauma symptoms on the relationship between reading, language, and maltreatment exposure. As referenced previously, PTSD symptoms may mediate the relationship between maltreatment, reading, and language separately (Alvarado et al., 2023; Mullins & Panlilio, 2023). Indeed, individuals with post-traumatic stress disorder (PTSD) due to maltreatment are more likely to show

developmental effects of maltreatment (De Bellis et al., 2013) and have lower outcomes (i.e., lower IQ scores and poorer academic achievement) than those exposed to maltreatment without PTSD symptoms (Kavanaugh & Holler, 2014). These findings highlight that the relationship between maltreatment and reading may be explained as the relationship between trauma symptoms and reading needs (Mullins & Panlilio, 2021) and emphasize why this information should be included in investigations. Indeed, many children do not develop symptoms after a traumatic experience (Kavanaugh & Holler, 2014), which may be the result of overexposure to traumatic events such that they no longer react to threatening stimuli (K. A. McLaughlin & Sheridan, 2016). The evidence is mixed as to whether PTSD mediates the relationship between maltreatment, language, and reading needs (Alvarado et al., 2023; Beers & De Bellis, 2002; De Bellis et al., 2013), making it unclear as to whether this is a mediating factor or if differences in maltreatment measurement conceal the relationship between maltreatment symptoms, language, and reading needs (Alvarado et al., 2023).

The Current Projects

This dissertation constitutes three papers that address these gaps in the current literature about the relationship between reading and language needs in children exposed to maltreatment. Overall, these studies aim to assert that this population includes profiles of children exposed to abuse with language and reading needs. *Paper 1* introduces the idea that there is a relationship between language and reading in children exposed to maltreatment. *Paper 2* investigates heterogeneity in verbal and nonverbal IQ patterns and how they coexist over time in these children. *Paper 3* identifies heterogeneity in early language skills and reading developmental patterns to inform SPLED identification and intervention. Together, collectively answer these overarching research questions:

1. To what extent does oral language ability predict reading ability in children exposed to maltreatment?
 - a. Is preschool or school entry a better time to assess language needs and learn about later reading skills?
2. What verbal and nonverbal intelligence trajectories exist in a sample of children exposed to maltreatment?
 - a. How do these profiles differ on substantiation, trauma symptoms, home environment, and demographic variables?
3. What profiles of early language and reading developmental patterns exist in a sample of children exposed to maltreatment?
 - a. How do these profiles differ on substantiation, trauma symptoms, home environment, and demographic variables?

Paper 1: The relationship between language and reading in a sample of children exposed to maltreatment

Paper 1 investigated the relationship between language and reading in children exposed to maltreatment. This paper assessed whether oral language skills at age three or age six predicted later reading ability at ages eight to 11. This investigation found that oral language skills did predict later reading in children exposed to maltreatment. Specifically, auditory comprehension at age three and vocabulary at age six independently predicted letter/word-ID and passage comprehension scores at ages eight to 11. Certain child characteristics, such as race and age, also predicted reading scores, suggesting that other variables may be important in the relationship between language and reading in these children. This investigation also controlled for the developmental delay in this sample and found that language skills predicted reading

ability irrespective of cognitive function. Taken together, these findings support the argument that the relationship between language and reading in children exposed to maltreatment is not related to overall cognitive impact but specific impairments in language and reading.

For the purposes of publication and this dissertation, Paper 1 included more information about nuances between substantiated and unsubstantiated maltreatment cases. Although children with substantiated and unsubstituted maltreatment investigations have historically performed similarly on outcome variables (e.g., cognitive functioning and reading scores) (Leiter et al., 1994). Upon further review, substantiation predicted language and reading scores for children exposed to maltreatment. These findings, alongside the findings about other demographic variables predicted reading, suggested that though the relationship between language and reading may persist in children exposed to maltreatment, other outside factors may also be influencing this relationship.

Paper 2: Verbal and nonverbal intelligence trajectories in children exposed to maltreatment

Paper 2 investigated whether children exposed to maltreatment presented heterogeneity in verbal IQ (vIQ), measured using vocabulary definitions, and nonverbal IQ (nvIQ), measured using matrices. This investigation identified three heterogeneous trajectories. Among these trajectories, over 90% of children were classified in the *high-stable* trajectory, with average vIQ and nvIQ scores. These findings are encouraging and suggest that many children may be resilient to the overall cognitive impact of maltreatment exposure. In addition, an *increasing* vIQ and nvIQ trajectory was identified. These children demonstrated rapid growth in both vIQ and nvIQ between the ages of three and seven, highlighting the possibility of resiliency in IQ for these children. Children classified into this trajectory were more likely to be in emotionally supportive

homes compared to children in the *high-stable* trajectory. Unfortunately, children classified in the *low-unstable* trajectory demonstrated highly affected vIQ and nvIQ between the ages of three and seven. Though they demonstrated slight growth at age 5, their scores decreased slightly again, resulting in no change. Interestingly, only 1% of children were classified into this trajectory, suggesting that though some of these children may require intensive cognitive function intervention, many children may demonstrate cognitive resiliency to maltreatment exposure. Overall findings from this investigation indicated heterogeneous IQ trajectories in children exposed to maltreatment, as well as a large sample of children resilient to cognitive impairments.

Paper 3: Maltreatment and Heterogeneity in Early Language Delays and Later Reading: Using a person-centered Approach to Understand Profiles of Developmental Functioning in Reading

Paper 3 investigated whether profiles of early language and reading developmental patterns could be found in children exposed to maltreatment. Indeed, this paper found three profiles of early language (i.e., auditory comprehension and expressive communication) and later reading developmental patterns (i.e., overall reading standard score, letter/word ID, and reading comprehension). The *resilient* profile comprised over 50% of children in the sample, with lower early language scores and unaffected reading scores later on. Nearly 10% of the sample of children belonged to the *at-risk* profile, which included children with below-average early language and reading scores over time. Children classified within this profile had a higher proportion of substantiated cases and were more likely to have cognitive disabilities. The *expected* profile included children with average language and reading developmental patterns (39%). This is a particularly encouraging finding, considering much of the maltreatment

literature argues that these children are likely to have affected language and reading needs. Overall, Paper 3 found evidence for heterogeneity in language and reading needs in children exposed to maltreatment, as well as possible child- and context-level factors that may be associated with profile membership.

CHAPTER 2

Early Language Skills and Later Reading Ability in Children Exposed to Maltreatment

Abstract

Background: Reading is vital for academic achievement, yet many children who experience maltreatment show evidence of long-term negative consequences in this domain. Such outcomes could be attributed to language as a reading-related mechanism. However, the relationship between these skills has not yet been investigated in children at risk of maltreatment exposure.

Objective: Given that reading relies heavily on language, this study aimed to examine whether language skills predict later reading ability in children exposed to maltreatment, and if so, whether oral language skills in preschool or school entry better predicted later reading ability in these children. This study also aimed to determine if developmental delay predicted reading skills in these children over and above early reading needs.

Participants: This study included 262 children from the National Survey of Child and Adolescent Well-Being (NSCAW-I) data, with complete Battelle Developmental Inventory assessments.

Methods: This study employed six hierarchical linear regression models: two models predicted later word identification and reading comprehension (ages 8 to 11) from preschool oral language skills (age 3), two models predicted reading outcomes from oral language skills at school entry (age 6), and two models predicted reading outcomes from both timepoints.

Results: Results indicated that oral language skills in preschool and school entry were significant predictors of later reading ability when investigated independently. Developmental delay did not predict later reading needs, indicating that this relationship held children exposed to maltreatment regardless of disability status. When considered within a single model, neither early language skills in preschool nor school remained a significant predictor of reading

comprehension. Other child- and context-level factors predicted reading skills at ages 8 to 11, highlighting the complexity of the relationship between language and reading in these children.

Conclusions: Early language needs may be related to later reading needs in children exposed to maltreatment. Research should focus on unpacking this complex relationship. Child welfare should consider administering basic language screener assessments to support academic intervention for these children.

Keywords: child maltreatment, reading, language, child welfare

Introduction

Reading is a complex skill that warrants further examination, particularly for children exposed to childhood maltreatment, given the long-term impact of these adverse events on academic performance (Dube & McGiboney, 2018; Fantuzzo et al., 2014; McGuire & Jackson, 2018; Ryan et al., 2018). Subsumed within the complexity of reading skills is the importance of oral language ability or linguistic processes (Foorman et al., 2015). Unfortunately, exposure to childhood maltreatment as a specific adverse learning environment has been shown to negatively impact linguistic processes (J. A. G. Lum et al., 2015; Sylvestre et al., 2016) and text-specific reading processes (Ferrara et al., 2023) that place these children at risk for developmental delay, warranting special education services. However, limited attention has been given to understanding the interplay between compromised early childhood linguistic abilities and the impact on later reading ability. Capitalizing on the neural plasticity of early childhood on language development and the importance of linguistic processes that precede reading processes, understanding how these processes are associated is important in mitigating later reading comprehension problems.

Reading and Language in the Context of Maltreatment Exposure

Reading involves integrating multiple cognitive processes to enable reading (McNamara & Magliano, 2009; Perfetti & Stafura, 2014). Indeed, readers rely on knowledge of orthographic (e.g., spelling, decoding, automatic word identification) and linguistic (e.g., morphology and syntax) knowledge to access (i.e., word identification) and derive meaning from text (i.e., reading comprehension). Thus, oral language contributes to reading comprehension directly and indirectly via word identification (Tunmer & Chapman, 2012), highlighting the impact language abilities have on all aspects of reading. Early acquisition of oral language as a foundational

reading skill depends upon many factors in early childhood to ensure that reading development occurs properly (Connor, 2016).

In the context of maltreatment, exposure to threat and deprivation associated with child abuse and neglect could explain why these children may also face reading challenges (Connor, 2016; K. A. McLaughlin, 2016a). Indeed, prior research has shown that exposure to maltreatment during early childhood creates susceptibilities to developing later reading deficits, as evidenced by lower scores relative to non-maltreated peers on standardized reading achievement tests (De Bellis et al., 2013; Nooner et al., 2018; Pillay, 2016) and state reading assessments (Fantuzzo et al., 2012; Kiesel, 2016; Rouse et al., 2011). These, in turn, may be associated with subsequent reading challenges in school (Hong et al., 2018; Maclean et al., 2016; K. C. Pears et al., 2011). However, such omnibus tests only explain that these children score lower than children not exposed to maltreatment but do not explain which reading mechanisms may be affected explicitly by maltreatment exposure.

Indeed, when assessing reading-related mechanisms in children exposed to maltreatment, they may also present with affected language abilities. These children have scored lower on assessments of orthographic (e.g., word identification, phonological awareness; Pears et al., 2011; and letter-word decoding assessments; Mills et al., 2011) and linguistic knowledge (e.g., expressive and receptive language (Lum et al., 2015; Sylvestre et al., 2016), grammar, (Fondren et al., 2020; Stacks et al., 2011), and vocabulary assessments (Alvarado et al., 2023). However, it is unclear if oral language needs relate to reading needs in children exposed to maltreatment or if these represent two sub-populations.

In addition to these considerations, examining the developmental nature of the relationship between word identification, oral language, and reading is essential, given

conflicting evidence on the emergence of language deficits due to maltreatment (Alvarado et al., 2023). That is, language deficits following maltreatment exposure may occur in early childhood for some children (Holmes et al., 2018) and adolescent years for others (Noll et al., 2010), making it unclear at which developmental stage language is impacted by maltreatment, and if such effects further impact reading. Indeed, some have argued that preschool language skills are more indicative of later reading ability in typically developing children (Larney, 2002; H. S. Scarborough, 2001), while others have said that school-aged language ability is more indicative of later reading ability (Holmes et al., 2018; McKean et al., 2017). Thus, understanding the impact of maltreatment on oral language skills earlier in development may provide insight into the effect on reading and, by extension, academic outcomes in children exposed to maltreatment.

The Current Study

Despite evidence that oral language and reading skills are vulnerable to maltreatment, it is unclear whether affected language and reading outcomes are related or if they indicate two groups of children exposed to maltreatment with different academic needs. Further, if language and reading needs are related in children exposed to maltreatment, it is unclear whether oral language skills in preschool or at school entry are more predictive of later reading problems for children exposed to maltreatment. It is, therefore, necessary to understand which developmental period may have a greater impact on later reading ability. These aims were addressed through the following research questions:

1. To what extent does preschool (age 3) oral language ability predict reading ability in elementary school (ages 8 to 11)?
2. To what extent does oral language ability at school entry (age 6) predict reading ability in elementary school?

3. To what extent does language ability during preschool and school entry predict reading ability in elementary school?

Method

Procedure

The current study used the first cohort of the National Survey of Child and Adolescent Well-Being study (NSCAW-I; 2008a) to assess the long-term outcomes of a nationally representative sample of child welfare-involved children from birth to 14 years of age. The complete NSCAW sample consisted of children and families with Child Protective Services (CPS) investigations for maltreatment between October 1999 and December 2000 ($n = 5,501$). The current study included longitudinal data from Waves 1 (2-6 months after investigation close), 4 (36 months after close), and 5 (59-97 months after close) from both substantiated and unsubstantiated cases. There are often similar outcomes later in development for children with either substantiated or unsubstantiated CPS investigations (Leiter et al., 1994), indicating that being investigated by CPS likely means the child is at extreme risk for maltreatment exposure.

Participants

To fully consider the relationship between developmental delay, language, and reading ability, the current study employed an analytic sub-sample of 262 children with complete Battelle Developmental Inventory scores. All children were investigated for exposure to maltreatment before age 3. At Wave 1, children's ages ranged between 3 and 3.92 years old ($M = 3.46$ years; $SD = 3.26$ months). At Wave 4, children were between 6 to 6.83 years old ($M = 6.26$ years; $SD = 2.36$ months). At Wave 5, children were between 8.16 and 11.5 years old ($M = 9.16$ years old, $SD = 8.86$ months).

Measures

Reading Ability in Elementary School

The Woodcock-Johnson Tests of Achievement, 3rd edition (WJ-III) (Woodcock et al., 2001) Letter-Word Identification (LWID) and Passage Comprehension (PC) subscales assessed word identification and reading comprehension skills, respectively, in children ages 8 to 11 at Wave 5. LWID measured the ability to recognize printed words, while PC assessed participants' ability to complete a sentence with a keyword based on context. Internal consistency for the reading subscales across the analytic sample for LWID was high (Cronbach's $\alpha = .79$), and PC was acceptable (Cronbach's $\alpha = .63$).

Oral Language Ability

Preschool: Age 3. The Preschool Language Scale, third edition (PLS-3) (Zimmerman et al., 1992) assessed oral language skills in children aged three at Wave 1. The PLS-3 includes two language subscales—Auditory Comprehension (AC) and Expressive Communication (EC)—which assess prelinguistic (i.e., attention, vocal development, and social communication) and language skills (i.e., syntax, morphology, vocabulary, and concept development). Test-retest reliability for both subscales across the entire sample was high (Cronbach's α AC = .85, EC = .84).

School Entry: Age 6. The Kaufman Brief Intelligence Test (K-BIT) (Kaufman and Kaufman, 1990) assessed oral language skills in children aged six at Wave 4. The K-BIT includes a vocabulary subscale, which evaluates children's expressive vocabulary knowledge and understanding of vocabulary definitions. Internal consistency for the vocabulary subscale across the analytic sample was high (Cronbach's $\alpha = .84$).

Covariates

Developmental delay. The Battelle Developmental Inventory (BDI) (Newborg et al., 1984) was used as a screener of developmental delay (Behl & Akers, 1996). The BDI is a

standardized assessment of development covering five domains (adaptive, personal-social, communication, motor, and cognitive development). BDI items were scored with a 2 (i.e., milestone achieved), 1 (i.e., milestone emerging), or 0 (i.e., milestone not yet evident). Then, subscale raw scores were converted into z-scores by the NSCAW research team. For this investigation, participants with a z-score of -2 to -1 were classified as at-risk for affected developmental delay. Participants with a z-score of -.99 or above were not at risk for affected developmental delay.

Demographic Variables. A demographic block controlled for additional factors impacting reading. Participants identified as either male (1) or female (2) assigned at birth. Participants self-reported their race (i.e., White, Black, Native American, Asian/Hawaiian/Pacific Islander, or Other) and ethnicity (i.e., Hispanic or non-Hispanic) (NSCAW; 2008b). Participants' responses were recoded into a single variable to fully capture participants' racial and ethnic identities in a single variable (e.g., Asian/non-Hispanic). The White/non-Hispanic group was the reference group. Race remained disaggregated regardless of sample size to adhere to a Quantitative Critical (QuantCrit) approach (Gillborn et al., 2018), which argues that quantitative data is socially constructed and disaggregating between races can improve interpretation and generalizability of results (Garcia et al., 2018; D. Jones et al., 2022).

Participants' income level was computed using the number of people in the household and the yearly household income reported by the participants' parents. Households were assessed using the HHS poverty estimation guidelines for the years specified to determine if they were considered below the national poverty line. Following procedures established by Panlilio et al. (2018), a dichotomous variable was computed, indicating whether the participant was above (1) or below (0) the poverty line at the time of data collection.

A one-way ANOVA assessed whether children differed on key variables based on whether the CPS investigation was substantiated or unsubstantiated. Most of these were not significant (risk of affected developmental delay, $F(1) = 1.31, p = .25$; preschool language skills AC, $F(1) = .1.80, p = .12$; EC, $F(1) = .73, p = .34$; and language skills at school entry, $F(1) = 1.40, p = .24$), indicating that there were no differences between substantiated and unsubstantiated cases on any of these variables. However, the WJ-III subscales were significantly different from one another based on substantiation (WJ LWID, $F(1) = 7.46, p = .007$; WJ PC, $F(1) = 4.35, p = .04$). Thus, substantiation was included as a control demographic variable. Substantiation of maltreatment exposure was measured as a dichotomous yes/no variable. NSCAW computed the variable based on CPS records included for each child at Wave 1 (NSCAW Appendix III).

Data Analyses

Using IBM SPSS Statistics (Version 27), descriptive statistics and correlations were first generated. Six total hierarchical multiple linear regression models were conducted. The first two regression models predicted word identification and reading comprehension at ages 8 to 11, using oral language skills at age 3. The following two regression models predicted word identification and reading comprehension at ages 8 to 11 using oral language skills at age 6. The final two regression models predicted word identification and reading comprehension at ages 8 to 11 using oral language skills from ages 3 and 6 together. For all models, the first block included the demographic variables (i.e., age, sex assigned at birth, race/ethnicity, and poverty). The second block included risk of affected developmental delay. Oral language skills at ages 3 or 6 were included in the third block when assessed independently. The final two models included oral language skills at age 3 in block three and oral language skills at age 6 in the fourth and final

block. Only the results from the model, including all blocks, are reported in text. See Tables 3a-5a for all blocks entered into the model. The linear regression assumptions were evaluated for each model. Residuals were assessed using Durbin-Watson statistics. Linearity, homoscedasticity, and normality were assessed by visual inspection of plots. Tolerance and VIF were also assessed.

Results

Descriptive Findings

At age 3, nearly 50% of participants scored at least one standard deviation below the mean for oral language skills (AC: 47.7%, $n = 125$; EC: 49%, $n = 128$). Nearly 20% of participants were at least one standard deviation below the mean for oral language skills at age 6 (18.2%, $n = 26$) and reading ability at ages 8 through 11 (word identification: 19.2%, $n = 37$; reading comprehension: 22.3%, $n = 43$). See Table 2.1 for descriptives. Oral language skills at age three significantly correlated with sex assigned at birth (AC $r = .17$, $p = .006$; EC $r = .19$, $p = .002$), such that participants who identified as female had higher scores. Substantiation was correlated with LWID ($r = -.21$, $p = .01$) and PC ($r = -.20$, $p = .02$) subscales of the WJ-III, such that children who did not report substantiation scored higher on both WJ-II subscales. Correlational analyses are included in Table 2.2.

Models 1 and 2: Preschool Oral Language Skills Independently Predicting Later Elementary Reading Ability

In Model 1, oral language skills at age three significantly predicted word identification at ages 8 to 11 (AC: $\beta = .31$, $p = .004$), suggesting that higher oral language scores in preschool were associated with higher word identification scores in elementary school for children exposed to maltreatment. After accounting for demographics and risk of affected developmental delay,

oral language skills at age 3 in the final block explained 14% unique variance in word identification at ages 8 through 11 (See Table 2.3). In the second block, risk of affected developmental delay did not significantly predict word identification ($\beta = -5.74, p = .08$). In the third and final block, child sex assigned at birth ($\beta = 6.59, p = .05$) substantiation predicted word identification at ages 8-11 ($\beta = -10.79, p = .003$), meaning that being female with an unsubstantiated maltreatment case predicted higher word identification scores.

In Model 2, oral language skills at age three did not significantly predict later reading comprehension abilities at ages 8 to 11 (AC: $\beta = .12, p = .07$), suggesting that higher oral language scores in preschool were not associated with higher reading comprehension scores in elementary school for children exposed to maltreatment. After accounting for demographics and risk of affected developmental delay, oral language skills at age 3 in the final block explained 8% unique variance in word identification at ages 8 through 11 (See Table 2.3). In the second block, risk of affected developmental delay did not significantly predict reading comprehension ($\beta = -3.63, p = .25$). In the third and final block, child age ($\beta = -1.15, p = .03$) and substantiation predicted word identification at ages 8-11 ($\beta = -9.74, p = .009$), children who were younger when investigated by CPS at Wave 1, and those with unsubstantiated maltreatment cases were predicted to have higher reading comprehension scores.

Models 3 and 4: Oral Language Skills at School Entry Independently Predicting Later Elementary Reading Ability

In Model 3, oral language skills at age six significantly predicted later word identification at ages 8 to 11 ($\beta = .47, p < .001$), suggesting that higher oral language scores at school entry were associated with higher word identification scores in later elementary school for children exposed to maltreatment. After accounting for demographics and risk of cognitive disability, the

inclusion of oral language skills at age 6 explained 11% unique variance at ages 8 through 11 (See Table 2.4). In the second block, developmental delay did not significantly predict word identification ($\beta = -4.93, p = .21$). In the third and final block, substantiation predicted word identification at ages 8-11 ($\beta = -12.36, p = .003$). In addition, two race/ethnicity characteristics remained significant, specifically identifying as American Indian/non-Hispanic ($\beta = -35.10, p = .03$) or Other/non-Hispanic ($\beta = -25.33, p = .03$) predicted lower reading comprehension scores compared to the White/non-Hispanic reference group. However, considering the small sample size of each of these groups, interpretation of significance in regression coefficients should be done with caution.

In Model 4, oral language skills at age six also significantly predicted reading comprehension at ages 8 to 11 ($\beta = .36, p = .009$), suggesting that higher oral language scores at school entry were associated with higher reading comprehension scores later in elementary school. After accounting for demographics and developmental delay, including oral language skills at age 6 explained 7% unique variance at ages 8 through 11 (See Table 2.4). In the second block, developmental delay did not significantly predict reading comprehension ($\beta = -3.54, p = .35$). In the third and final block, substantiation predicted word identification at ages 8-11 ($\beta = -8.57, p = .03$). In addition, two race/ethnicity characteristics remained significant, specifically identifying as American Indian/Hispanic ($\beta = -35.65, p = .03$) or Other/non-Hispanic ($\beta = -23.76, p = .04$) predicted lower reading comprehension scores compared to the White/non-Hispanic reference group.

Models 5 and 6: Oral Language Skills in Preschool and at School Entry Predicting Later Elementary Reading Ability

In Model 5, oral language skills at age 3 (AC: $\beta = .20, p = .12$; EC: $\beta = .01, p = .41$) and age 6 ($\beta = .29, p = .06$) did not significantly predict word identification at ages 8 to 11. In block three, oral language at age three significantly predicted word identification at ages 8 to 11 ($\beta = .27, p = .04$). However, this was no longer so when oral language skills at age six were added to the model. Indeed, there was no significant F change between blocks three and four ($p = .06$). After accounting for demographics and developmental delay, including oral language skills at ages 3 and 6 only explained 3% unique variance at ages 8 through 11 (See Table 2.5). In the second block, the developmental delay did not significantly predict word recognition ($\beta = -4.93, p = .21$). In the fourth and final block, substantiation predicted word identification at ages 8-11 ($\beta = -11.48, p = .004$), meaning that unsubstantiated cases predicted higher word identification scores.

In Model 6, oral language skills at age 3 (AC: $\beta = .12, p = .23$; EC: $\beta = .02, p = .85$) and age 6 ($\beta = .25, p = .11$) did not significantly predict reading comprehension at ages 8 to 11. Indeed, there was no significant F change between blocks three and four ($p = .11$). After accounting for demographics and developmental delay, including oral language skills at ages 3 and 6 only explained 3% unique variance at ages 8 through 11 (See Table 2.5). In the second block, the developmental delay did not significantly predict word recognition ($\beta = -3.54, p = .93$). In the fourth and final block, child age ($\beta = -2.11, p = .03$) substantiation predicted word identification at ages 8-11 ($\beta = -7.95, p = .05$) meaning that being younger and having an unsubstantiated maltreatment case predicted high reading comprehension scores. One race/ethnicity characteristic remained significant, specifically identifying as American Indian/Hispanic ($\beta = -31.88, p = .05$) predicted lower reading comprehension scores compared to the White/non-Hispanic reference group.

Discussion

This study aimed to understand whether language outcomes were related to reading outcomes in children exposed to maltreatment and what developmental language period better predicted this relationship in these children. Indeed, this study found that oral language skills at age 3 predicted later reading ability at ages 8 to 11. Auditory comprehension at this age predicted overall reading skills. These findings align with previous evidence suggesting that auditory comprehension skills are critical reading. Indeed, children with language and reading needs are likely also present with auditory comprehension needs (Sharma et al., 2009). For example, auditory comprehension can affect later word identification in children with dyslexia (Boets et al., 2011). Such findings highlight how this specific skill may directly affect reading in those with reading needs.

In addition, oral language skills at age 6 predicted reading skills at 8 to 11. These findings highlight the relationship between early language skills and later reading needs and suggest that children exposed to maltreatment with early language needs may have reading needs later on. In addition, though developmental delay was specifically controlled for, it did not predict later reading needs in children exposed to maltreatment. Such findings indicate that the relationship between language and reading can be identified in these children irrespective of their disability status. Taken together, these results support previous findings that children exposed to maltreatment present with impaired oral language skills (Lambros et al., 2010; Miller & Santos, 2020).

However, when considered together, oral language skills at ages 3 and 6 no longer predicted reading skills at ages 8 to 11. These findings may highlight the overall complexity of reading needs in children exposed to maltreatment and that child-level factors, such as

race/ethnicity characteristics and age, may interact with context factors, such as substantiation and other experiences. However, they are in contrast to previous investigations that have emphasized that many outcomes, including standardized reading and math scores, grades, behavioral measures, and school attendance, do not differ between children with and without substantiated maltreatment cases (Leiter et al., 1994). Substantiation is a legal term referring to whether there was enough evidence to confirm maltreatment exposure. However, this substantiation should not be considered confirmation of maltreatment exposure, but that there was enough evidence to justify maltreatment occurred. Indeed, many cases of maltreatment likely go unsubstantiated because there is not sufficient evidence (Leiter et al., 1994).

Despite what other studies have found, results from the present investigation suggest that there may be differences between children with substantiated and unsubstantiated maltreatment cases. It may be that children with substantiated maltreatment cases are at increased risk such that their maltreatment exposure was able to be confirmed. Indeed, there is some evidence that children with substantiated maltreatment exposure demonstrate more depressive symptoms compared to children without substantiated maltreatment cases (Kugler et al., 2019), further highlighting the possibility of increased risk. Thus, substantiation may have predicted lower reading skills because these children were at increased risk overall, resulting in a greater impact on academic domains. Such results warrant further investigation to understand and capitalize on possible protective factors that could support children's development after maltreatment exposure.

Finally, this investigation also found that some demographic characteristics, including race/ethnicity, sex assigned at birth, and age, predicted later reading skills. Though these findings may indicate differences based on demographic characteristics, they may also signal that children

exposed to maltreatment can be exposed to various child- and context-level factors that impact reading skills. Indeed, evidence suggests that child-level factors such as age and gender and context-level factors such as home placement and caregiver education level can affect cognitive and social/emotional domains in children exposed to maltreatment (Widom, 2014; Yoon et al., 2023). Such findings highlight the holistic impact maltreatment can have on cognition and how reading and language may be differentially affected by child- and context-level factors associated with maltreatment exposure.

Implications for Research

This investigation found that the relationship between language and reading in children exposed to maltreatment is highly complex, such that child- and context-level factors may differentially impact it. Previous investigations have found that findings regarding language and reading needs in children exposed to maltreatment are mixed, possibly as a result of the complexity of the relationship between these domains and child- and context-level factors associated with maltreatment exposure (e.g., home placement, gender; Alvarado et al., 2023; Ferrara et al., 2023). Indeed, the increased complexity of assessing reading in children with maltreatment may mask relationships between maltreatment exposure and reading needs. Given that the relationship between language and reading hasn't been previously examined in children exposed to maltreatment, findings from this study add to the argument that investigating child- and context-level factors associated with this relationship can help elucidate specific pathways in this research. Future investigations may wish to employ more complex statistical modeling techniques to explore how individual differences in child- and context-level factors associated with maltreatment impact language and reading needs in these children.

Implications for Child Welfare and Special Education

Our study found that nearly half of preschool-aged children evidenced oral language problems, suggesting that children exposed to maltreatment have unmet academic needs. Thus, child welfare and special education services can better support children's language and associated reading needs by providing appropriate early assessment and intervention services (Corr & Santos, 2019). Of particular concern is that some language impairments may not be evident upon first contact and can only be recognized through formal language screening assessments (Nation, 2005, 2009; C. M. Selin et al., 2019). However, language screening assessment only occurs in formal care settings or school entry and may not be included in child welfare intake (Stock & Fisher, 2006). Given the developmental importance of early linguistic skills on later reading, early screener assessments, specifically assessing oral language competency, should be administered to children exposed to maltreatment to ensure they receive necessary early intervention services. In addition, screener assessments measuring various language skills should be administered (Hogan et al., 2014). Indeed, this investigation found evidence that auditory comprehension specifically was predictive of later reading ability. Thus, it may be that specific areas of need in language may differentially impact reading. Understanding specific impairments may help child welfare services provide children with more individualized and efficient care.

Child welfare caseworkers may use preliminary screener assessments to flag early language impairments in children exposed to maltreatment (Krier et al., 2018). Early identification of language needs could provide an avenue by which children exposed to maltreatment can access services and increase the likelihood of positive developmental trajectories in language and reading. Considering the lack of connection between early intervention, special education, and child welfare (Corr & Santos, 2019), actions such as these

may jumpstart academic success for children exposed to maltreatment even before the initiation of special education services (Jonson-Reid et al., 2004; Munger et al., 2022).

Limitations and Future Directions

These findings should be considered with some limitations. One limitation of this study was the small sample size of children with complete BDI scores. This sample was selected because they were the only children in the NSCAW-I sample with complete BDI scores. Developmental delay was critical to the investigation to rule out affected cognitive functioning as a possible variable in the relationship between language and reading in this sample. Therefore, although the sample was small, it allowed for confirmation that language outcomes affected reading outcomes irrespective of affected developmental delay, suggesting that cognitive functioning may not impact reading ability. This sample may have been larger had there been more complete BDI measures for more children in this overall sample. Future investigations should attempt to use representative samples of children specifically with cognitive functioning needs to determine if developmental delays in cognitive domains may cause reading needs.

Another limitation related to the first was that some demographic groups, specifically racial/ethnic identities, consisted of small samples. This investigation attempted to align with QuantCrit, which argues that racial background and income cannot be entirely disentangled (D. Jones et al., 2022). QuantCrit methodological approaches typically disaggregate by race/ethnicity and income to highlight minorities' experiences, specifically economic vulnerabilities that may be concealed by dichotomous groupings (Jones et al., 2022). Seeing that the samples were already small when disaggregated by race, this investigation chose not to disaggregate by race/ethnicity and income to affect the sample sizes further. Indeed, disaggregating by race/ethnicity alone may have been sufficient to explain some differences in language and

reading, considering that SES does not always account for differences in races and ethnicities in reading ability (Hahn & Barnett, 2023). Future investigations should attempt sampling that is more proportional to the broader population or those involved in child welfare to better examine the role of race/ethnicity and income to have a more complete picture of the individual effects of maltreatment on language and reading ability in children of color. There is a need to disentangle risk and inherent systemic bias in this system to understand better the needs of these children and how these biases interact with race and ethnicity identities.

A final limitation of this study was that, although these language measures are informative in some ways, there are also updated and improved methods of assessing oral language ability in children since the data collection window of this study. For example, there is evidence that grammar may be a more sensitive measure of language ability than vocabulary (Alvarado et al., 2023). Despite this limitation, the PLS-3 and the K-BIT have been validated alongside other language measures, such as the Peabody Picture Vocabulary Test and the Wechsler Intelligence Scale for Children – Third Edition (Chin et al., 2001; Qi et al., 2003), suggesting that though it is not a perfect measure of language, it is suited for the present study. Future data collection projects should consider using updated measures aligned with current best practices for measuring language development and disorders in children (e.g., Bishop et al., 2016).

Conclusion

Early language needs may inform later reading needs in children exposed to maltreatment. However, this relationship is highly complex and may be easily affected by outside factors that are often unconsidered. To better understand the nuances of this relationship, additional investigations should attempt to unpack individual relationships in the overall

relationship between language and reading in these children. Doing so may inform early identification and intervention for these children to improve reading and language outcomes.

Table 2.1: Child Descriptives

Demographic Characteristics	<i>N</i>	%
Sex assigned at birth		
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
Native American/non-Hispanic	11	4.20
Native American/Hispanic	1	.38
Asian/Hawaiian/Pacific	4	1.53
Islander/non-Hispanic	3	1.15
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	0.76
Other	5	1.90
Missing	14	5.34
Poverty Level		
Above poverty line	114	43.51
Below poverty line	119	45.42
Missing	29	11.17
Substantiated Maltreatment Case		
Substantiated case	150	57.25
Unsubstantiated case	112	42.75
Risk of Cognitive Disability		
No risk (-.98 SD and above)	117	44.66
Risk (-2 to -1 SD)	145	55.34

Table 2.2: 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	17
1. Age in months	41.52	0.26	1																
2. Sex assigned at birth ^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. Native American (non-Hispanic)	–	–	.002	.05	-.06	-.14*	-.04	1											
7. Native American (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. Substantiation	–	–	-.18*	.09	-.06	.00	-.02	-.09	-.16*	-.09	-.05	.03	.09	11					
13. Risk of Cognitive Disability ^a	0.55	0.50	-.02	-.04	.01	.02	-.04	.07	.06	.05	.03	.06	.02	-.09	1				
14. PLS-3 Auditory Comprehension	84.23	18.04	.18**	.17**	-.10	-.17**	-.03	-.02	-.06	.07	-.08	-.12*	.01	-.14*	-.11	1			
15. PLS-3 Expressive Communication	86.32	19.69	.02	.17**	.03	-.12	-.04	.02	-.04	.09	-.09	-.12	-.03	-.08	.63**	-.05	1		
16. K-BIT Vocabulary Subscale	95.57	13.67	-.14	-.13	-.004	-.18*	.01	.01	-.02	.04	-.12	-.20*	.02	-.13	.37**	.34**	-.10	1	
17. W-J LWID	96.85	17.32	.10	.07	-.03	-.19**	-.08	.04	-.11	.19**	-.09	.09	-.10	-.04	.38**	.24**	.41**	-.27**	1
18. W-J PC	90.32	15.12	-.06	.08	-.02	-.22**	-.06	.03	-.13	.17*	-.10	-.07	-.05	-.02	.33**	.25**	.44**	.72**	-.24**

* $p < .05$, ** $p < .01$ ^a Marked correlations are Spearman and all others are Pearson.

Table 2.3: Hierarchical Regression Analysis: Oral Language Skills at Age 3 Predicting Reading

Predictor Variables	Model 1			Model 2		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Block 1: Demographic Characteristics						
Age in months	0.21	0.55	0.04	-0.66	0.53	-0.12
Sex assigned at birth (1 = male, 2 = female)	8.10*	3.65	0.22	2.52	3.48	0.07
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-5.18	6.06	-0.08	-6.37	5.79	-0.11
Black/non-Hispanic	-10.66**	3.86	-0.27	-11.81**	3.68	-0.31
Black/Hispanic	-8.94	11.79	-0.07	2.55	11.26	0.02
Native American/ non-Hispanic	-7.68	10.46	-0.07	-4.64	9.99	-0.05
Native American/ Hispanic	-38.15*	16.82	-0.21	-39.00*	16.06	-0.22
Asian/Hawaiian/Pacific Islander/non-Hispanic	17.25	11.99	0.13	8.65	11.45	0.07
Other/non-Hispanic	-32.42**	12.07	-0.25	-30.68**	11.53	-0.25
Other/Hispanic	2.07	7.18	0.03	-9.83	6.86	-0.14
Below Poverty Line (yes or no)	-4.43	3.37	-0.12	-3.30	3.22	-0.10
Substantiation (1 = yes; 0 = no)	-11.14**	3.96	-0.27	-10.00*	3.78	-0.25
	R^2	0.29		0.27		
	F	3.16***		2.81**		
Block 2: Risk of Cognitive Disability						

BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-5.74	3.27	-0.16	-3.63	3.15	-0.11
R^2		0.32			0.28	
ΔR^2		0.02			0.01	
ΔF		3.09			1.33	
Block 3: Oral language skills at Age 3						
PLS-3 Auditory Comprehension	0.31**	0.10	0.33	0.20	0.11	0.22
PLS-3 Expressive Communication	0.12	0.11	0.12	0.11	0.108	0.114
R^2		0.45			0.36	
ΔR^2		0.14			0.08	
ΔF		10.86** *			5.23**	

Note: Results of hierarchical regression analyses; * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2.4: Hierarchical Regression Analysis: Oral Language Skills at Age 6 Predicting Reading

Predictor Variables	Model 3			Model 4		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Block 1: Demographic Characteristics						
Age in months	0.15	0.93	0.02	-2.10*	0.88	-0.27
Sex assigned at birth (1 = male, 2 = female)	6.48	4.45	0.17	-2.23	4.22	-0.06
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-13.71	8.07	-0.18	-6.89	7.65	-0.10
Black/non-Hispanic	-12.73*	4.94	-0.31	-14.66**	4.69	-0.38
Black/Hispanic	-15.98	17.12	-0.10	2.50	16.23	0.02
Native American/ non-Hispanic	-8.31	10.95	-0.09	2.00	10.39	0.02
Native American/ Hispanic	-41.30*	16.96	-0.26	-40.25*	16.09	-0.26
Asian/Hawaiian/Pacific Islander/non-Hispanic	-5.01	17.06	-0.03	-12.45	16.18	-0.08
Other/non-Hispanic	-33.18**	12.23	-0.29	-29.67*	11.60	-0.27
Other/Hispanic	0.83	7.32	0.01	-10.66	6.94	-0.17
Below Poverty Line (yes or no)	-4.54	4.33	-0.12	-0.04	4.10	-0.001
Substantiation (1 = yes; 0 = no)	-13.41**	4.28	-0.34	-9.38*	4.06	-0.26
	R^2	0.36			0.35	
	F	2.86**			2.73**	
Block 2: Risk of Cognitive Disability						

BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-4.93	3.92	-0.13	-3.54	3.74	-0.10
R^2		0.37			0.36	
ΔR^2		0.02			0.01	
ΔF		1.58			0.90	
Block 3: Oral language skills at Age 6						
K-BIT Vocabulary Subscale	0.47***	0.13	0.38	0.36**	0.13	0.30
R^2		0.48			0.43	
ΔR^2		0.11			0.07	
ΔF		12.42** *			7.20**	

Note: Results of hierarchical regression analyses; * $p < .05$, ** $p < .01$, *** $p < .001$

Table 2.5: Hierarchical Regression Analysis: Oral Language Skills at Ages 3 and 6 Predicting Reading

Predictor Variables	Model 5			Model 6		
	<i>B</i>	<i>SE B</i>	β	<i>B</i>	<i>SE B</i>	β
Block 1: Demographic Characteristics						
Age in months	0.15	0.93	0.02	-2.10*	0.88	-0.27
Sex assigned at birth (1 = male, 2 = female)	6.48	4.45	0.17	-2.23	4.22	-0.06
Race and Ethnicity (white/non-Hispanic as reference)						
White/Hispanic	-13.71	8.07	-0.18	-6.89	7.65	-0.10
Black/non-Hispanic	-12.73*	4.94	-0.31	-14.66**	4.69	-0.38
Black/Hispanic	-15.98	17.12	-0.10	2.50	16.23	0.02
Native American/ non-Hispanic	-8.31	10.95	-0.09	2.00	10.39	0.02
Native American/ Hispanic	-41.30*	16.96	-0.26	-40.25*	16.09	-0.26
Asian/Hawaiian/Pacific Islander/non-Hispanic	-5.01	17.06	-0.03	-12.45	16.18	-0.08
Other/non-Hispanic	-33.18**	12.23	-0.29	-29.67*	11.60	-0.27
Other/Hispanic	0.83	7.32	0.01	-10.66	6.94	-0.17
Below Poverty Line (yes or no)	-4.54	4.33	-0.12	-0.04	4.10	0.00
Substantiation (1 = yes; 0 = no)	-13.41**	4.28	-0.34	-9.38*	4.06	-0.26
R^2		0.36			0.35	
F		2.86**			2.73**	
Block 2: Risk of Cognitive Disability						

BDI Std. Score -2 to -.98 (0 = no risk; 1 = risk)	-4.93	3.92	-0.13	-3.54	3.74	-0.10
R^2		0.37			0.36	
ΔR^2		0.02			0.01	
ΔF		1.58			0.90	
Block 3: Oral language skills at Age 3						
PLS-3 Auditory Comprehension	0.27*	0.13	0.28	0.22	0.13	0.24
PLS-3 Expressive Communication	0.15	0.12	0.15	0.06	0.12	0.07
R^2		0.50			0.42	
ΔR^2		0.13			0.07	
ΔF		7.45***			3.44*	
Block 4: Oral language skills at Age 6						
K-BIT Vocabulary Subscale	0.29	0.15	0.23	0.25	0.15	0.21
R^2		0.53			0.45	
ΔR^2		0.03			0.03	
ΔF		3.81			2.61	

Note: Results of hierarchical regression analyses; * $p < .05$, ** $p < .01$, *** $p < .001$

CHAPTER 3

Parallel Growth Trajectories of Verbal and Nonverbal Intelligence in Children At-Risk for Early Childhood Maltreatment

Abstract

This study aimed to investigate IQ developmental trajectories in a sample of children at risk for maltreatment exposure and to understand how child- and context-level factors (i.e., associated trauma symptoms, home characteristics, substantiation, and demographic characteristics) may predict the likelihood of trajectory membership. Using a parallel growth mixture model, this study identified three verbal and nonverbal IQ trajectories in this sample of children at risk for maltreatment exposure: *high-stable*, *increasing*, and *low-unstable* trajectories of verbal and nonverbal IQ. Over 90% of children in this sample presented with unaffected vIQ and nvIQ (i.e., children classified into the *high-stable* trajectory), indicating possible resiliency in IQ for these children. In addition, nearly 40% of the sample presented with drastic growth in vIQ and nvIQ scores over time (i.e., children classified into the *increasing* class), indicating the opportunity for cognitive catch-up in these children. Finally, 10% of the sample demonstrated lower vIQ and nvIQ trajectories over time, suggesting that some children may demonstrate affected cognitive function. Predictors of profile membership were identified, specifically chronic health problems and cognitive stimulation at home. Findings from this investigation highlight opportunities for child welfare and speak to the importance of early intervention for cognitive needs in some children exposed to maltreatment.

Keywords: maltreatment, verbal intelligence, nonverbal intelligence, development

Introduction

The impact of childhood maltreatment on general cognitive functioning has been well-documented (Young-Southward et al., 2020), with maltreated children showing lower IQ scores relative to non-maltreated community samples (e.g., Crozier & Barth, 2005; Jaffee & Maikovich-Fong, 2011; Masson et al., 2015; Su et al., 2019). Further, these children may present with impairments across other related cognitive abilities, such as executive functioning, working memory, and processing speed (Ainamani et al., 2021; Su et al., 2019b). These associations exhibit a developmental relationship wherein children who experience maltreatment during the sensitive period of early childhood fare worse than those who experience maltreatment at older ages (Cowell et al., 2015; K. Pears & Fisher, 2005). Moreover, when traumatic symptoms accompany maltreatment experiences, cognitive impairments worsen (DeBellis et al., 2009; DeBellis et al., 2013). Given that children's cognitive abilities are important for learning (Esposito & Bauer, 2022) and later academic achievement (Peng & Kievit, 2020), there is a need to understand the developmental trajectory of cognitive abilities due to maltreatment experiences. This inquiry is especially important when attempting to unpack potential mechanisms that may explain why maltreatment results in later academic challenges (e.g., Fantuzzo & Perlman, 2007; Mullins & Panlilio, 2021; Panlilio et al., 2018; Perlman & Fantuzzo, 2010; Ryan et al., 2018) and help inform interventions to support these children and reduce the likelihood of long-term negative outcomes.

According to the Federal Child Abuse Prevention and Treatment Act (CAPTA; 42 U.S.C.A. § 5106g), maltreatment (e.g., child abuse and neglect) is defined as "any recent act or failure to act on the part of a parent or caretaker which results in death, serious physical or emotional harm, sexual abuse or exploitation;" or "an act or failure to act which presents an

imminent risk of serious harm." In 2022, Child Protective Services (CPS) received over 4 million referrals alleging maltreatment that involved 7.5 million children (U.S. Department of Health & Human Services, 2024). Of this total, over 550,000 children were victims of maltreatment, indicating the presence of the highest level of risk given the amount of evidence needed to substantiate the initial allegations. Approximately 44% of substantiated maltreatment victims were five years old and below, indicating that a large proportion of children experienced adverse environments during a sensitive period of development. During sensitive periods of development, young children's physical, socioemotional, and cognitive domains grow rapidly, given experience-driven brain plasticity that facilitates adaptation to the developmental context (K. A. McLaughlin & Gabard-Durnam, 2022a). Unfortunately, deviations from expectable environments during this period due to the absence of expected environmental input (e.g., neglect) or the presence of unexpected environmental input (e.g., abuse) result in neurophysiological changes that alter developmental domains (K. A. McLaughlin, 2016b). Of relevance to the present study is developmental changes in cognitive functioning.

Cognitive Functioning and Maltreatment Exposure

During sensitive periods of development, *experience-expectant* learning processes (i.e., heightened neuroplasticity and sculpting of the brain architecture) rely heavily on expectable environmental inputs such as responsive caregiving, play, or shared reading to promote young children's cognitive development, especially language (K. A. McLaughlin & Gabard-Durnam, 2022a). Cognitive functioning or intellectual ability (hereon referred to as IQ) is a highly stable and increasingly heritable trait across development due to underlying genetic contributions (Tucker-Drob & Briley, 2014). IQ is a general domain composed of subdomains categorized as crystallized and fluid intelligence (Carroll, 1993). These intelligences represent how information

is stored and what information is typically accessed to utilize that intelligence (Flanagan & Dixon, 2007). *Crystallized intelligence* is a person's store of knowledge and is often used as a proxy for assessing language abilities, referred to as verbal intelligence (vIQ), because it is a "store of primarily verbal or language-based knowledge" (Flanagan & Dixon, 2014, p. 373). *Fluid intelligence* is the ability to perform novel mental operations and is often used as a proxy for problem-solving skills referred to as non-verbal intelligence (nvIQ) (Flanagan & Dixon, 2007). Though these domains are independent in childhood, they become increasingly more correlated over time in the general population (van Soelen et al., 2011), with adults relying on both vIQ and nvIQ for memory integration and learning (Esposito & Bauer, 2022).

Although the impact of maltreatment on general cognitive ability has been well-established (Young-Southward et al., 2020), most studies only include a composite IQ score and combine both vIQ and nvIQ, masking the potential differential impact of maltreatment on these subdomains. Indeed, when looked at separately, impaired nonverbal (Nikulina & Widom, 2013) and verbal (A. A. Scarborough et al., 2009; Viezel et al., 2015) reasoning is seen in children exposed to maltreatment, highlighting how different aspects of IQ may be affected by maltreatment exposure. Within the context of poverty, the inclusion of both vIQ and nvIQ in the same analysis showed gaps in both subdomains for low-income students across kindergarten through fifth grade relative to their peers (Kaya et al., 2017). Across disability research, children diagnosed with a specific learning disorder (SLD), or autism spectrum disorder (ASD) often score lower on vIQ relative to nvIQ (Cornoldi et al., 2019; Faerman et al., 2023). Both subdomains of IQ have been shown to improve over time across early school age (Alghamdi et al., 2021) and adolescence (Ramsden et al., 2011) in non-maltreated populations.

Furthermore, there is evidence that vIQ is responsive to intervention and could be

increased to the same levels as nvIQ by school age for children after cochlear implantation (Fei et al., 2022). Taken together, there is a need to further explicate the interrelatedness of vIQ and nvIQ because of maltreatment. It may be that the relationship between these may explain cascading effects on children's overall cognitive functioning (Masten & Cicchetti, 2010), therefore signaling potential heterogeneity in cognitive development.

Possible Heterogeneity in IQ Trajectory for Children Exposed to Maltreatment

Although cognitive delays in children exposed to maltreatment are considered stable over time (Enlow et al., 2012; Matte-Landry et al., 2023), evidence of differential effects on vIQ and nvIQ may indicate a need to examine possible differences in growth across these subdomains of IQ. In addition, the timing of maltreatment during developmental periods appears to be particularly important to the relationship between maltreatment exposure and IQ. As outlined earlier, children exposed to maltreatment during the first two years of development exhibit lower scores on cognitive assessments compared to children exposed to maltreatment during preschool (Enlow et al., 2012). Cognitive needs in these children also continue into later life. Adults exposed to childhood maltreatment report severe cognitive dysfunction, leading to difficulties leaving home for work or recreation due to memory lapses and confusion (M. J. Brown et al., 2022). Such findings highlight the longevity of impaired cognitive functioning and the long-term degradation of these skills after maltreatment exposure and into later life.

Given the enduring negative effects of maltreatment, it is therefore important to understand the longitudinal development of both vIQ and nvIQ, especially to understand potential heterogeneity in growth. Despite the long-term outcomes of decreased IQ in children exposed to maltreatment, there is a lack of longitudinal studies on cognitive development in these children (Jackson, 2023; Struck et al., 2021). This is perhaps due to an assumption that IQ

will remain stable over time as in the general population (Hoekstra et al., 2007; van Soelen et al., 2011). Indeed, previous research investigating IQ over time has assessed the between-person impact of maltreatment timing on cognitive functioning but not within-person variation in IQ over time in children exposed to maltreatment (Matte-Landry et al., 2023). Further, though previous research has found that IQ may be stable in these children (Enlow et al., 2012), individual variation or heterogeneity may have masked some proportion of participants with an increasing or decreasing IQ growth trajectory—a known limitation with variable-centered modeling (Muthén & Muthén, 2000). Thus, the absence of heterogeneity in IQ findings among children exposed to maltreatment may be attributed to the assumption that only one stable IQ trajectory exists instead of multiple trajectory types within a given sample, underscoring the importance of individual differences in development for these children. Moreover, given the conceptualization of IQ as consisting of vIQ and nvIQ subdomains, it is necessary to model and understand how each growth parameter for one may potentially influence the growth parameters for the other.

In addition, despite evidence that maltreatment correlates with IQ in school-age through adulthood, less is known about the early childhood entry point to the developmental trajectory. For example, in a meta-analysis, only 16 of 72 studies included children ages zero to five years, yet the zero-to-five age group had the largest between-group effect size relative to older children and adults (Masson et al., 2015). These findings highlight the need to investigate IQ trajectories, specifically in younger children, to understand the impact of early maltreatment exposure better. Though there may be an impact on IQ, it is yet unclear how vIQ and nvIQ separate and are differentially affected by maltreatment. Given the importance of early intervention and the responsiveness of vIQ to intervention, it is therefore important to further understand progression

across developmental periods to inform optimal intervention timing.

Finally, more needs to be understood about how child- and context-level factors associated with maltreatment exposure may impact IQ trajectories in vIQ and nvIQ. For example, children exposed to maltreatment may develop protective or resiliency factors for domains such as psychopathy (Su et al., 2019b), suggesting that these children may present with resiliency in other cognitive domains, such as IQ. Indeed, there is evidence that once children are in safe environments, they demonstrate “cognitive catch-up” to their non-maltreated peers (Young-Southward et al., 2020, p. 13). However, these children may be exposed to additional factors, such as additional adverse childhood experiences (ACEs) (K. A. McLaughlin, 2016b) or stress exposure (Masson et al., 2015), which may result in negative cascades over time (Masten & Cicchetti, 2010). Understanding antecedents for positive and negative developmental cascades in IQ can help inform which factors may support IQ development and children with IQ delays that require appropriate identification and intervention.

Factors That May Impact IQ Trajectories in Children Exposed to Maltreatment

There are a variety of child- and context-level factors that may impact IQ trajectories in children exposed to maltreatment. Children at risk for maltreatment exposure present with chronic health problems (Helton & House, 2019), which have been linked to affected IQ functioning in children (Hardy et al., 2017). Chronic health problems can cause children to have to stay home from early childhood care (Purtell & Ansari, 2022), which may have negative effects on certain IQ skills, such as executive functioning (Ehrlich et al., 2018; Fuhs et al., 2018) as well as overall IQ development. Finally, some evidence suggests that demographic characteristics, such as SES, (Fisher & Widom, 2021) are related to IQ for children at risk for maltreatment exposure. However, recent research indicates that demographic characteristics may

not influence cognitive outcomes in adults exposed to child maltreatment (Zhang et al., 2023). Thus, it is yet unclear whether demographic characteristics may impact IQ trajectories in children exposed to maltreatment. Overall, it has not been empirically tested whether these child-level factors are related to IQ development in children at risk for maltreatment exposure.

There are also a variety of context-level factors that may impact IQ development in children exposed to maltreatment. The environment in which the child develops may affect the relationship between IQ and maltreatment exposure. Indeed, children exposed to maltreatment are also at risk of being exposed to comorbid ACEs, such as violence at home or in their neighborhoods, and can increase the risk for cognitive impairments later in life (Zhang et al., 2023). In addition, some evidence suggests the home environment, specifically the emotional support children receive in the home, mediates the relationship between adversity factors and cognitive domains (e.g., poverty impacting executive functioning) (Hackman et al., 2015). Other cognitive skills are also known to be affected by the home environment. For example, home environment characteristics can predict children's linguistic outcomes, such as the quality of mother-child interactions (Eigsti & Cicchetti, 2004) or receipt of responsive care (Su et al., 2019b), highlighting the overall impact the environment can have on cognitive development. A final context-level factor that may impact the relationship between IQ and maltreatment is whether CPS substantiated maltreatment exposure. Previous investigations have found that children with substantiated and unsubstantiated cases of maltreatment score similarly on IQ and other cognitive functioning assessments (A. A. Scarborough et al., 2009). The argument has been that long-term consequences of maltreatment persist regardless of substantiation status, indicating that even if evidence of victimization was not found, involvement with CPS, in general, is still associated with academic challenges (Panlilio et al., 2018; Stone, 2007).

However, more recent research has found that children with different substantiation statuses may differ in domains such as internalizing behaviors (Kugler et al., 2019), suggesting there may be more to investigate about this factor.

The Current Study

This study aimed to understand patterns in vIQ and nvIQ developmental trajectories over time to determine whether there were varied IQ trajectories in a sample of children at risk for maltreatment exposure, including children with both substantiated and unsubstantiated cases. This study also sought to understand how child- and context-level factors (i.e., associated trauma symptoms, home characteristics, substantiation, and demographic characteristics) may predict the likelihood of trajectory membership. The following research questions guide this investigation:

1. To what extent do vIQ and nvIQ growth parameters modeled together indicate heterogeneity in cognitive developmental trajectories of children at risk for maltreatment?
2. To what extent do child- and context-level factors predict membership in specific developmental trajectory classes?

Method

Procedure and Participants

The current study used the first cohort of the National Survey of Child and Adolescent Well-Being study (NSCAW-I; 2008) to assess the long-term outcomes of a nationally representative sample of child welfare-involved children. The complete NSCAW sample consisted of children and families with Child Protective Services (CPS) investigations for maltreatment between October 1999 and December 2000 ($n = 5,501$). The current study included

longitudinal data from Waves 1 (2-6 months after investigation close), 3 (18 months after close), and 4 (36 months after close) from both substantiated and unsubstantiated cases.

All children were investigated by CPS for exposure to maltreatment before age 3 ($n = 793$). Children around ages three at Wave 1 ($M = 3.96 (.81)$), five at Wave 3 ($M = 5.25 (.94)$), and seven at Wave 4 ($M = 6.56 (.95)$). This sample included children with and without substantiated maltreatment cases.

Measures

Intelligence

Intelligence (i.e., vIQ and nvIQ) was measured using the subtests of the Kaufman Brief Intelligence Test (K-BIT; Bain & Jaspers, 2010; Kaufman & Kaufman, 1990). vIQ was assessed using the vocabulary subscale, which measured expressive vocabulary and vocabulary definition knowledge (NSCAW Appendix III). nvIQ was evaluated using the matrices subscale, which measured the ability to perceive relationships using a pattern completion task (NSCAW Appendix III).

Home Characteristics

The Home Observation for Measurement of the Environment (HOME) assessed the home environment's engagement and support quality and quantity (Bradley et al., 1988; NSCAW Appendix III). This assessment included information about the home environment and the mother's behavior towards the child (NSCAW Appendix III).

Daily Living Skills

The Vineland Adaptive Behavior Scale (VABS; Sparrow et al., 1984) Daily Living Skills subscale, was administered at Wave 1 at which measured personal (e.g., how the child eats, dresses, and performs personal hygiene), household (household tasks the child performs), and

interpersonal skills (how the child spends his or her time, and telephone skills) (Helton & House, 2019). VABS items differed based on the participant's age at the time of assessment, but all assessed daily living skills relative to age-appropriate expectations resulting in a standard score.

Substantiation

Substantiation of maltreatment exposure was measured as a dichotomous yes/no variable. NSCAW computed the variable based on CPS records included for each child at Wave 1 (NSCAW Appendix III).

Demographic Variables.

Gender, race, and ethnicity measured at Wave 1 were included as demographic variables. Participants identified as either male (1) or female (2); the survey did not include additional gender options (e.g., nonbinary, trans). Participant's parents or guardians reported their race (i.e., White, Black, Native American, Asian/Hawaiian/Pacific Islander, or Other) and ethnicity (i.e., Hispanic or non-Hispanic) (NSCAW; 2008b). Race remained disaggregated regardless of sample size to adhere to a Quantitative Critical (QuantCrit) approach (Gillborn et al., 2018), which argues that quantitative data is socially constructed and disaggregating between races can improve interpretation and generalizability of results (Garcia et al., 2018; Jones et al., 2022). Chronic health problems were measured by a caregiver or caseworker, who reported whether the participant had ever had a diagnosed chronic illness (NSCAW Appendix III).

Analytic Plan

We employed parallel process growth mixture modeling to investigate whether unique vIQ and nvIQ trajectory profiles exist in a sample of children at ages three, five, and seven children exposed to abuse and neglect. Parallel process growth models allow for the simultaneous examination of growth parameters for concurrent processes. The intercepts and

slopes for vIQ and nvIQ were modeled simultaneously to model the relationship between vIQ and nvIQ (L. K. Muthén & Muthén, 2017; Willett & Sayer, 1996). Fit and adequacy of the unconditional models were assessed using the Vuong-Lo-Mendell-Rubin Likelihood Ratio Test (VLMR-LRT), to determine whether there are a sufficient number of trajectories to explain the data, sample size-adjusted Bayesian Information Criterion (adjusted BIC), where smaller values indicate better model fit, and entropy where values above .80 indicate better classification and adequate class/profile separation (Grimm & Ram, 2009; Nylund et al., 2007). The second analysis stage estimated the conditional model, which included the auxiliary variables outlined above. These auxiliary variables were included in the model to understand the extent to which they predicted profile membership. Odds ratios were reported, indicating odds of belonging to specific profiles relative to a reference profile, given the relative strength of each auxiliary variable predictor.

Results

Descriptive Findings

See Table 3.1 for sample demographics. Children in this sample scored relatively high on vIQ scores, compared to the standard score of 100, over time (Wave 1: 91.84 (13.80); Wave 3: 92.54 (15.12); Wave 3: 93.61 (14.84)). Children in this sample presented with even higher nvIQ scores over time (Wave 1: 95.34 (17.88); Wave 3: 98.84 (16.48); Wave 3: 98.40 (13.72)). Children's overall HOME scores were low, with an average of just over ten and an eight out of a score of 30 for both cognitive stimulation and emotional support (CS: 10.67 (2.31); ES: 8.57 (2.27)).

See Table 3.2 for correlations between all variables. All IQ scores (verbal and nonverbal) were positively correlated with one another IQ scores at all time points (r range = 0.31-0.79, $p <$

.01). HOME cognitive stimulation was positively correlated with vIQ and nvIQ at all time points (r range = 0.7-0.23, $p < .05$). HOME emotional support was also positively correlated with vIQ and nvIQ at Wave 3. Daily living skills were positively correlated with all vIQ and nvIQ scores at all time points (r range = 0.12-0.16, $p < .01$). Substantiation was positively correlated with nvIQ scores at Wave 4 ($r = .09$, $p < .05$).

Verbal and Nonverbal IQ Trajectories: Unconditional Models

A three-trajectory model was selected based on the best-fitting model (see Figure 3.3) the three class model met elbow criteria VLMR-LRT, in that the VLMP-LRT was significant for a three class model (VLMR-LRT = 36.84, $p < .001$) while the four class was not (VLMR-LRT = 34.79, $p = .04$), and that increasing to four classes made little difference to the adjusted BIC (adjusted BIC 3-trajectory model = 28550.09 versus. 4-trajectory model = 28532.81). Finally, there was minimal difference between the entropy of a three (.93) and four-trajectory (.94) model. Thus, considering these indicators alongside theoretical interpretations of the data, a three-profile model was a better fit.

Class 1 (*high-stable* class) included children with average vIQ and nvIQ scores across timepoints and represented the largest proportion of the sample ($n = 741$ (.93)). Class 2 (*low-unstable* class) included children with scores up to two SD below the standard score on vIQ and over two SDs below the mean on nvIQ scores at timepoint one, slightly higher scores at timepoint two, leveling off to lower scores at least two SD below the standard score at timepoint three for both vIQ and nvIQ ($n = 8$ (.01)). This class represented very few students. Indeed, only 1.2% of children in this sample were in the low-unstable class. Class 3 (*increasing* class) included children who scored over one SD below the standard score on vIQ at the first time point, increased their scores at the second time point, and ended up with scores no lower than

one SD below the standard score at timepoint 3 ($n = 44$ (.06)). This finding was replicated though with greater magnitude for nvIQ score for this class. Students' nvIQ scored over two SDs below the standard score at timepoint one. These scores increased to only two SD below the mean at timepoint three and up to less than one SD below the mean at timepoint three.

Predictors of Trajectory Membership: Conditional Models

Table 3.4 contains trajectory-specific means for the study covariates. See Table 3.5 for odds ratios. Children with diagnosed chronic health problems were less likely to belong to the *low-stable* class ($OR = .11$; $CI: 0.01, 1.00$) than the *high-stable* class. Children who experienced higher cognitive stimulation at home had a lower likelihood of belonging to the *increasing class* relative to the *high-stable class* ($OR = .77$; $CI: 0.61, 0.96$). No other covariate predicted trajectory membership. See Figures 3.2 and 3.3 for odds ratio comparison.

Descriptive Information About Profiles

Table 3.6 details the demographic characteristics by profile. Notable descriptive differences between the sex assigned at birth and maltreatment types varied across trajectories. Regarding sex assigned at birth, the *low-unstable* trajectories included most male children (88%), whereas the *high-stable* and *increasing* trajectories included 51% and 59% of males, respectively. Regarding maltreatment type, only three maltreatment types were recorded for the *low-unstable* trajectory (i.e., physical maltreatment, physical neglect, and supervisory neglect), contrary to the *high-stable* and *increasing* trajectories, which included children who reported more types of maltreatment overall.

Discussion

The present study investigated vIQ and nvIQ trajectories in children at risk of maltreatment exposure and attempted to identify possible child- and context-level factors that

indicated trajectory membership. This investigation identified three vIQ and nvIQ trajectories: *high-stable, increasing, and low-unstable*. Overall, these findings suggest that there is heterogeneity in IQ development in these children and that such domains may not be stable in all children at risk for maltreatment exposure.

Heterogeneity in Verbal and Nonverbal IQ Trajectories

High-Stable Trajectory

Children in the *high-stable* trajectory presented with vIQ and nvIQ scores consistent with the general population (Hoekstra et al., 2007) throughout development and included the largest proportion of participants (93%). This finding is particularly encouraging, considering that children at risk for maltreatment exposure exposed to maltreatment are often reported as having lower scores on IQ assessments (e.g, Matte-Landry et al., 2023). Indeed, this study is aligned with recent evidence that children exposed to maltreatment demonstrate “multi-domain resilience” in language, social skills, and emotion regulation (Yoon et al., 2023, p. 718), highlighting the potential for resiliency in other cognitive domains. Evidence also suggests that certain brains, such as the hippocampus and associated HPA axis, may also be resilient to child maltreatment exposure (Ioannidis et al., 2020), further emphasizing the potential for IQ resilience.

These findings may be the result of various protective factors (Ioannidis et al., 2020). One protective factor that was identified in this investigation was cognitive stimulation, or the “availability of enriching environmental inputs that facilitate learning opportunities for children” (Rakesh et al., 2024) in the home. When children engage in cognitively stimulating activities, they often interact with an adult who can foster attention development and scaffold learning opportunities” (Rakesh et al., 2024). Unfortunately, less cognitive stimulation at home—

characterized by fewer opportunities for learning, less enriching learning experiences, and lower caregiver-involvement in learning—especially early in development can, impact long term cognitive development. Such lack of exposure can have lasting consequences for neural development and later academic achievement (Rakesh et al., 2024). Considering that children were more likely to belong to the *high-stable* trajectory if they had higher cognitive stimulation at home compared to the *increasing* trajectory, improving cognitive stimulation opportunities at home may help support vIQ and nvIQ development over time.

An interesting finding is that children in the *high-stable* trajectory were more likely to present with chronic health problems, such as asthma, life-threatening allergic reactions, or vision or hearing loss that corrective eyewear cannot correct. It may be that through CPS investigation and the Child Abuse Prevention and Treatment Act ([CAPTA] 2003 reauthorization and Individuals with Disabilities Education Improvement Act [IDEA] of 2004) infants and toddlers potential physical or cognitive developmental needs are referred to early intervention programs. Children may be eligible for Part C if a physical or cognitive developmental delay or disability or if the child may be at risk for delay or disability (Casanueva et al., 2008). In practice, children exposed to maltreatment with observable impairments, such as physical impairments are more likely to be identified for additional services (Lambros et al., 2010; Malmgren & Meisel, 2004) and may then be identified for areas of potential cognitive intervention as well. Thus, it may be that children with chronic health problems score average in the average range in vIQ and nvIQ over time because they received identification for physical health needs early on.

Increasing Trajectory

Children classified into the *increasing* trajectory demonstrated increasing vIQ and nvIQ

scores throughout development. These findings are also noteworthy because children in the *increasing* trajectory demonstrated increasing scores across all three-time points at a steeper rate of increase for nvIQ, suggesting that their IQ growth progressed faster than their peers.

Considering this rapid growth occurred after CPS investigation, such recovery may be evidence that once children are in safer environments, such as living conditions after CPS investigation, they may demonstrate cognitive recovery, such that their scores are in the expected range (Young-Southward et al., 2020).

Children classified into the *increasing* trajectory were less likely to live in cognitively stimulating home compared to children in the *high-stable* class. This is aligned with previous research suggesting that children exposed to maltreatment living in more cognitively stimulating have improved IQ outcomes (Yoon et al., 2023). Indeed, improved living conditions after maltreatment exposure may allow for recovery (Chamberland et al., 2015) either from the long-term impact of stress or the short-term suppression of IQ due to environment-related distress (Koenen et al., 2003). Thus, these children may present with rapidly improving IQ skills due to cognitively stimulating environments.

Low-Unstable Trajectory

Children classified into the *low-unstable* trajectory scored lower on vIQ and nvIQ throughout development. Though these children demonstrated slightly improved scores between ages three and five, they decreased again from five to seven. These findings support previous research that has found that children exposed to maltreatment present with affected cognitive functioning (Su et al., 2019b). Indeed, children in this trajectory demonstrated affected verbal (A. Scarborough et al., 2009; Viezel et al., 2015) and nonverbal (Nikulina & Widom, 2013) IQ in line with previous samples. However, only 1% of the sample included children classified into

this trajectory. These findings are encouraging and suggest that though some children at risk for maltreatment exposure may have affected IQ, many others do not.

Children in the *low-unstable* class were less likely to have chronic health problems compared with children in the *high-stable* class. Unfortunately, because identifying children for services can be so challenging, investigations often rely on observable signs of need (e.g., physical impairments, behavior outbursts, or observable cognitive delays) to categorize students (Lambros et al., 2010; Malmgren & Meisel, 2004). Therefore, though children exposed to maltreatment with observable impairments are more likely to receive services (Lambros et al., 2010; Malmgren & Meisel, 2004) children with less obvious symptoms of disability (Vig & Kaminer, 2002) are less likely to receive services. Thus, children in the *low-unstable* trajectory may have not presented with obvious IQ needs, resulting in undiagnosed or supported IQ development over time.

Implications

These findings have implications for child welfare. Child welfare may wish to consider how resources are spent on cognitive intervention for children after investigation. CPS-involved children may benefit from a trauma-informed multitiered system of support (MTSS) framework (Chafouleas et al., 2016), a universal prevention approach to identify children investigated by CPS who may be at increased risk for cognitive developmental needs and those at decreased risk. Indeed, some children may benefit drastically from CPS involvement to support IQ development (i.e., children in the *increasing* and *low-unstable* trajectories), while others may already present with resilient IQ skills (i.e., children in the *high-stable* trajectory). Thus, resources within CPS can be more appropriately distributed, understanding that not all children will require IQ intervention after the CPS investigation. In addition, child welfare may consider providing

intervention to help parents improve their emotional support at home. Indeed, some evidence suggests that parents may benefit from interventions, such as home visits, that specifically include opportunities to learn more about emotional support (Casillas et al., 2016; Shenk et al., 2017; Van Der Put et al., 2018). Thus, including such options as part of an MTSS framework may offer opportunities for parents to learn how to provide emotional support to their children (Van Der Put et al., 2018) and provide opportunities for IQ intervention through emotional support. Finally, findings from this study highlight the importance of early intervention for cognitive needs in some children at risk for maltreatment exposure. Child welfare may wish to begin conversing with early childhood education (ECE) centers. Indeed, these findings suggest that some children at risk for maltreatment exposure may require IQ intervention. Children at risk for maltreatment who received ECE demonstrated improved cognitive outcomes (Romano et al., 2015; Sattler, 2023). Though collaboration between ECEs and child welfare has been complex (Corr et al., 2019), it may be beneficial for child welfare to collaborate with ECE teachers and staff to support the cognitive development of children at risk for maltreatment exposure (Toros et al., 2021).

Limitations and Future Directions

There are some limitations to this investigation as an exploratory study. First, only eight children were classified into the *low-stable* class. Though this trajectory size surpassed the recommended one percent of the sample can be considered (Jung & Wickrama, 2008), this is a very small class. The three trajectory models were used for this investigation because of the strong model fit and the theoretical interpretation of this data, understanding that this was an exploratory study. However, because of the small sample size, generalization is not recommended. Future investigations should use larger, representative samples of children at risk

for maltreatment exposure to confirm three IQ trajectories.

A second limitation of this study is that cognitive functioning was measured using a single assessment. Though the KBIT has been widely used as a proxy for cognitive functioning (Canivez et al., 2005; Prewett, 1992, 1995) and can provide helpful information about IQ functioning in children, it is mainly meant as a screener assessment (Bain & Jaspers, 2010). As an exploratory study, this investigation offered insight into these children's possible IQ trajectories. However, using multiple IQ measures besides the KBIT may provide more clarity overall (Bain & Jaspers, 2010). Future investigations should consider using several IQ assessments to compare to one another so as not to assume cognitive functioning from a single measure.

Finally, this investigation found that few child- and context-level factors predicted trajectory membership. However, this could be because of issues with measurement in the NSCAW data set. NSCAW data is incomplete as a national survey, making finding measurable differences between groups difficult. This investigation utilized data as an exploratory analysis investigating trends in children exposed to maltreatment. Future data collection projects may want to consider how to address missingness in the future. Although this investigation found few child- or context-level factors that impacted class membership, finding such differences can help identify children exposed to maltreatment in need of IQ support. Thus, future research may delve further into the cognitive abilities of children exposed to maltreatment to better understand what child, family, or environmental characteristics lead to class membership amongst these children.

Conclusion

In conclusion, the presence of three distinct trajectories, *high-stable*, *increasing*, and *low-unstable* trajectories, sheds light on the heterogeneity of IQ development in children at risk for

maltreatment, challenging the assumption of stability found in general population samples. The study also identified child- and context-level factors that influenced trajectory membership, highlighting the complex interplay between environmental influences and cognitive development. Notably, the results suggest potential opportunities for intervention and support for children at risk for maltreatment exposure. Future research should delve further into the cognitive abilities of children exposed to maltreatment to understand better the factors influencing their cognitive development. These efforts are crucial for informing effective interventions and support systems for this vulnerable population.

Table 3.1: Sample Descriptive Frequencies

Variable	<i>n</i>	%
Child Sex Assigned at Birth		
Male	415	52.3
Female	378	47.7
Substantiated Indicator		
No	268	33.8
Yes	362	45.6
Missing	163	20.6
Race/Hispanicity		
Black/non-Hispanic	225	28.4
White/non-Hispanic	372	46.9
Hispanic	143	18.0
Other	52	6.6
Missing	1	0.1
Child Type of Abuse/neglect		
Physical Maltreatment	185	23.3
Sexual Maltreatment	100	12.6
Emotional Maltreatment	43	5.4
Physical Neglect	153	19.3
Supervisory Neglect	199	25.1
Abandonment	17	2.1
Moral/Legal Maltreatment	8	1
Educational Maltreatment	4	0.5
Exploitation	3	0.4
Other	20	2.5

Missing	61	7.7
Chronic Health Problems		
Yes	213	26.9
No	577	72.8
Missing	3	0.4

Table 3.2: Correlations Between Main Study Variables (n = 793)

Study Variables	1	2	3	4	5	6	7	8	9	10
1. Sex assigned at birth ^a	1									
2. Substantiation ^a	0.09*	1								
3. Chronic health problems ^a	0.08*	-0.07	1							
4. HOME cognitive stimulation	0.00	-0.09*	0.03	1						
5. HOME emotional support	0.02	-0.10*	0.02	0.30**	1					
6. KBIT vIQ at Wave 1	-0.01	-0.03	0.01	0.23**	0.09	1				
7. KBIT nvIQ at Wave 1	0.01	-0.10	0.04	0.15**	0.05	0.42**	1			
8. KBIT vIQ at Wave 3	-0.04	0.01	0.00	0.21**	0.09*	0.75**	0.38**	1		
9. KBIT nvIQ at Wave 3	0.07	0.09*	0.04	0.11**	0.08*	0.32**	0.27**	0.39**	1	
10. KBIT vIQ at Wave 4	-0.06	-0.01	0.02	0.21**	0.07	0.74**	0.32**	0.76**	.31**	1
11. KBIT vIQ at Wave 4	-0.01	-0.02	0.04	0.10**	0.03	0.40**	0.32**	0.36**	.39**	.47**

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

^aMarked correlations are Spearman and all others are Pearson.

Table 3.3: Summary of Fit Statistics of Latent Profile Models

Model	Adjusted BIC	VLMR- LRT	<i>p</i>	Entropy
2-Class	28569.44	120.28	<.001	0.91
3-Class Model	28550.09	36.84	<.001	0.93
4-Class Model	28532.81	34.79	.14	0.94

□

Table 3.4: Descriptive Statistics of Covariates, vIQ, and nvIQ Score Based on Three-Trajectory Model

Measure	<i>High-Stable</i> (<i>n</i> = 741)		<i>Increasing</i> (<i>n</i> = 44)		<i>Low-Unstable</i> (<i>n</i> = 8)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
KBIT vIQ at Wave 1	93.01	13.17	77.29	12.23	65.25	7.14
KBIT nvIQ at Wave 1	98.63	13.02	48.14	9.11	51.75	20.86
KBIT vIQ at Wave 3	93.43	14.38	80.85	18.78	70.14	21.11
KBIT nvIQ at Wave 3	100.87	13.58	71.31	25.19	56.71	19.75
KBIT vIQ at Wave 4	94.39	14.22	85.09	17.56	66.71	18.38
KBIT nvIQ at Wave 4	99.45	12.21	90.25	16.45	44.71	7.52
Covariates						
HOME cognitive stimulation	8.62	2.23	7.48	2.77	9.25	1.17
HOME emotional support	10.72	2.26	9.82	2.82	10.63	2.83

Table 3.5: Odds of Being in Profile; High-Stable Reference Class

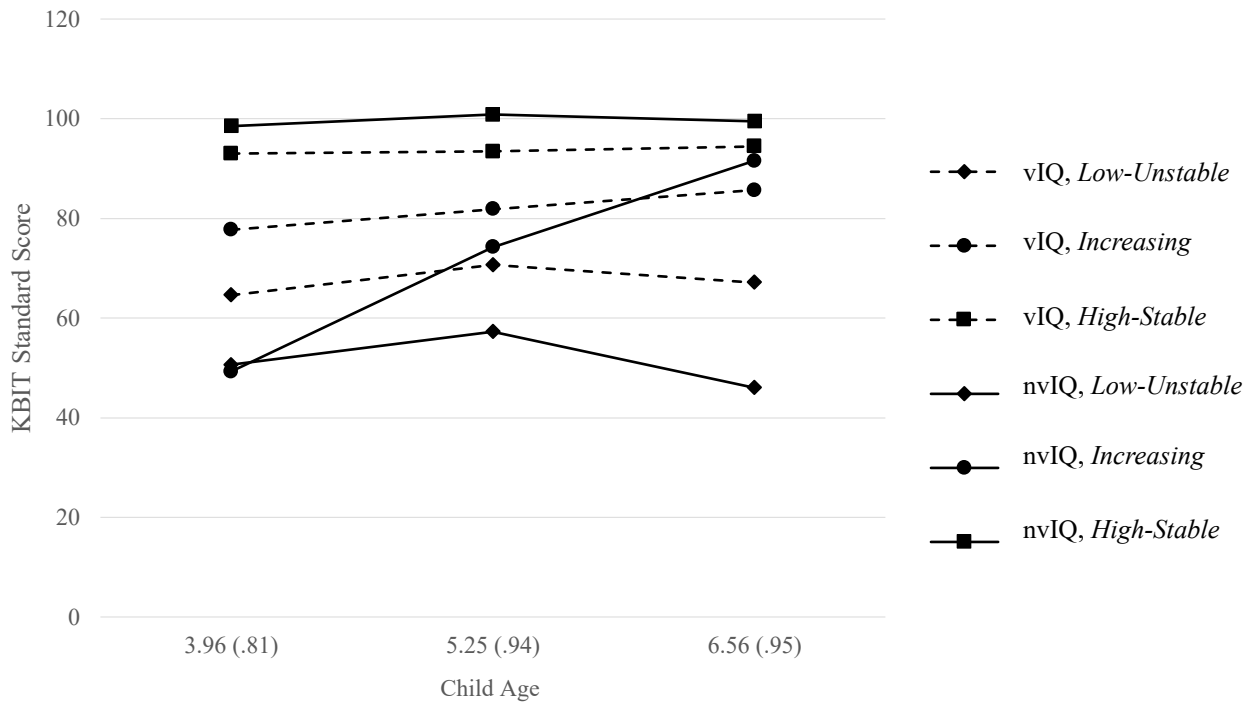
Variable	<i>Increasing</i>		<i>Low-Unstable</i>	
	<i>OR</i>	<i>p</i>	<i>OR</i>	<i>p</i>
Sex Assigned at Birth	0.88	0.84	0.37	0.61
Substantiation	2.28	0.35	0.27	0.5
Chronic Health Problems	2.97	0.39	0.11	0.05
HOME: Cognitive Simulation	0.77	0.02	1.25	0.48
HOME: Emotional Support	1.01	0.93	0.83	0.46

Table 3.6: Descriptive Frequencies of Child- and Context-Level Factors in a Three-Profile Model

Variable	<i>High-Stable</i> (<i>n</i> = 741)		<i>Increasing</i> (<i>n</i> = 44)		<i>Low-Unstable</i> (<i>n</i> = 8)	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Child Sex Assigned at Birth						
Male	382	51.6	26	59.1	7	87.5
Female	359	48.4	18	40.9	1	12.5
Substantiated Indicator						
No	254	34.3	10	22.7	4	50
Yes	338	45.6	22	50	2	25
Missing	149	20.1	12	27.3	2	25
Race/Hispanicity						
Black/non-Hispanic	206	27.8	16	36.4	3	37.5
White/non-Hispanic	350	47.2	19	43.2	3	37.5
Hispanic	137	18.5	4	9.1	2	25
Other	47	6.3	5	11.4	0	0
Missing	1	0.1				
Child Type of Abuse/neglect						
Physical Maltreatment	172	23.2	11	25	2	25
Sexual Maltreatment	96	13	4	9.1	0	0
Emotional Maltreatment	38	5.1	5	11.4	0	0
Physical Neglect	144	19.4	5	11.4	4	50
Supervisory Neglect	184	24.8	13	29.5	2	25
Abandonment	16	2.2	1	2.3	0	0
Moral/Legal Maltreatment	8	1.1	1	2.3	0	0

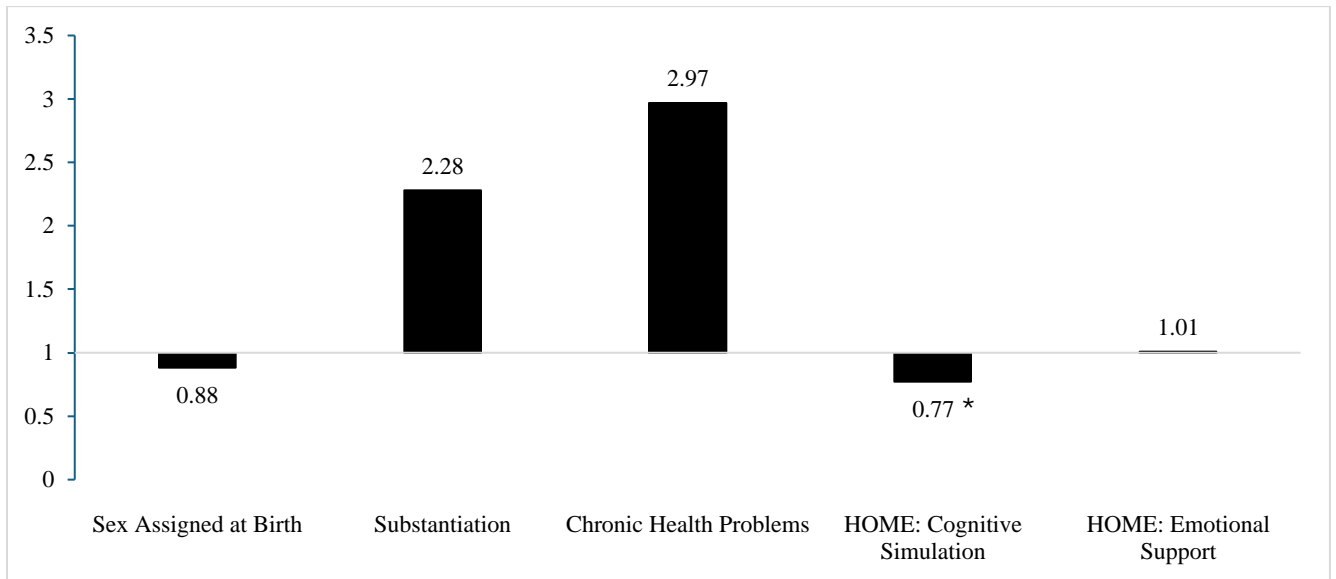
Educational						
Maltreatment	4	0.5	4	9.1	0	0
Exploitation	3	0.4	11	25	0	0
Other	19	2.6	4	9.1	0	0
Missing	57	7.7	5	11.4		
Child Chronic Health						
Problems						
Yes	196	26.5	12	27.3	5	62.5
No	543	73.3	31	70.5	3	37.5
Missing	2	0.3	1	2.3		

Figure 3.1: Three Trajectories of vIQ And nvIQ in Children At Risk for Maltreatment Exposure



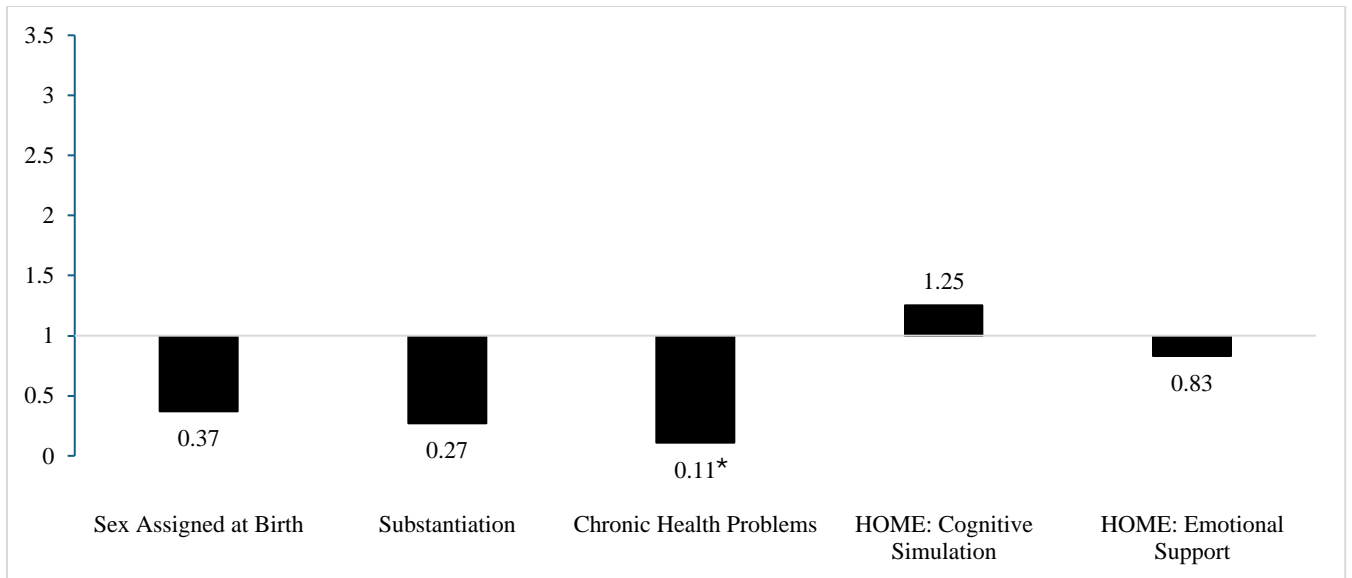
Note. Latent trajectory classes for verbal and non-verbal IQ across ages 4, 5, and 7 in Waves 1, 3, and 4, respectively.

Figure 3.2 Odds of Being In the Increasing Trajectory Compared To The High-Stable Trajectory



Note: Values correspond to odds ratios for each child- and context-level factor included as covariates. * $p < .05$

Figure 3.3 Odds of Being in The Low-Unstable Trajectory Compared To The High-Stable Trajectory



Note: Values correspond to odds ratios for each child- and context-level factor included as covariates. * $p < .05$

CHAPTER 4

Maltreatment and Heterogeneity in Early Language Delays and Later Reading: Using a Person-Centered Approach to Understand Profiles of Reading and Language Needs

Abstract

This investigation aims to understand how early language skills are related to later reading developmental patterns in children involved with Child Protective Services (CPS) and child- and context-level factors pertaining to these needs. Latent Profile Analysis (LPA) was employed to explore heterogeneity in language and reading profiles in a sample of children in the National Survey of Child and Adolescent Well-Being I. Results indicated three profiles of early language and later reading abilities (i.e., resilient, expected, and at-risk). Almost 40% of the sample presented with unaffected early language and later reading skills (i.e., *expected* profile). In addition, over 50% of the sample scored lower on early language assessments but demonstrated unaffected reading skills later on. These encouraging findings suggest that some children may present with resiliency in reading skills later. Unfortunately, nearly 10% of the sample had affected early language and reading abilities (i.e., *at-risk* profile), indicating that some children may present with language and reading needs. Understanding the child and context-level factors most associated with each profile can support trauma-informed education and help identify children at risk more accurately and efficiently.

Introduction

Children exposed to (or at risk for) maltreatment, which includes real or perceived threats of physical, emotional, or psychological abuse (Gee, 2020), often struggle academically (Hunter et al., 2021) as evidenced by lower grades (Slade & Wissow, 2007) and lower scores on standardized reading assessments (Crozier & Barth, 2005; Hong et al., 2018; Ryan et al., 2018). These long-term consequences of maltreatment persist regardless of substantiation status, indicating that even if evidence of victimization was not found, involvement with Child Protective Services (CPS) in general is still associated with academic challenges (Panlilio et al., 2018; Stone, 2007). For children with disabilities, in particular, academic risk factors appear to increase, given the potential bidirectional influence between maltreatment and disability (Panlilio & Corr, 2020). Indeed, studies have shown that children with disabilities are more likely to experience maltreatment relative to peers (L. Jones et al., 2012; Sedlak et al., 2010; Turner et al., 2011). Furthermore, experiences of early adversity, such as maltreatment, have been associated with an increased likelihood of developmental delays (Bright et al., 2016; Pears & Fisher, 2005; Zimmer & Panko, 2006).

Though the exact prevalence of developmental delays and disabilities among young children involved with CPS is unclear, given variations in disability definition and methods of identification (Legano et al., 2021), lack of access to Early Intervention (EI) and other supportive services place these children at an increased risk for specific learning disabilities (i.e., meeting the criteria for diagnosis of disability within a particular domain, including reading) upon school entry (Corr & Santos, 2017; Snowling & Hulme, 2021). Such incidences of learning disabilities necessitate increased access to special education (SPLED) services upon school entry

(Cavanaugh, 2016; Jonson-Reid et al., 2004). A better understanding of reading processes is of particular relevance to the current study, given the centrality of reading skills on academic achievement (York et al., 2015).

Reading and Child Welfare Involvement

Two processes characterize reading. The first is *word identification*, during which words are broken down into orthographic (i.e., spelling) and phonological (i.e., sound/symbol connection) parts to reveal semantic (i.e., language) units (Perfetti & Stafura, 2014). The second is *reading comprehension*, during which the reader automatically links semantic units to mental images generated from text information and inferences (McNamara & Magliano, 2009), leaving the reader with a coherent mental model to comprehend the text (Kintsch, 2005). In addition to these learner-related cognitive processes, contextual influences that nurture or hinder reading development (e.g., shared book reading, responsive caregiving) are also important to consider (Connor, 2016). For CPS-involved children, exposure to many biological, cognitive, and environmental adversities (Snowling & Hulme, 2021) can disrupt these learner- and context-level factors that negatively impact overall reading crucial for academic success (Overton, 2007). Thus, CPS involvement and possible maltreatment exposure may have differential impacts on reading developmental patterns over time.

Unfortunately, early childhood exposure to maltreatment as a context for learning and development has been associated with lower reading achievement scores on standardized neuropsychological assessments (e.g., Woodcock Johnson-III, De Bellis, et al., 2013; Nooner et al., 2018; Pillay, 2016) and state standardized reading assessments (J. Fantuzzo et al., 2012; Kiesel, 2016; Rouse et al., 2011) relative to non-maltreated peers. Indeed, maltreatment has

resulted in lower scores on assessments of word identification, such as phonological awareness, decoding (Mills et al., 2011; K. C. Pears et al., 2011), and lower scores on reading comprehension assessments, such as passage comprehension (A. A. Scarborough & McCrae, 2010). These outcomes, in turn, result in later reading disability if not addressed in a timely and effective trauma-informed manner. Such developmental disparities observed in children underscore the importance of timely identification and intervention, particularly for those who have been exposed to maltreatment (Corr & Santos, 2017). Early detection and treatment can significantly impact emergent literacy skills and subsequent outcomes like reading proficiency.

However, despite the seemingly equifinal sequelae of maltreatment and later reading challenges, there is evidence to indicate possible heterogeneity in children's developmental processes associated with reading. For example, differential effects exist due to the timing of maltreatment experience wherein early childhood exposure has been shown to result in stable, though significantly lower, reading ability compared to non-maltreated children, while later exposure has been associated with more variability in reading (Hong et al., 2018). Considering that over 44% of maltreatment victims are between 0-5 years of age (U.S. Department of Health, Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau, 2024), it is essential to understand what factors might influence differential patterns of development. This important cognitive domain warrants further attention since emergent literacy skills are highly reliant on language. Evaluating the foundational processes that underpin reading ability, such as language, can aid in identifying potential challenges that may manifest later in these children's reading abilities.

Language and Maltreatment Exposure

Language development is essential for reading development, an experience-expectant process reliant on the quality of home and early care environments during the first two years of life to promote cognitive growth (Kim, 2020). Indeed, reading relies accurate phonological and morphological awareness, as well as knowledge of sentence structure (e.g., grammar and syntax knowledge) to deriving meaning from individual sentences and building meaningful comprehension (Tunmer & Chapman, 2012). Vocabulary knowledge supports the automatic activation of word meanings from memory (Perfetti, 2010), while inferences from language knowledge help to derive accurate meaning from text (Kintsch, 2005). Therefore, language is an important developmental domain wherein variability in linguistic ability may indicate challenges with later reading comprehension. Furthermore, because language develops earlier than reading (H. S. Scarborough, 2009), it will be important to understand the early connection between language needs and later reading to inform better early identification and intervention for children involved in CPS. Indeed, early language skills could be used to screen children who come into contact with CPS and understand linguistic needs, reading needs, and the home context in which emergent literacy skills develop.

CPS involvement has been shown to increase the risk of developing language disorders; for example, in a study of children exposed to adversity, including maltreatment, 20% of the children presented with language disorders (C. Selin et al., 2022). Exposure to, or risk of exposure to, maltreatment experiences affect expressive and receptive language skills (J. A. G. Lum et al., 2015; Sylvestre et al., 2016) that persist over time (Eigsti & Cicchetti, 2004). Evidence also suggests that maltreatment impacts grammar knowledge (C. Selin et al., 2022),

wherein children demonstrate shorter and less complex utterances and make more grammatical errors in language use (Alvarado et al., 2023). Given the potential variability in language development as a result of context-level experiences such as maltreatment, it is therefore important to understand its concurrent and subsequent role in influencing heterogeneity in reading.

Heterogeneity Across Reading and Language Needs

Underlying heterogeneity in the profiles of reading needs results in differentially affected reading processes (McNamara & Magliano, 2009) with various detectable reading symptoms. For example, a reader can have word identification and reading comprehension needs (Catts et al., 2014), representing an overlap in language and reading disability (McNamara & Magliano, 2009). Other readers with affected reading comprehension may appear to read fluently but have language needs impacting reading comprehension (Catts et al., 2014). These readers can be the most challenging to identify and support because they struggle with “higher-level” comprehension processes (Kelso et al., 2022, p. 539). Readers can also have affected word identification and intact reading comprehension skills (Tunmer & Chapman, 2012), indicative of criteria for dyslexia (Lindstrom, 2019). These readers are often proficient once they can access text, likely after receiving intensive direct intervention specific to word identification (Connor et al., 2016).

In addition to variability across reading needs, there are also different profiles of language needs. For example, developmental language disorder (DLD) is a general diagnosis that includes various language needs (Adlof et al., 2022), though this definition excludes children with language needs associated with specific developmental disorders (e.g., language

impairments as a result of autism spectrum disorder or Down's Syndrome; McGregor et al., 2020). When children with DLD present language difficulties, their symptoms are a heterogeneous variety of language impairments (Tomblin et al., 2000), including impaired grammatical knowledge and orthographic learning (Adlof et al., 2022). Unfortunately, low language skills early on regardless of language symptoms, can result in poor language trajectories throughout development (McKean et al., 2017) that may be resistant to growth when exposed to later language intervention (Catts et al., 2014).

Though language and reading are considered separate domains (Snowling & Hulme, 2021), many language disorders overlap with reading disorders (Snowling et al., 2020), highlighting how impairments in language may affect reading processes. Children with DLDs who overcome their phonological awareness and language issues by preschool are at reduced risk of developing reading needs later (Snowling & Hulme, 2021). Unfortunately, many children present with reading impairments in the later elementary school grades (Catts et al., 2012), demonstrating the common overlap between language and reading needs for children. Given the common overlap and complexity between language and reading needs, maltreatment exposure may add another layer of complexity that must be further unpacked.

To better understand heterogeneity in CPS-involved children's early language and reading development, it is necessary to employ more person-centered methods. Indeed, different profiles of language and reading needs exist in populations of children not exposed to maltreatment (McNamara & Magliano, 2009). However, it is yet unclear how maltreatment may impact these profiles. Therefore, the inclusion of language and reading factors to explore profiles of early reading needs is warranted. Furthermore, given the importance of other individual- and context-

level factors in the development of reading, it is necessary to understand better how the home environment, trauma symptoms, and other developmental skills contribute to profile membership that signal additional intervention needs for children with maltreatment exposures. Such information can help SPLED with early identification processes and guide trauma-informed language and literacy interventions for children involved in child welfare.

The Current Study

This investigation aims to understand how early language skills are related to later reading developmental patterns in children involved with CPS, alongside the child- and context-level factors pertaining to these needs. This inquiry is based on the argument that language abilities are essential for successful reading outcomes and that differentiating profiles of language and reading developmental patterns can provide insight into the connection between these needs in both domains. Such investigations can help to identify early indicators of later reading needs to support early identification and intervention for SPLED, as well as trauma-informed literacy and language instruction for children involved in child welfare.

This study will investigate the following research questions:

1. What early language and reading developmental pattern profiles exist in a sample of children involved in child welfare?
2. How do these profiles differ based on demographic characteristics and child- and context-related factors (i.e., trauma symptoms, home environment, daily living skills, chronic health problems, and demographic variables)?

Method

Data and Sample

The current study used the first cohort of the National Survey of Child and Adolescent Well-Being (NSCAW I; 2008) to assess the long-term outcomes of a nationally representative sample of children involved with CPS. The complete NSCAW sample consisted of children and families who were investigated by Child Protective Services (CPS) for reported child maltreatment between October 1999 and December 2000 ($n = 5,501$) and was collected across five waves (See Table 4.1). The current study included longitudinal data from Waves 1, 4, and 5 from substantiated and unsubstantiated cases. Wave 1 data collection occurred two to six months after a maltreatment investigation was closed, between November 1999 and April 2001, during which children were ages 0-5 (NSCAW; 2008a). Wave 4 data collection occurred 36 months after maltreatment investigations closed, between August 2002 and February 2004, during which children were ages 3-8. Wave 5 data collection occurred between 59 and 97 months after the close of a maltreatment investigation, between September 2005 and December 2007, during which children were ages 5-13 (NSCAW; 2008a). From the overall NSCAW I sample, all children aged 0 to 5 with complete data were selected ($n = 2,598$). See Table 4.2 for sample demographics. The NSCAW I data did not include personally identifiable information; thus, an Institutional Review Board review was unnecessary for this study.

Measures

Early Language Skills

Early language was measured at Wave 1 using the Preschool Language Scale-3 (PLS-3) for children at age 3 (Zimmerman et al., 1992). The PLS-3 includes two language subscales—the Auditory Comprehension (AC; 32 items; NSCAW sample Cronbach's $\alpha = .89$) and Expressive Communication (EC; 39 items; NSCAW sample Cronbach's $\alpha = .92$) subscales—which assess

prelinguistic (i.e., attention, vocal development, and social communication) and language skills (i.e., syntax, morphology, vocabulary, and concept development; NSCAW; 2008a).

Reading Developmental Patterns

Reading comprehension was first measured at Wave 4 using the Woodcock-McGrew-Werder Mini-Battery of Achievement (MBA; Woodcock et al., 1994), which included letter-word identification, vocabulary, and comprehension subscales (73 items; Cronbach's $\alpha = .72$; NSCAW Appendix II). Reading was then assessed again at Wave 5 using the updated Woodcock-Johnson III (WJ-III) reading assessment. The letter-word identification (76 items; Cronbach's $\alpha = .74$) and passage comprehension subscales (47 items; Cronbach's $\alpha = .64$) were included in this investigation separately (Kirsch, 2011; Wendling et al., 2007).

Auxiliary Variables

The Home Observation for Measurement of the Environment (HOME; measured at wave 1) assessed the home environment's engagement and support quality and quantity (Bradley et al., 1988; NSCAW Appendix III) and included information about the environment and the mother's behavior towards the child (NSCAW Appendix III) on two subscales, the cognitive stimulation (CS) and environmental support (ES) scales scored from 0-30, with higher scores reflecting homes with more CS and ES. This investigation also found that the HOME subscales had poor reliability (HOME cog stim ages 0-2: 9 items; Cronbach's $\alpha = .28$; HOME cog stim ages 3-5: 10 items; Cronbach's $\alpha = .35$; HOME emotional support ages 0-2: 9 items; Cronbach's $\alpha = .17$; HOME emotional support ages 3-5: 11 items; Cronbach's $\alpha = .065$). However, the NSCAW user manual lists the reliability in the overall sample as low (Cronbach's $\alpha < .45$). Thus, considering this is an exploratory investigation, the HOME was included to help identify these profiles better.

The Vineland Adaptive Behavior Scale (VABS; Sparrow et al., 1984) was administered at Wave 1 to measure children's daily living skills. VABS measured a child's ability to function within societal expectations (Helton & House, 2019). The NSCAW data collection project only used the Daily Living Skills subscale, which measured personal (e.g., how the child eats, dresses, and performs personal hygiene), household (household tasks the child performs), and interpersonal skills (how the child spends his or her time, and telephone skills). VABS items differed based on the participant's age at the time of assessment, but all assessed daily living skills relative to age-appropriate expectations (VABS ages 0-1: 15 items; Cronbach's $\alpha = .74$; VABS ages 3-5: 15 items; Cronbach's $\alpha = .77$) resulting in a standard score.

Trauma symptoms were measured at Wave 5 using the Trauma Symptom Checklist for Children (TSCC; Briere & Runtz, 1989). This measure assessed internalizing and externalizing trauma symptoms, specifically anxiety, depression, posttraumatic stress, sexual concerns, dissociation, and anger related to experiences of trauma in a single standard score (NSCAW Appendix III; 10 items; Cronbach's $\alpha = .81$).

Demographic variables were measured in Wave 1. Participants' parents or guardians identified their children as either male or female with the intention of also collecting gender with this information. However, this investigation will only refer to sex assigned at birth, not gender identity or expression. Participants self-reported their race (i.e., White, Black, Native American, Asian/Hawaiian/Pacific Islander, or Other) and ethnicity (i.e., Hispanic or non-Hispanic) (NSCAW; 2008b). Substantiation of maltreatment exposure was measured as a dichotomous yes/no variable. NSCAW computed the variable based on CPS records included for each child at Wave 1 (NSCAW Appendix III). Child chronic health problems and cognitive and physical

disability status were collected from caregiver or caseworker reports (NSCAW Appendix III).

Analytic Plan

Using Mplus (Version 8; Muthén & Muthén, 2017), Latent Profile Analysis (LPA) was employed to explore heterogeneity in language and reading profiles for children involved with CPS. LPA is a form of mixture modeling wherein categorical latent profiles are identified based on individual responses to continuous manifest variables (Masyn, 2013). LPA is an important person-centered approach where all participants' responses are considered in the models (Harring & Hodis, 2016; Panlilio et al., 2018). Each participant's likelihood of belonging to each profile is computed, and the participant is allocated to the profiles with the highest probability (i.e., posterior probability). Participants belonging to different profiles have unique characteristics that distinguish them from members of other profiles (T. W. McLaughlin et al., 2015).

Though previous applications of LPA have been made in the context of maltreatment by assessing emotional disorders (Cumming et al., 2023), children with disabilities (T. W. McLaughlin et al., 2015), or maltreatment types (Gee, 2020b), there has yet to be an investigation into the reading and associated language need profiles of children involved in CPS. LPA is uniquely suited to determine profiles in samples of CPS-involved children, given that they often score at the fringes of normal distributions on standardized assessments. LPA models can also accommodate auxiliary covariates to understand the likelihood of profile membership further. Such an approach can provide a better understanding of how various child- and context-level factors predict profile membership based on language and reading performance.

The first stage of the analysis estimated the appropriate number of latent profiles within unconditional models. Fit and adequacy of the unconditional models were assessed using sample

size-adjusted Bayesian Information Criterion (adjusted BIC), where smaller values indicate better model fit, bootstrapped likelihood ratio test (BLRT) where lower p -values indicate the rejection of the $k - 1$ profile model for the k class model, and entropy where values above .80 indicate better classification and adequate class/profile separation (Nylund et al., 2007; Ram & Grimm, 2009). Additional model fit was assessed following standards specified by Nagin and Odgers (2012), which included average posterior probability (APP; values over .70 indicate better fit), odds of correct classification (OCC; values over 5.0 indicate better classification), and the difference (in absolute terms) between the estimated probability of profile membership and the proportion of individuals assigned to that profile based on their posterior probability (absolute difference values below 50% indicate better fit).

The second analysis stage estimated the conditional model, which included the auxiliary variables outlined above. These auxiliary variables were included in the model to understand the extent to which they predicted profile membership. Odds ratios were reported, indicating odds of belonging to specific profiles relative to a reference profile, given the relative strength of each auxiliary variable predictor.

Results

Descriptive Findings

See Table 4.2 for sample demographics. Children were an average of 1.5 (1.70) years old. The sample scored relatively high on the language assessments compared to the standard score of 100 (AC: 91.44 (19.29); EC: 90.88 (19.57)), though the standard deviations were high, suggesting some variability in these scores. MBA (101.05 (16.99) and WJ-III subscale scores (LWID: 99.58 (16.58); WJPC: 93.31 (14.64) followed a similar pattern. Thus, children in this

sample presented with relatively high reading scores but with variability in those scores.

Children's overall HOME scores were low, with an average of just over 7 out of a score of 30 for both cognitive stimulation and emotional support (CS: 7.68 (2.63); ES: 7.57 (1.95)). Children's daily living scores were also high (VABS: 98.59 (19.98)), indicating strong daily living skills but with a high SD. Lastly, TSCC scores suggest that children in the sample showed some symptoms of trauma (49.96 (11.05))

See Table 4.3 for correlations between all variables. Both AC and EC language subscales were positively correlated with MBA scores (AC $r = .36, p < .001$; EC $r = .37, p < .001$), as well as WJ-III LWID (AC $r = .18, p < .001$; EC $r = .18, p < .001$), and WJ- III PC (AC $r = .21, p < .001$; EC $r = .22, p < .001$), reading subscales. In addition, language measures positively correlated with HOME scores, specifically ES scores (AC $r = .09, p < .001$; EC $r = .06, p < .001$). Daily living scores were correlated with most variables. In contrast, trauma symptoms were negatively correlated with age ($r = -.41, p < .001$) and the AC language subscale ($r = -.09, p = .02$). Child age was negatively correlated language scores (AC $r = -.13, p < .001$; EC $r = -.22, p < .001$), reading (LWID $r = -.06, p = .005$; PC $r = -.22, p < .001$), and daily living ($r = -.45, p < .001$) scores, but positively correlated with cognitive stimulation ($r = .71, p < .001$) and emotional support ($r = .31, p < .001$). Sex assigned at birth was also correlated with language (AC $r = .05, p = .01$; EC $r = .07, p < .001$) and reading scores (LWID $r = .11, p < .001$; PC $r = .08, p < .001$), as well as chronic health problems ($r = .07, p < .001$) and daily living skills ($r = .07, p < .001$). Substantiation negatively correlated language scores (AC $r = -.05, p = .02$; EC $r = -.06, p = .01$), and reading scores (LWID $r = -.07, p = .01$), age ($r = -.07, p = .002$). Substantiation was negatively correlated with chronic health problems.

Profiles of Early Language and Later Reading: Unconditional Models

Three profiles of early language and later reading developmental patterns were found (see Figure 4.6). This three-profile model was selected based on the best-fitting model as evidenced by the highest entropy (.70), APP (.86, .86, and .86), and OCC (9.89, 5.45, and 71.47) values, and interpretability of the profiles. Though the two-profile model had higher entropy (.80), the adjusted BIC and BLRT values were lower for the three-profile model, which means they were considered to have better relative fit (see Table 4.4; Nylund et al., 2007). Although the goal is to select a model with profiles that are homogeneous, well separated, and appropriate proportioned, if the number of profiles is still not entirely clear, theoretical understanding of the latent variable and the population should be applied to make a final selection (Lubke & Muthén, 2005; Lukenheimer et al., 2019). Thus, the three-profile model better fit the theoretical interpretation of the data. See Table 4.5 for average language and reading scores for each early language and reading developmental pattern profile.

The first profile (i.e., *resilient* profile) contained over 50% of the sample ($n = 1411$) that scored in the low-average PLS-3 measures in preschool age but scored in the average ranges for the MBA and WJ-III subscale at later ages (see Figure 4.2). These children initially presented with mildly affected language needs upon first contact with CPS. However, children in this profile showed catch-up in reading scores by school age, as indicated by average scores on the standardized reading measures. Results suggest that despite early language needs, children in this profile appeared to show improvements in later reading.

The second profile (i.e., *at-risk* profile) included 8% of the sample ($n = 176$) who demonstrated language needs at preschool age and subsequent reading needs by school age,

given lower scores on the PLS-3 subscales and the MBA and WJ-III subscales (see Figure 4.3). Children classified within this profile presented with below-average language skills at preschool age upon first contact with CPS, as well as below-average reading skills post-CPS decision outcome. These results indicate the potential for overlapping needs across language and reading that persist over time from first contact with CPS through post-investigation outcomes.

The third profile (i.e., *expected* profile) contained nearly 40% of the sample ($n = 1011$) that scored within the average age-expected range in language at preschool age using the PLS-3 subscale and reading at school age using the MBA and WJ-III subscales (see Figure 4.4). Children classified within this profile presented with average or typically developing language skills at preschool age upon first contact with CPS and average or typically developing reading skills post-CPS decision outcome. These results suggest that despite the early risks presented with CPS involvement, which may include suspected abuse or neglect in the home environment, children classified within this profile did not demonstrate reading or language needs.

Given evidence of heterogeneity in language and reading needs based on these three profiles, it is important to understand further what individual- and context-level factors predict membership in each group. What follows next are the results of the conditional models that examine what factors predict the likelihood that children will be classified within each of these three profiles (i.e., *resilient*, *expected*, *at-risk*).

Predictors of Profile Membership: Conditional Models

The study means for each profile are in Table 4.5. To align with person-centered methods and to de-stigmatize research regarding neurodiversity, the *resilient* profile was selected as the reference profile because it represented over half of the sample and thus may indicate a more

appropriate within-group sample comparison for CPS involvement. See Table 4.7 for all odd ratios. The likelihood of children being classified in the *at-risk profile* decreases relative to the resilient profile with higher daily living skills, ($OR = 0.91$) suggesting that children with higher daily living skills are more resilient. Children who exhibited chronic health problems were more likely to be classified in the *expected profile*, relative to the *resilient profile* ($OR = 3.83$). Children living in more cognitively stimulating homes were more likely to be in the *expected profile*, relative to the *resilient profile* ($OR = 1.34$). See Figures 4.5 and 4.6 for odds ratio comparison.

Given that the other covariates in the model did not reach significance in predicting the probability of profile membership, what follows next is descriptive information about each demographic characteristic for children within each profile.

Descriptive Information About Profiles

Table 4.6 includes the complete list of demographic characteristics by profile. Descriptive findings of profile-specific factors show unique characteristics of children classified within each profile. Specifically, notable descriptive differences between the sex assigned at birth, maltreatment types, chronic health problems (e.g., asthma, life-threatening allergic reaction(s), vision or hearing loss that corrective eyewear cannot correct), and cognitive disabilities (e.g. development delay) varied between profiles. Regarding sex assigned at birth, the *at-risk* profile included the most children who were identified as male (61%), whereas the *expected* and *resilient* profiles included 48% and 55% male, respectively. Regarding maltreatment type, roughly 30% of children in the *resilient* and *expected* profiles and only 20% of children in the *at-risk* profile presented with physical neglect.

Discussion

The present study examined evidence of heterogeneity in early language and later reading for children involved with CPS. Findings indicated the presence of three distinct developmental profiles of early language and reading skills. Specifically, these distinct profiles classified CPS-involved children within the following groups: *resilient*, *at-risk*, and *expected*. Furthermore, this study found evidence that children's daily living skills and cognitive stimulation received in their homes predicted membership within each profile. Interestingly, trauma symptoms did not predict profile membership, suggesting that trauma symptoms did not differ between different language and reading profiles.

Heterogeneity in Language and Reading

Resilient Profile

Children classified in the *resilient* profile, representing the largest group, showed below-average language scores when they first encountered CPS and child welfare at preschool age. Indeed, this finding is in line with prior work that showed how early experiences of abuse and neglect have negative impacts on several language skill domains, such as receptive language, expressive syntax, and pragmatics (Eigsti & Cicchetti, 2004; Selin et al., 2022; Sylvestre et al., 2015). However, a promising finding in this study showed that the same children in this profile demonstrated reading skills by school age that were on par with peers. This suggests that most children involved with the child welfare system in this sample may present with early language needs but somehow overcome these challenges and demonstrate normative reading ability later. Given the transactional nature of language and reading, wherein language skills are foundational for later comprehension (Kintsch, 2005; McNamara & Magliano, 2009; Perfetti, 2010; Tunmer

& Chapman, 2012), it is encouraging to see such a pattern of growth.

Indeed, the improved reading abilities for children classified within this profile align with language disability research, suggesting that children with language needs often overcome reading needs over time, resulting in sufficient reading skills later (Adlof et al., 2022). Moreover, such patterns of developmental catch-up have been seen within intervention studies that targeted language domains within a population of children involved with CPS. For example, Merritt and Klein (2015) found that participation in high-quality early care and education (ECE) programs such as preschool, Head Start, Early Head Start predicted better language scores at preschool even after controlling for initial language abilities, maltreatment type, and child and caregiver demographics. A study by Zajac and colleagues (2019) showed that children aged 36 to 48 months placed in foster care had higher receptive vocabulary scores when compared to those who were kept in their biological homes after a CPS investigation, though variability in foster placement type does not appear to be evidence of placement effects on young children's language development (Stacks et al., 2011).

Children in the *resilient* profile were less likely to reside in cognitively stimulating homes compared to children in the *expected* profile. Previous research suggests that children exposed to maltreatment living in more cognitively stimulating have improved cognitive outcomes (Yoon et al., 2023). Thus, it may be that these children were not exposed to such stimulation early on but were later [enrolled] in high-quality environment, such as an early childhood care (ECE) program. Such intervention opportunities are important in shifting the early language and later reading abilities of children involved with the child welfare system (Merritt & Klein, 2015; Corr et al., *under review*). Indeed, there is some evidence that children demonstrate benefits from

ECEs without accreditation, while others argue that more formal educational settings impact cognitive gains (Sattler, 2023). Regardless, the possibility of providing intervention in various domains is encouraging, considering how often it is reported that these students are struggling. Indeed, though they presented with average reading later on, nearly 20% of the resilient profile reported a cognitive disability, further highlighting the importance of early intervention opportunities.

Interestingly, children in *resilient* profile were less likely to have chronic illnesses compared to children in the *expected* profile. It may be that these children were not identified for observable signs of need (e.g., physical impairments, behavior outbursts, or observable cognitive delays; Lambros et al., 2010; Malmgren & Meisel, 2004) and therefore did not receive services for their language and reading needs right away. Indeed, less obvious disability identifies include developmental language disorders (Selin et al., 2019) poor comprehenders (Catts et al., 2005), highlighting the possibility that these children may have received intervention later in their development.

At-Risk Profile

Nearly 10% of the sample of children belonged to the *at-risk* profile, as indicated by below-average early language abilities during initial CPS contact and below-average later reading skills by school age. This finding is in line with prior evidence that children involved in child welfare present with reading needs (Hong et al., 2018). This finding is further supported by language impairment research, which states that a percentage of children with language needs may not show improvement in reading needs over time, resulting in comorbid language and reading impairments (Adlof et al., 2022). Given that the smallest proportion of children in this

sample evidenced the highest needs, this may signal the need for more targeted interventions requiring a higher dose-response consideration.

From the perspective of experience-driven developmental plasticity (K. A. McLaughlin & Gabard-Durnam, 2022b), children exposed to adversity adapt to their environment based on expected developmental input during infancy/toddlerhood, such as language and additional opportunities for facilitated learning, such as ECE programs. Neurophysiological circuits are shaped by adverse experiences (e.g., abuse and neglect) that result in enduring effects across domains of development (e.g., cognitive, emotional, and behavioral). For example, cumulative and chronic effects of adverse events have been associated with disruptions to stress regulation in adults (Marques-Feixa et al., 2023) and long-term consequences on adult mental health (Steine et al., 2017). Intervention for these needs is possible; however, changes will require increased effort that capitalizes on neuropsychological development later in life despite the challenges (K. A. McLaughlin & Gabard-Durnam, 2022b). In other words, the longer time children spend in adverse environments may mean that their increased vulnerabilities in language skills and reading abilities may only respond to intervention at a proportional dosage to show positive effects.

Children classified within this profile were predominantly male, with a higher proportion of substantiated cases but remaining in their biological homes, higher incidence of neglect, and more likely to have cognitive disability and emotional problems (see Table 4.2). Together, these signal an accumulation of risk factors that may have exacerbated this sample of children's language and reading needs. Indeed, the special education literature has shown that boys, relative to girls, are three times more likely to be referred for SPLED services (Coutinho & Oswald,

2005; Oswald et al., 2003) with trauma-related symptoms, possibly being rated as more behaviorally disruptive, resulting in more punitive classroom responses (Loomis & Panlilio, 2022). Moreover, studies have shown that children who remained within their biological homes without any supportive services show decreased language abilities relative to those who were placed in foster care or enrolled in quality ECE programs (Merritt & Klein, 2015; Zajac et al., 2019). Finally, experiences of neglect and physical abuse have been associated with more language delays relative to other forms of maltreatment, such as sexual and emotional abuse (Wiggins et al., 2007). Despite these cumulative risk factors, children classified under this profile were also more likely to live in homes with more cognitive stimulation than children in the *resilient* profile. Although cognitive stimulation has been shown to be a resilience and protective factor for CPS-involved children (Yoon et al., 2023), one possibility that it did not predict membership in the other positive trajectory profiles may be due to a mismatch of child needs. For example, a study by Fondren et al. (2020) found that maternal sensitivity was a salient moderator of elaborate reminiscing and child's receptive language in the CPS-involved families.

Expected Profile

Finally, 40% of the sample of children belonged to the *expected* profile as indicated by average early language during initial CPS contact and average later reading scores by school age. This is a particularly encouraging finding, considering that so much of the maltreatment literature argues that these children are likely to have affected language and reading needs (e.g., Hong et al., 2018; Selin et al., 2022) and suggests that heterogeneity in these domains may be masking how often these children score in the average range. Understanding the child- and context-level factors that make up the whole experience for these children may help SPLED, and

child welfare services recognize children at lower risk for later reading needs. These findings may help inform ways to promote language and reading growth over time.

Indeed, children in the *expected* profile were more likely to live in homes with more cognitive stimulation compared to children in the *resilient* profile. It may be that children who had unaffected language and reading skills were exposed to an enriching a home that facilitated cognitive development, and in with an adult who fostering attention development and scaffolding learning opportunities (Rakesh et al., 2024). In comparison, children in the resilient profile may show growth over time because they were exposed to a different cognitively stimulating opportunity that encouraged growth over time.

Interestingly, children in *expected* profile were more likely to have chronic illnesses compared with children in the *resilient* profile. It may be that through CPS investigation and the Child Abuse Prevention and Treatment Act ([CAPTA] 2003 reauthorization and Individuals with Disabilities Education Improvement Act [IDEA] of 2004), infants and toddlers' potential physical or cognitive developmental needs are referred to early intervention programs. Thus, children exposed to maltreatment with observable impairments, such as physical impairments are more likely to be identified for additional services (Lambros et al., 2010; Malmgren & Meisel, 2004) and may then be identified for areas of potential cognitive intervention as well. Thus, it may be that children with chronic health problems score present with unaffected language and reading skills because they are already being identified for chronic health needs.

Children classified within the *expected* profile reported higher daily living skills and a very low proportion of children with cognitive disabilities. Taken together, these findings signal that children in this group were at reduced risk of severe overall impact of maltreatment.

Children in this profile appear to be better equipped to care for themselves and engage in the community, reducing unemployment risk or intensive living support needs (Stabel, 2013). Daily living skills are also positively associated with language (Becker-Weidman, 2009), reading, and math (Coohey et al., 2011). Thus, children in this profile may have expected language and reading scores because they have the “attributes” required for daily living that may be needed to learn in a classroom (Coohey et al., 2011, p. 696). Fortunately for those in the *resilient* and *at-risk* profiles, daily living skills are child-level factors that can be improved through intervention (Becker-Weidman, 2009). Addressing these needs, in addition to other interventions, may encourage improved outcomes and profile movement. In addition, less than one percent of children classified into the profile reported cognitive disabilities. Children exposed to maltreatment without cognitive disabilities are at a decreased risk for executive functioning (Chen et al., 2020) and academic needs (De Bellis et al., 2013), highlighting the reduced risk of academic needs in children in this profile.

Implications

These results have implications for trauma-informed education that require the specification of more nuanced mechanisms to inform practice (Panlilio et al., 2023). Moreover, the child- and context-level factors included in this study can help to piece together a more complete picture of the whole child to better identify CPS-involved children at risk for language and reading needs. For example, within a trauma-informed multitiered system of support (MTSS) framework (Chafouleas et al., 2016), a universal prevention approach may be implemented across the board for children who have a history of child welfare system involvement. The presence of three distinct profiles provides evidence that children within this

sample may follow the same relative proportion of students who require services across the three tiers. This means that children in the *expected* profile likely benefit from universal prevention strategies that target the child, teachers, and classroom. Targeted prevention strategies may be needed for children classified in the *resilient* profile to mitigate the early detrimental effects of abuse and neglect by providing language-based and reading-related interventions. For children in the *at-risk* profile, more select intervention strategies may be required to address the cumulative effects of early adversities such as abuse and neglect. Although the *at-risk* profile only includes 10% of this sample, more intensive and effective services may be needed to ensure developmental catch-up.

Findings from this study can further help inform trauma-informed practices used within SPLED. Considering that trauma-informed practices may be essential to SPLED (Hunter et al., 2021), this investigation highlights how over half of children involved in child welfare may be at increased risk for language needs as well. Thus, trauma-informed practices should include early identification and intervention for language needs among these children. Further, teachers and other professionals working with these students in school should engage in specialized instruction to help recognize behaviors that may trigger students (Hunter et al., 2021), such as including support for daily living skills and targeted cognitive stimulation, expecting that children involved with CPS may need targeted support in these areas to access language and reading interventions.

Finally, given that the MTSS framework was adapted from public health, the child welfare system can also undertake a similar tiered approach when providing services for families at the onset of CPS investigations. Caregivers can improve language by engaging in at-home

language interventions such as communication tactics for parents or education classes, such as “First Steps,” that educate parents on cognitive, language, and socio-emotional skills (Jeong et al., 2021). In addition, parents can help intervene with reading needs by engaging in reading and literacy activities (Sim et al., 2014). Despite the benefits of these programs, their effectiveness is still unclear when addressing maltreatment (Gubbels et al., 2019), suggesting that additional research needs to be done to continue to improve such interventions. By providing language-based and reading-based support services in addition to responsive parenting and cognitive stimulation, maltreatment prevention and intervention programs can evaluate the need for additional support based on the patterns of risk outlined in these three profiles.

Limitations and Future Directions

This was an exploratory LPA to investigate possible heterogeneity in language and reading needs for children involved with CPS. One limitation of LPA is the lack of generalizability of findings. Indeed, profile membership depends on comparisons between individuals included in the sample (Lubke & Muthén, 2005). Including different individuals in the model may change model fit and individual profile membership. In addition, profile membership is model-dependent. Individuals may be assigned different profiles based on model selection, which is decided by individual interpretation of model fit and theoretical application (Harring & Hodis, 2016). For these reasons, making any implications or decisions based on a single sample is highly discouraged (Lubke & Muthén, 2005). To directly address programs, policies, or individual children, additional confirmatory studies need to replicate these findings and continue to investigate individual mechanisms in this model. Future investigations should prioritize using multiple large, representative samples to help improve interpretability and

generalizability of results.

Another limitation of this study was that the home environment assessment (HOME) was unreliable. As a CPS sample, NSCAW data is riddled with missingness, including missing HOME data, which likely affected the reliability of this measure. The HOME was ultimately included as a context-level factor of interest. Specifically, this investigation was interested in capturing a child's living context, considering that findings related to this measure would need to be considered carefully before being generalized. Considering the overall lack of generalizability of the exploratory investigation, it seemed prudent to include this in the model. Future investigations should aim to improve overall generalizability and identify highly reliable home environment assessments to include context-level factors.

A final limitation of this investigation was the language measures used. This investigation utilized the PLS-3. Though a good assessment of receptive and expressive language (Zimmerman et al., 1992), more recent research has argued that grammar measures may better measure language skills in children (Alvarado et al., 2023). At the time of this data collection, only receptive and expressive assessments were available, which is why they are included in this investigation. However, future investigations should prioritize using language sampling, such as mean length utterance, to assess language needs in these children (Alvarado et al., 2023). Doing so may help improve pathway research regarding key mechanisms in this model to help unpack the relationship between language and reading.

Conclusion

This investigation identified *resilient*, *expected*, and *at-risk* profiles of early language and later reading developmental patterns. These encouraging findings suggest that there may indeed

be heterogeneity in profiles of early language and reading developmental patterns and challenge future investigations to consider how they approach populations of children involved in child welfare when assessing reading needs. Further, understanding the child- and context-level factors most associated with each profile can support trauma-informed education and help identify children at risk for reading needs more accurately and efficiently.

Table 4.1: Timeline of NSCAW Data Collection

	Wave			
	1	3	4	5
Age at Wave Data collection	0 to 3	1 to 4	3 to 6	8 to 11
	Measure			
Preschool Language Scale (PLS-3)	X			
Woodcock-McGrew-Werder Mini-Battery of Achievement (MBA)			X	
Woodcock-Johnson III Reading Assessment (WJ-III)				X
Home Observation for Measurement of the Environment (HOME)		X	X	
Vineland Adaptive Behavior Scale (VABS)				X
Trauma Symptoms Checklist for Children (TSCC)				X
Demographic variables	X			

Table 4.2: Sample Descriptive Frequencies

Variable	<i>N</i>	%
Age in Years		
0	1033	39.8
1	548	21.1
2	269	10.4
3	264	10.2
4	258	9.9
5	226	8.7
Child Sex Assigned at Birth		
Male	1363	52.5
Female	1235	47.5
Substantiated Indicator		
No	774	29.8
Yes	1302	50.1
Missing	522	20.1
Race/Hispanicity		
Black/non-Hispanic	887	34.1
White/non-Hispanic	1053	40.5
Hispanic	483	18.6
Other	166	6.4
Missing	9	0.3
Child Type of Abuse/neglect		
Physical Maltreatment	496	19.1
Sexual Maltreatment	141	5.4
Emotional Maltreatment	123	4.7
Physical Neglect	742	28.6
		110

Supervisory		
Neglect	659	25.4
Abandonment	81	3.1
Moral/Legal		
Maltreatment	17	0.7
Educational		
Maltreatment	4	0.2
Exploitation	3	0.1
Other	137	5.3
Missing	195	7.5
Home Setting		
Bio Parent	1763	67.9
Adopted Home	8	0.3
In-Home: Other	127	4.9
Out-of-Home	692	26.6
Missing	8	0.3
Chronic Health Problems		
Yes	739	28.4
No	1852	71.3
Missing	7	.30
Cognitive Disability		
Yes	361	13.9
No	2236	86.1
Missing	1	0
Emotional or Behavior Problem		
Yes	289	11.1
No	728	28
Missing	1581	60.9
Physical Disability		
Yes	58	2.2
No	2533	97.5
Missing	7	0.3

Table 4.3: Correlations Between Main Study Variables (n = 2598)

Study Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Age in years	1												
2. Sex assigned at birth ^a	0.00	1											
3. Substantiation ^a	-0.08**	0.00	1										
4. Chronic health problems ^a	0.01	0.07**	-0.06**	1									
5. PLS-3 Auditory Comprehension	-0.13**	0.05*	-0.06*	0.07**	1								
6. PLS-3 Expressive Communication	-0.22**	0.07**	-0.06**	0.04*	0.58**	1							
7. MBA reading	0.02	0.19**	-0.02	0.08	0.35**	0.37**	1						
8. WJ-III letter-word ID	0.79**	0.06**	-0.09**	0.03	-0.05*	-0.10**	0.55**	1					
9. WJ-III passage comprehension	-0.22**	0.08**	-0.01	0.06**	0.21**	0.22**	0.60**	0.13**	1				
10. HOME cognitive stimulation	0.71**	0.01	-0.10**	0.02	0.02	-0.04	0.15**	0.60**	-0.09**	1			
11. HOME emotional support	0.31**	0.02	-0.05*	0.03	0.09**	0.06*	0.02	0.23**	-0.01	0.44**	1		
12. VABS	-0.45**	0.07**	-0.03	0.10**	0.26**	0.28**	0.30**	-0.39**	0.25**	-0.25**	-0.06**	1	
13. TSCC	-0.14**	-0.02	0.08	-0.06	-0.09*	-0.04	0.00	-0.04	0.01	-0.07	0.02	-0.07	1

* $p < .05$, ** $p < .01$ ^a Marked correlations are Spearman and all others are Pearson.

Table 4.4: Summary of Fit Statistics of Latent Profile Models

Model	Adjusted BIC	BLRT	BLRT p	Entropy
2-Profile Model	81708.03	1176.04	<.001	0.80
3-Profile Model	81008.88	727.26	<.001	0.70
4-Profile Model	80774.52	262.48	<.001	0.63
5-Profile Model	80505.13	297.50	<.001	0.67

Table 4.5: Descriptive Statistics of Covariates and Language and Reading Skills Based on Three-Profile Model

	Resilient (<i>n</i> = 1411)		At-Risk (<i>n</i> =176)		Expected (<i>n</i> =1011)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Measure						
PLS: Auditory Comprehension	80.89	12.12	72.27	16.85	109.49	12.53
PLS: Expressive Communication	82.22	14.18	68.95	16.08	106.75	14.78
MBA: Reading Std Score	98.58	12.85	77.00	9.25	111.79	14.75
WJ-III: Letter-Word Identification Std Score	100.31	12.82	66.37	15.75	104.65	14.06
WJ-III: Passage Comprehension Std Score	94.05	11.28	62.21	14.83	97.99	11.29
Covariates						
Age	1.59	1.61	2.61	1.58	1.33	1.77
HOME: Cognitive Stimulation	7.53	2.61	8.24	2.74	7.79	2.63
HOME: Emotional Support	7.45	1.98	7.57	2.12	7.73	1.86
VABS: Daily living Skills	96.76	19.29	81.23	18.20	104.17	19.00
TSCC: Trauma Symptoms T Score	50.71	11.13	49.06	11.35	49.12	10.82

Table 4.6: Descriptive Frequencies of Child- and Context-Level Factors in a Three-Profile Model

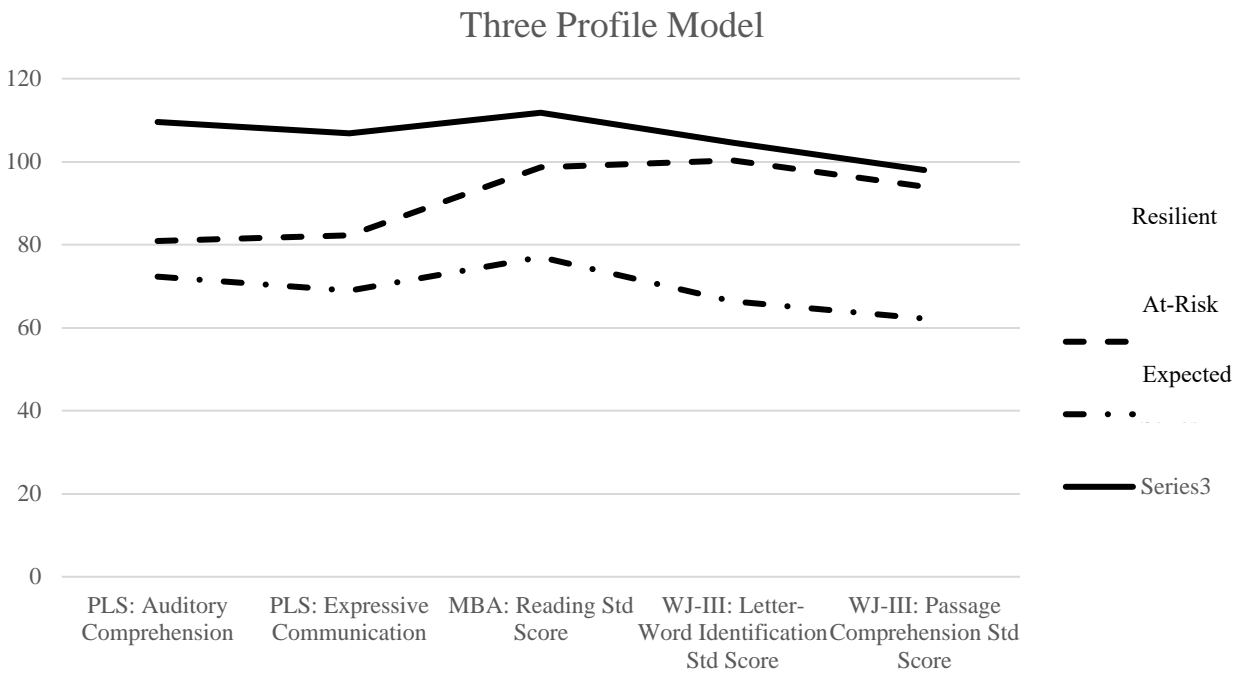
Variable	Resilient <i>n</i> =1411		At-Risk <i>n</i> =176		Expected <i>n</i> =1011	
	<i>N</i>	%	<i>N</i>	%	<i>n</i>	%
Age in Years						
0	480	34.0	12	6.8	541	53.5
1	358	25.4	44	25.0	146	14.4
2	172	12.2	34	19.3	63	6.2
3	168	11.9	24	13.6	72	7.1
4	133	9.4	35	19.9	90	8.9
5	100	7.1	27	15.3	99	9.8
Child Sex Assigned at Birth						
Male	771	54.6	108	61.4	484	47.9
Female	640	45.4	68	38.6	527	52.1
Substantiated Indicator						
No	395	28.0	45	25.6	334	33.0
Yes	719	51.0	96	54.5	487	48.2
Missing	297	21.0	35	19.9	190	18.8
Race/Hispanicity						
Black/non-Hispanic	512	36.3	61	34.7	314	31.1
White/non-Hispanic	517	36.6	74	42.0	462	45.7
Hispanic	284	20.1	34	19.3	165	16.3
Other	93	6.6	6	3.4	67	6.6
Missing	5	0.4	1	0.6	3	0.3
Child Type of Abuse/neglect						
Physical Maltreatment	274	19.4	39	22.2	183	18.1
Sexual Maltreatment	74	5.2	8	4.5	59	5.8
Emotional Maltreatment	69	4.9	6	3.4	48	4.7
Physical Neglect	406	28.8	36	20.5	300	29.7

Supervisory Neglect	355	25.2	51	29.0	253	25.0
Abandonment	46	3.3	5	2.8	30	3.0
Moral/Legal Maltreatment	4	0.3	4	2.3	9	0.9
Educational Maltreatment	1	0.1	0	0.0	3	0.3
Exploitation	1	0.1	0	0.0	2	0.2
Other	69	4.9	12	6.8	56	5.5
Missing	112	7.9	15	8.5	68	6.7
Home Setting						
Bio Parent	952	67.5	116	65.9	695	68.7
Adopted Home	2	0.1	2	1.1	4	0.4
In-Home: Other	64	4.5	9	5.1	54	5.3
Out-of-Home	389	27.6	48	27.3	255	25.2
Missing	4	0.3	1	0.6	3	0.3
Child Chronic Health Problems						
Yes	429	30.4	64	36.4	246	24.3
No	978	69.3	111	63.1	763	75.5
Missing	4	0.3	1	0.6	2	0.2
Cognitive Disability						
Yes	260	18.4	100	56.8	1	0.1
No	1150	81.5	76	43.2	1010	99.9
Missing	1	0.1	0	0.0	0	0.0
Emotional or Behavior Problem						
Yes	173	12.3	40	22.7	76	7.5
No	400	28.3	80	45.5	248	24.5
Missing	838	59.4	56	31.8	687	68.0
Physical Disability						
Yes	36	2.6	6	3.4	16	1.6
No	1371	97.2	170	96.6	992	98.1
Missing	4	0.3	0	0.0	3	0.3

Table 4.7: Odds of Being in Profile; Resilient Reference Profile

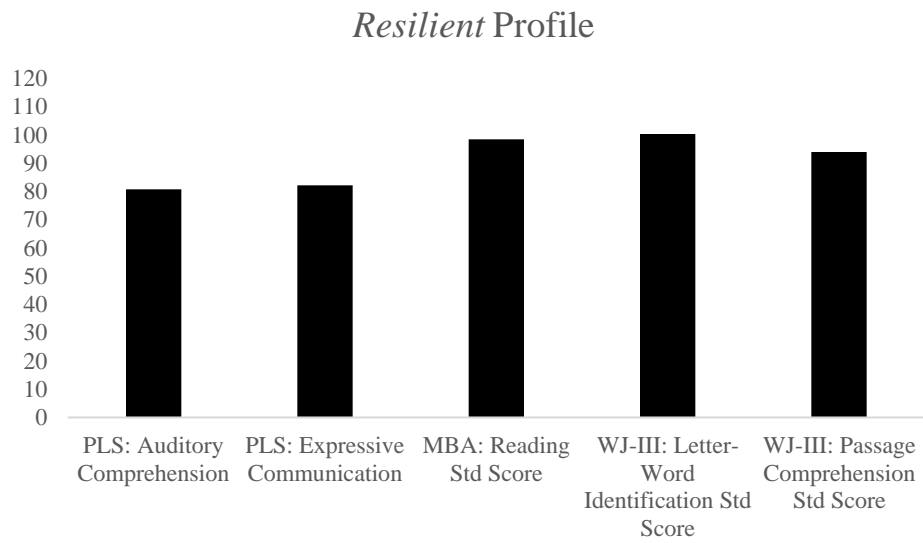
Variable	At-Risk		Expected	
	<i>OR</i>	<i>p</i>	<i>OR</i>	<i>p</i>
Age	1.38	0.78	0.80	0.69
Sex Assigned at Birth	0.17	0.11	0.52	0.15
Substantiation	5.34	0.10	2.48	0.12
Chronic Health Problems	2.94	0.19	3.83	0.08
HOME: Cognitive Simulation	1.12	0.54	1.34	0.02
HOME: Emotional Support	0.80	0.51	0.80	0.24
VABS: Daily Living	0.91	0.01	1.01	0.46
TSCC: Trauma Symptoms	0.99	0.77	1.00	0.91

Figure 4.1: Three Profile Model



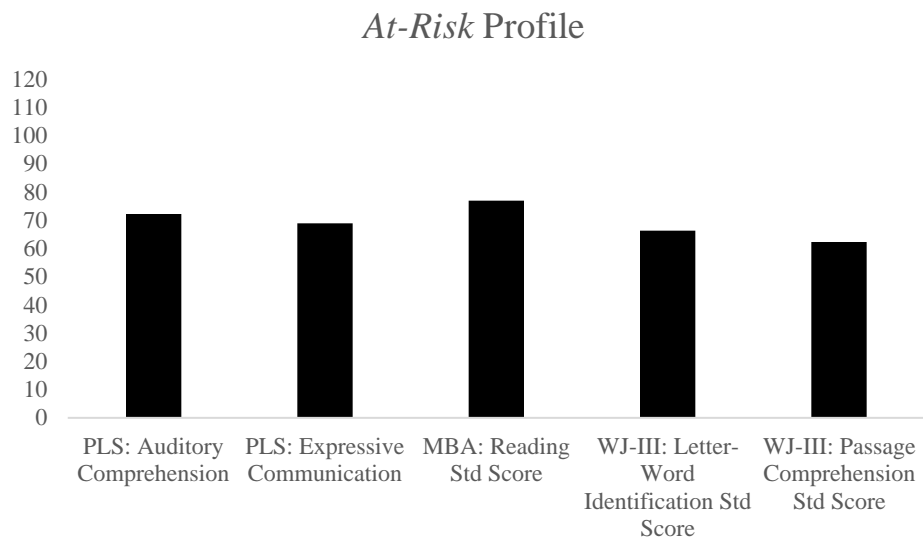
Note. X-axis represents standard scores. Y-axis represents language and reading scores for this profile.

Figure 4.2: Resilient Profile



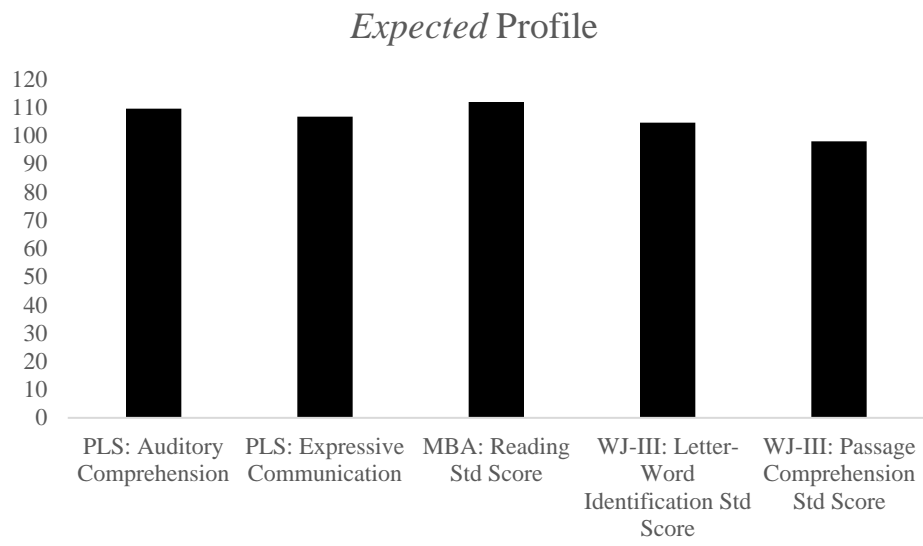
Note. X-axis represents standard scores. Y-axis represents language and reading scores for this profile.

Figure 4.3: At-Risk Profile



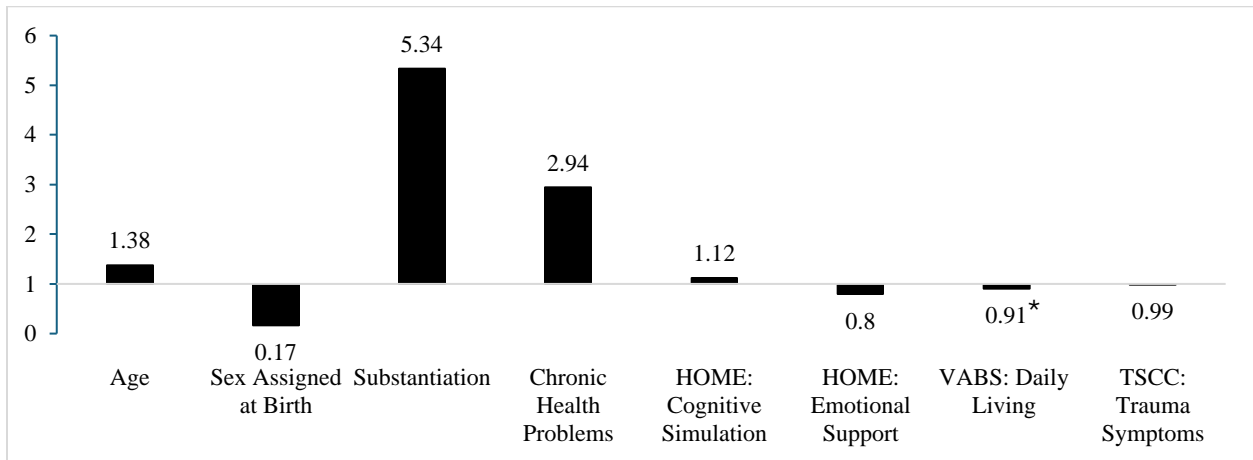
Note. X-axis represents standard scores. Y-axis represents language and reading scores for this profile.

Figure 4.4: Expected Profile



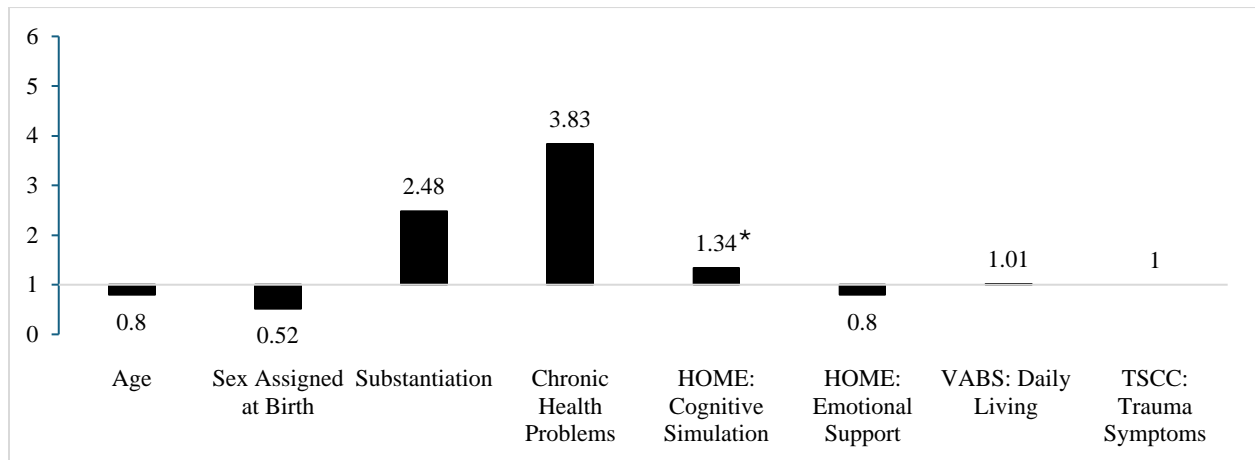
Note. X-axis represents standard scores. Y-axis represents language and reading scores for this profile.

Figure 4.5: Odds of Being in the At-Risk Profile Compared to the Resilient Profile



Note: Values correspond to odds ratios for each child- and context-level factor included as covariates. * $p < .05$

Figure 4.6: Odds of Being in The Expected Profile Compared To The Resilient Profile



Note: Values correspond to odds ratios for each child- and context-level factor included as covariates. * $p < .05$

CHAPTER 5

Overall Discussion

Summary of the Current Projects

The current projects investigated the relationship between language, reading, maltreatment exposure, and various child- and context-level factors associated with this relationship. Paper 1 attempted to investigate whether maltreatment exposure impacted language and reading needs in these children and whether needs in both domains were related to one another. This investigation found evidence that early language abilities predicted later reading abilities in children exposed to maltreatment; specifically, auditory processing skills at age three and vocabulary knowledge at age six independently predicted reading scores in word recognition and reading comprehension at ages eight to 11. In addition, over 20% of the sample presented with reading needs by elementary school. Together, these findings suggested that children exposed to maltreatment may present with language needs (Lambros et al., 2010; Miller & Santos, 2020), which may be related to their reading needs later on. Paper 1 was also interested in whether affected cognitive functioning impacted the relationship between language and reading in these children. However, risk of cognitive disability did not predict later reading abilities, suggesting the relationship between language and reading persists regardless of disability status. Finally, Paper 1 also found that certain child- and context-level factors (i.e., age, sex assigned at birth, race/ethnicity, poverty exposure, and substantiation) predicted reading skills at ages 8 to 11, while language skills at ages three and six did not when all were included in a single model. These findings suggest that other factors may impact the relationship between language and reading in children exposed to maltreatment and speak to the need to consider the holistic experience of children when investigating cognitive and academic domains.

Paper 2 attempted to investigate whether cognitive functioning, measured by vIQ and nvIQ, was stable in children exposed to maltreatment and whether there were heterogeneous IQ trajectories could be found in these children. This investigation identified three trajectories of vIQ and nvIQ in children exposed to maltreatment. Over time, children classified into the high-stable trajectory had average vIQ and nvIQ scores. This class included the largest proportion of children (93%). Such findings are encouraging and speak to the possibility of resiliency in cognitive functioning after maltreatment exposure (Yoon et al., 2023). Children classified into the *increasing* trajectory (6%) had vIQ and nvIQ scores that increased over time. These children showed drastic growth in both vIQ and nvIQ over time after the CPS investigation. Interestingly, children in the *increasing* trajectory were more likely to live in emotionally supportive homes than children in the *high-stable* trajectory. These findings may speak to recovery of cognitive skills after maltreatment exposure (Koenen et al., 2003), possibly due to improved environmental factors, such as a more emotionally supportive home (Chamberland et al., 2015; Yoon et al., 2023).

The *low-unstable* trajectory included the children with affected cognitive functioning in both vIQ and nvIQ and the smallest sample of children (1.2%). Specifically, these children demonstrated a slight increase in vIQ and nvIQ scores between Waves 1 and 3 but saw a decrease again at Wave 4. Overall, children in this trajectory scored similarly to children exposed to maltreatment in previous investigations (Matte-Landry et al., 2023). Children classified in this trajectory were more likely to have chronic illnesses compared to children in the *high-stable* trajectory. Such findings align with previous research that children with chronic illnesses are more likely to present with affected cognitive functioning outcomes (Hardy et al., 2017), highlighting how children classified in this trajectory may be at increased risk for adversity, such

as health problems. Having said this, very few children exposed to maltreatment were classified into the *low-unstable* trajectory, an encouraging finding considering that investigations often identify these children as having highly affected cognitive functioning (Young-Southward et al., 2020). Overall findings from Paper 2 suggest that heterogeneous IQ trajectories may exist in samples of children exposed to maltreatment and that certain child- and context-level factors may speak to differences in experiences that result in varied IQ trajectories.

Paper 3 investigated different profiles of early language and reading developmental patterns in children exposed to maltreatment. Specifically, this investigation intended to identify whether language and reading needs were related in these children and whether various profiles of language and reading needs existed in this sample. This investigation also attempted to identify child- and context-level factors involved in the relationship between language, reading, and maltreatment. This investigation identified three profiles of early language and later reading developmental patterns. Children classified into the *resilient* profile had lower early language scores but unaffected reading scores later. This profile included over 50% of children in the sample, suggesting that this profile of language and reading abilities may be a shared experience among children exposed to maltreatment. Such findings may indicate the possibility of resilience in reading needs for children exposed to maltreatment (Yoon et al., 2023), such that some children demonstrate language needs that do not develop into later reading needs.

Nearly 10% of the children were classified into the *at-risk* profile, in which children scored below average on early language and reading assessments over time. Children classified within this profile had a higher proportion of substantiated cases and were more likely to have cognitive disabilities, signaling an accumulation of risk factors that may have exacerbated children's language and reading needs. Indeed, children exposed to maltreatment with cognitive

disabilities are at an increased risk for executive functioning (Chen et al., 2020) and academic needs (De Bellis et al., 2013), highlighting the increased risk of academic needs in children in this profile. Despite these risk factors, children classified under this profile were also more likely to live in homes with more cognitive stimulation than children in the *resilient* profile. It may be that the increased opportunity for cognitive stimulation for children in this profile is part of an attempt at cognitive intervention to support cognitive development (Votruba-Drzal & Miller, 2016; Zhai et al., 2010) as a resilience and protective factor for children exposed to maltreatment (Yoon et al., 2023),

The *expected* profile included children with average language and reading developmental patterns (39%). This is a particularly encouraging finding, considering much of the maltreatment literature argues that these children have affected language and reading needs (e.g., Hong et al., 2018; Selin et al., 2022). Children classified within the *expected* profile reported higher daily living skills and a very low proportion of children with cognitive disabilities, highlighting how children in this profile may have been better equipped to care for themselves (Stabel, 2013) and engage in cognitive tasks, such as reading and math (Barnes et al., 2020). Taken together, these findings signal that children in this profile were at reduced risk of severe overall impact of maltreatment. Overall, Paper 3 found evidence for heterogeneity in language and reading needs in children exposed to maltreatment, as well as possible child- and context-level factors that may be associated with profile membership.

Evidence of Language as A Central Component of the Reading System

Findings from these investigations provide evidence that language is a central component of the RSF as a dynamic system (McNamara & Magliano, 2009). Indeed, auditory comprehension (Paper 1), expressive communication (Paper 1, 3), and vocabulary (Paper 1, 2)

all positively correlated with word identification and reading comprehension. Auditory comprehension is considered a form of comprehension (Wolf et al., 2019) in which listeners use information to build accurate mental models like reading, though without accessing text (Hogan et al., 2014). Indeed, skills such as inferencing and connecting information to form mental models are required for both auditory and reading comprehension (Hogan et al., 2014; Kintsch, 2005). Expressive communication similarly contributes to reading comprehension (Hjetland et al., 2017) by utilizing linguistic knowledge and language processes necessary for comprehension (Ebert & Scott, 2016). Finally, vocabulary knowledge is essential to building mental models (Hogan et al., 2014; Kintsch, 2005) and contributes to word identification and reading comprehension by supporting the automatic activation of word meanings from memory (Perfetti, 2010; Tunmer & Chapman, 2012). A reader's vocabulary, or lexicon, is also crucial to adequate word reading and learning (Perfetti & Stafura, 2014), emphasizing the importance of having a "high quality" vocabulary in reading outcomes (Perfetti & Stafura, 2014; p. 26).

Profiles of Reading and Language Needs in Children Exposed to Maltreatment

These investigations yielded various profiles of needs in samples of children exposed to maltreatment (see Appendix B), though differences in these profiles were not immediately apparent. Results of Paper 1 revealed that the sample means for reading were average, indicating that children exposed to maltreatment in this sample had largely unaffected reading skills at ages eight to eleven. However, nearly 50% of children scored at least one standard deviation below the mean on language skills at age three, and almost 20% of the sample scored at least one standard score below the mean on language scores at age 6, indicating that though some children presented with language needs that persisted while others presented language needs that recovered. These findings suggested that different profiles of language and reading needs existed

over time in children exposed to maltreatment.

Paper 3 then revealed heterogeneous samples of language and reading needs in children exposed to maltreatment. Nearly 90% of the sample presented with unaffected reading abilities later (i.e., *resilient* and *expected* profiles, Paper 3), possibly explaining the average reading scores in Paper 1. Despite these average reading scores, over 50% of the sample had lower early language scores (i.e., *resilient* profile; Paper 3), suggesting that some children exposed to maltreatment presented with language needs but that these needs did not develop into reading needs. This finding aligns with previous evidence that children with DLD who overcome their phonological awareness and language issues by preschool (Adlof et al., 2022) are at reduced risk of developing reading needs later (Snowling & Hulme, 2021) and suggests that many children exposed to maltreatment may fall into such disability profile. Paper 3 also revealed that nearly 10% of the children in the sample presented with both language and reading development needs (i.e., *at-risk* profile), suggesting that some children exposed to maltreatment with early language needs develop into reading needs later on. Such findings highlight the potential for several reading and language needs profiles in these children and suggest that some children are at more risk of needs in these domains than others.

No profiles of children with only word identification or reading comprehension specific needs were identified, indicating that children with impairments in one were likely to also present with impairments in another (Paper 1, 3). In terms of reading, children exposed to maltreatment with reading needs in these samples would be considered “overall poor readers” (Catts et al., 2014). In terms of language, children exposed to maltreatment these samples presented with DLDs, including auditory processing, expressive communication (Paper 1, 3), and vocabulary needs (Paper 2). These findings align with previous evidence suggesting that

children with DLDs language needs also tend to be poor readers (Hogan et al., 2014; Sharma et al., 2009).

The Effect of Child Maltreatment Exposure on Reading as a Dynamic System

These investigations provided some evidence for how maltreatment as a context-level factor impacts reading and language as an associated mechanism. In these investigations, language predicted reading skills in children exposed to maltreatment (Paper 1), though not all children with language needs also presented with reading needs later (Paper 3). These findings support the argument that though language and reading needs often overlap (Snowling et al., 2020), they are two separate domains (Snowling & Hulme, 2021) and, thus, may be differentially affected by maltreatment. Having said this, there was no evidence that reading needs existed without language needs in these populations (Paper 1, 3), suggesting that language may be impacted directly by maltreatment, which then may or may not go on to affect reading skills.

This investigation also provided some evidence for how maltreatment can impact reading development. The above findings suggest that while some children may demonstrate reading needs across development after maltreatment exposure, others appear resilient to such effects (Paper 3). However, this is less the case for language needs, in which some samples included over 50% of children exposed to maltreatment with affected language skills (i.e., *resilient* and *at-risk* profiles; Paper 3). Thus, though reading development may be disrupted for some children exposed to maltreatment, it is more likely that these children will demonstrate affected language development. Such findings highlight how dynamic change from maltreatment as an adverse context-level factor can affect the individual mechanisms within the system but not the system overall (Connor, 2016).

These investigations complicated the relationship between language, reading, and

maltreatment. Indeed, they found that child- and context-level factors, such as race, ethnicity, age (Paper 1), chronic health problems and cognitive stimulation at home (Papers 2, 3) affected the relationship between language and reading in children exposed to maltreatment. This is in line with previous evidence that suggests that child- factors, such as age and gender, and context-level factors, such as home placement and caregiver education level, can affect cognitive, social, and emotional domains in children exposed to maltreatment (Widom, 2014; Yoon et al., 2023). Such findings highlight the holistic impact maltreatment can have on cognitive skills and the complexity of the relationship between language and reading after maltreatment exposure.

Addressing Empirical Questions About the Relationship Between Maltreatment Exposure, Language, and Reading

These investigations identified heterogeneity in language and reading needs in children exposed to maltreatment. Some children presented with language and reading needs (Paper 1, 3), while others had only language needs (Paper 3). This suggests that while language and reading needs may coexist in children exposed to maltreatment, language needs do not always indicate later reading needs. These findings underscore that needs in one domain do not necessarily imply needs in another (Snowling et al., 2020). However, as there were no profiles in which reading needs existed without early language needs, reading needs may be contingent upon language needs in this population (Paper 3). These findings highlight the importance of language skills and development for children exposed to maltreatment and emphasize the need for individualized education to address the diverse profiles of language and reading needs in these children.

Second, these investigations found little evidence that children exposed to maltreatment present with cognitive needs that impact reading directly. Paper 1 found that developmental delays did not predict later reading needs, suggesting that cognitive functioning did not affect the

relationship between language and reading. In addition, Paper 2 found that 1% of children exposed to maltreatment presented with affected IQ, indicating that few children exposed to maltreatment in this sample presented with overall cognitive needs. This investigation also identified an *increasing* trajectory in which children demonstrated accelerated growth in both vIQ and nvIQ (Paper 2). This suggests that some children with affected cognitive functioning may overcome cognitive needs with proper intervention and experience “cognitive catch-up” with their non-maltreated peers (Young-Southward et al., 2020, p. 13). Thus, findings from Paper 2 indicated the limited impact cognitive functioning may have on the relationship between language and reading in these children.

In addition, findings from Paper 3 may have begun to identify differences between children with a predisposition for cognitive functioning needs who were exposed to maltreatment from children with needs as a result of maltreatment exposure only. In Paper 3, children with both language and reading needs were more likely to report a cognitive disability (i.e., *at-risk* profile). Such comorbid needs in language, reading, and cognitive domains may demonstrate increased severity in disability impact (Barnes et al., 2020), affecting cognitive functioning beyond external influences. In contrast, children with only language needs reported far fewer children with cognitive disabilities (i.e., *resilient* profile; Paper 3), suggesting less overall cognitive impact in this profile (Barnes et al., 2020). In addition, profiles did not differ in trauma symptoms (Paper 3), suggesting that the overall toll of maltreatment and the academic outcomes as a result of mental health needs would be similar (Leonard et al., 2016). Taken together, these findings indicate that children in the *resilient* profile may demonstrate superficial needs as a result of maltreatment exposure, while children in the *at-risk* profile may demonstrate overall increased cognitive impact as a result of a predisposition to cognitive disabilities in addition to

maltreatment exposure. In comparison, the *resilient* profile may represent children demonstrating affected cognitive domains as a result of maltreatment exposure. Though these children may require intervention at some point, evidence suggests that these children may be more cognitively resilient (Yoon et al., 2023) and thus more receptive to intervention.

Third, these investigations found that substantiation may need to be considered when investigating cognitive outcomes in samples of children exposed to maltreatment. Though previous investigations have found that children with substantiated and unsubstantiated cases score similarly on IQ and other cognitive functioning assessments (A. A. Scarborough et al., 2009), Papers 1 and 3 found differences in profile classification based on substantiation status. In addition, this investigation found that substantiation correlated with language, reading, and vIQ (Papers 1, 2, and 3), suggesting that it may be related to language and reading needs in these children. Such findings align with more recent findings that children with different substantiation statuses may differ in domains such as internalizing behaviors (Kugler et al., 2019). However, issues with maltreatment substantiation during CPS investigation persist, and it can be difficult to know if substantiation is related to actual risk or other factors, such as racial bias (Dettlaff et al., 2011). Thus, though this context-level factor may be linked to language and reading needs in children exposed to maltreatment, more information about maltreatment substantiation practices and better data collection about this process may help improve research about how it affects academic and cognitive outcomes.

Finally, as mentioned, these investigations found no evidence that trauma symptoms affected the relationship between language, reading, and maltreatment (Paper 3). Though previous investigations have found that trauma symptoms are related to other domains, such as engagement (Mullins & Panlilio, 2021, 2023), these investigations did not find a relationship

between trauma symptoms, language, or reading in children exposed to maltreatment. Though trauma correlated with some language and reading scores, they did not predict profile membership (Paper 3), suggesting that children in different profiles did not differ in trauma symptoms. These findings suggest that other measures of maltreatment may be better assessments of the emotional impact of maltreatment, such as a multidimensional characterization of child maltreatment (Selin et al., 2022). Research should include measures of maltreatment severity (i.e., the actual or threat of physical or psychological harm), frequency (i.e., the number of events), chronicity (i.e., the length of time and the developmental stages affected), or dosage (i.e., the negative impact of increased frequency or chronicity of maltreatment) to capture maltreatment experiences accurately (Alvarado et al., 2023; Jackson et al., 2019; Kavanaugh & Holler, 2014). However, despite the importance of these factors, investigations have “yet to parse out whether and how maltreatment dimensions interact to affect language acquisition” (Alvarado et al., 2023; pg. 9), and few studies have measured these maltreatment characteristics. Thus, measures should assess details in maltreatment experiences to disentangle how individual experiences impact language and reading comprehension in these children.

Implications For Research

These investigations uncovered several empirical questions to help guide future research. These investigations posit there is heterogeneity in language and reading domains, as well as overall cognitive functioning in children exposed to maltreatment. Considering the exploratory nature of these investigations, making any implications or decisions based on these investigations alone is discouraged (Lubke & Muthén, 2005). Questions remain as to whether

similar profiles of language and reading needs exist in other samples of children exposed to maltreatment. Additional confirmatory studies must replicate these findings (Lubke & Muthén, 2005) and continue investigating individual mechanisms that maltreatment may affect. Future investigations are encouraged to build datasets including information about cognitive domains, as well as child- and context-level factors, to have a better understanding of the holistic experiences of children exposed to maltreatment. When building such datasets is not available, researchers should prioritize using large, representative samples that include various child- and context-level factors in addition to cognitive outcomes to help improve the interpretability and generalizability of results.

In addition, this investigation identified that some children exposed to maltreatment with language needs continue to present with reading needs, while others do not (Paper 1, 3). Though these investigations speculate why this may be, additional research must unpack the individual differences between children demonstrating resiliency in cognitive domains and children needing additional support. Indeed, though it was previously suggested that language needs for children in the resilient profile are a direct result of maltreatment, it could be that children in this profile have a predisposition for DLDs with phonological awareness and language issues by preschool and are at reduced risk of developing reading needs later (Adlof et al., 2022; Snowling & Hulme, 2021). Thus, to unpack nuanced differences between these profiles, additional research should focus on disentangling the impact of maltreatment from predispositions toward cognitive disabilities. Future investigations should continue to include child- and context-level factors, such as child race and ethnicity, substantiation (Paper 1), chronic health problems (Paper 2, 3), home environment (i.e., cognitive stimulation and emotional support), and cognitive disability (Papers 2, 3), to understand better how these and other factors may affect the relationship

between language and reading in children exposed to maltreatment. Doing so may provide insight into the factors that provide resiliency to improve language and reading needs for these children.

Finally, future investigations should consider utilizing measures of language and reading that help promote causal pathway research to continue to unpack the overall relationship between reading, language, and maltreatment. In the current exploratory investigations, receptive and expressive language and vocabulary measures were used as the only available language measures in preschool. Though these have been used as proxies for linguistic measures (Wolf et al., 2019), language samples assessing mean length utterance may be a better measure of developmental language disorders than receptive and expressive language assessments, considering they may be better assessments of overall language skills (Alvarado et al., 2023). Duplicating such investigations using grammar assessments as language measures may help the reliability of these investigations and offer more support for the interconnected nature of reading, language, and maltreatment. Future investigations should also continue to parse apart individual mechanisms of reading as best as possible. Continuing to include measures of word identification and reading comprehension can help elucidate individual differences in reading needs related to language and maltreatment (Ferrara et al., 2023) and help understand profiles of language and reading needs in these children.

Implications for Trauma-Informed Practices

Trauma-informed practices consider the personal, mental, and inter-relational distress caused by trauma (Cavanaugh, 2016) to ensure children's and practitioners' (e.g., case workers, teachers, counselors) physical, psychological, and emotional safety (Hornor et al., 2019).

Trauma-informed practices are structured around knowledge of trauma and its impact on the

student when designing learning environments and interventions (Cavanaugh, 2016; Ernest et al., 2022) and provide instructional support to improve child-professional interactions and prevent retraumatizing students (Cavanaugh, 2016).

Child Welfare

The child welfare system can undertake a tiered approach when providing services for families at the onset of CPS investigations. Within a trauma-informed multitiered system of support (MTSS) framework (Chafouleas et al., 2016), a universal prevention approach may be implemented for children who have a history of child welfare system involvement, while more specific support may be provided for children and families exhibiting additional risk factors, such as internalizing or externalizing behaviors. Addressing emotional and behavioral needs through trauma-informed MTSS (Chafouleas et al., 2016), with options such as emotional support (Panlilio et al., 2018) and counseling (Brassard et al., 2009), may offer more opportunities for these children to attend intervention early (Gersten et al., 2001; McNamara & Magliano, 2009).

In addition, child welfare may use an MTSS framework to support caregivers and offer families services to promote cognitive development in children. For example, caregivers can support language development by engaging in at-home language interventions such as communication tactics for parents or education classes that educate parents on cognitive, language, and socio-emotional skills (Jeong et al., 2021). In addition, caregivers can help intervene with reading needs by engaging in reading and literacy activities (Sim et al., 2014). Further, caregivers may benefit from interventions, such as home visits, that specifically include opportunities to learn more about emotional support (Casillas et al., 2016; Shenk et al., 2017; Van Der Put et al., 2018). Despite these many options, resources can be limited. Thus, including

such options as part of an MTSS framework may offer opportunities for children and families exhibiting the most need.

SPLED

These investigations provide evidence that children exposed to maltreatment may require SPLED support for IQ, language, or reading needs at some point and highlight the importance of introducing trauma-informed practices. Indeed, some evidence suggests that children exposed to maltreatment with IQ, language, and reading needs may be the most vulnerable and may require additional support beyond academic intervention. Interventions for children exposed to maltreatment should include mental health and behavior management support to ensure that children can and want to persist (Gersten et al., 2001). Once children are identified as having experienced maltreatment, an MTSS approach can be taken to address trauma symptoms (Margolius et al., 2020). Children exposed to maltreatment may benefit from trauma-focused psychotherapy (Kavanaugh & Holler, 2014) to address internalizing and externalizing behaviors resulting from trauma (Cavanaugh, 2016). Opportunities for cognitive rehabilitation commonly used for traumatic brain injuries can also help support neurocognitive deficits due to maltreatment (Kavanaugh & Holler, 2014).

MTSS frameworks already utilized to address literacy needs in these children may also benefit children exposed to maltreatment. Indeed, the presence of three distinct profiles in Paper 3 provides evidence that children within this sample may follow the same relative proportion of students who require services across the three tiers of MTSS. Children in the *expected* profile would likely benefit from universal prevention strategies (i.e., tier 1; Harris et al., 2023). In contrast, children classified in the *at-risk* profile may require more intensive and effective literacy instruction, as well as language support, to ensure developmental catch-up (i.e., tier 3,

Harris et al., 2023). Such findings speak to the overall benefit of an MTSS intervention approach for these children.

A Theoretical Framework to Understand Reading, Language and Maltreatment

This proposed model conceptualizes how the impact maltreatment may have on reading at ages eight and older and language as a reading-related process for children exposed to maltreatment age three and younger based on previous literature and the three investigations included in this dissertation (See Appendix C). The first box, labeled “Maltreatment,” is meant to indicate the exposure to child maltreatment. This event sets off a cascade of events that may impact a child’s language and reading skills. After exposure to maltreatment, children are then exposed to a variety of child- (e.g., chronic illness) and context-level (e.g., cognitive stimulation at home) factors. Such exposures can directly impact language skills, such as phonological and morphological awareness and syntax skills. The arrow indicates this impact, which represents time passing as the child ages and becomes more adept at language. As these children age, they continue to be exposed to child- and context-level factors, indicated by the arrow. These factors continue to impact language skills, but they also begin to affect reading skills as such abilities are developed in elementary school. Thus, children exposed to maltreatment may build reading skills that are primarily impacted by the disruption of language much earlier in their education.

An important finding of these investigations was that while some children exposed to maltreatment presented challenges in reading and language in line with previous literature, there were also children who did not present with such needs in each study. Thus, based on the evidence from these papers, I hypothesize that there are three possible outcomes for children exposed to maltreatment. First, almost 40% of children may children exposed to maltreatment present with sufficient unaffected reading and language skills. Thus, these children may be

exposed to more positive child- and context-level factors after maltreatment exposure. Second, nearly 50% of children exposed to maltreatment present with mixed language and reading needs. Indeed, all of these children present with language needs typically, suggesting that these children may be exposed to more negative child- and context-level factors earlier on. Regarding reading, some of these children do not present with needs. In contrast, others do, suggesting that some children may be exposed to more positive child- and context-level factors longer after maltreatment exposure. Third, some children present with highly affected language and reading outcomes over time in children exposed to maltreatment. Although this may be the smallest percentage of children exposed to maltreatment (10%), these children are likely those at highest risk for SPLED education and life-long impacts of maltreatment.

A challenge with testing this model is that children will see “positive” and “negative” child- and context-level factors differently; not all children find the same things helpful or hurtful. Thus, to study this, more work needs to be conducted investigating the lived experiences of children exposed to maltreatment to establish more accurate measures of positive and negative influences.

Conclusion

Considered together, these papers found that some children exposed to maltreatment may or may not present with language and reading needs. Indeed, the findings from these three investigations overwhelmingly speak to an overall resiliency in children exposed to maltreatment in a variety of cognitive domains. Such findings indicate that these children may indeed recover cognitively after maltreatment exposure and emphasize the need to identify ways in which to encourage such cognitive recovery. Understanding how individual differences in child- and context-level factors affect the relationship between language and reading in these children may

improve the identification and support of these children and inform future research about cognitive and academic needs in this population.

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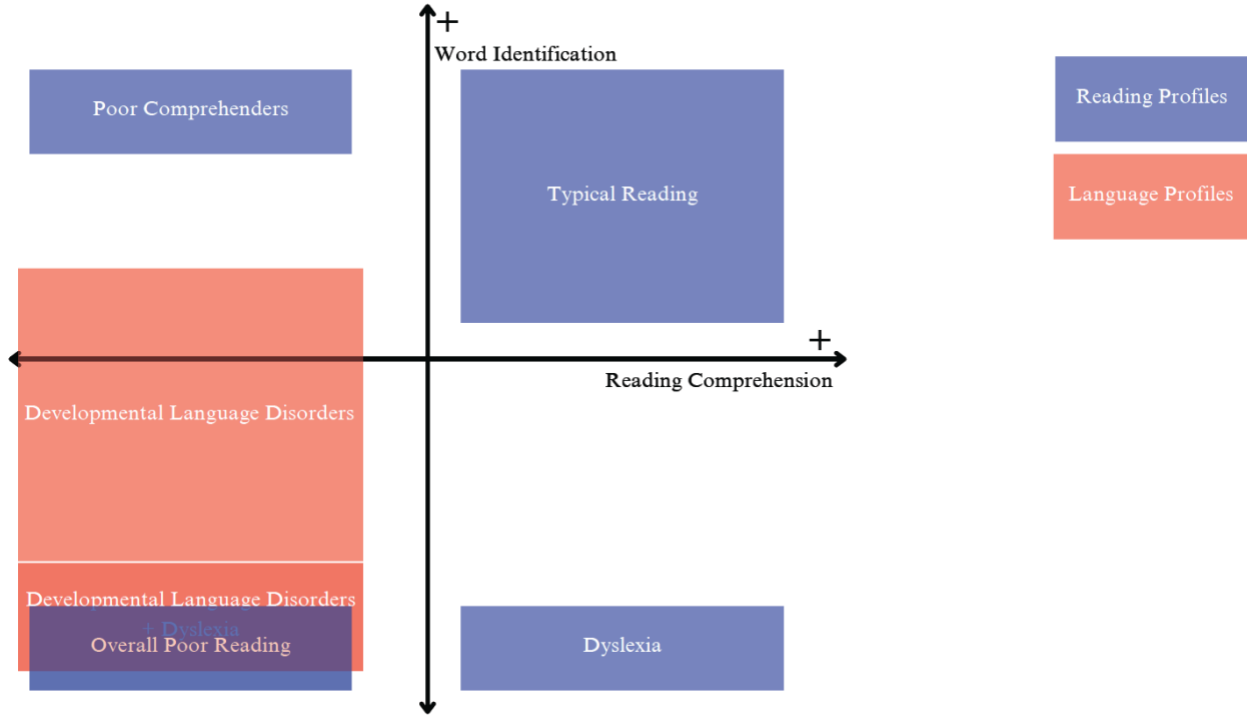
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APPENDICES

Appendix A

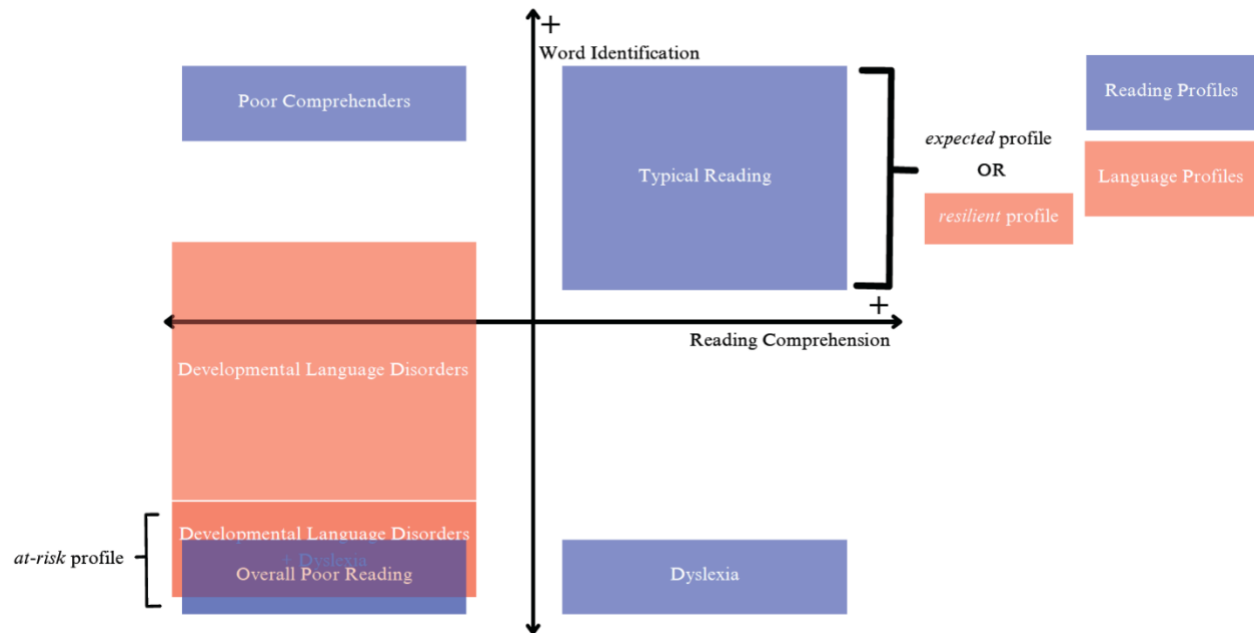
Reading and Language Need Profiles



Note. Four quadrants depicting different profiles and language and reading needs. Axes refer to word identification and reading comprehension processes. Blue boxes indicate reading profiles. Red boxes indicate language profiles and associated reading concerns, if applicable.

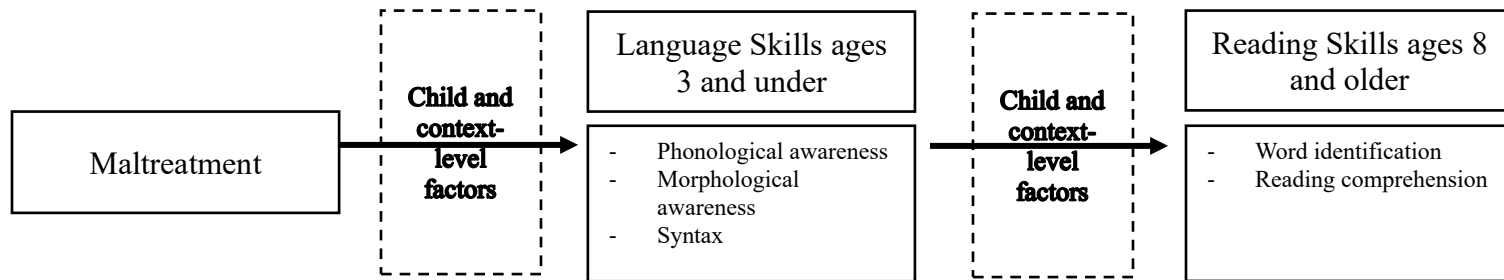
Appendix B

Reading and Language Need Profiles of Children Exposed to Maltreatment



Note. Four quadrants depicting different profiles and language and reading needs. Brackets indicate where different profiles early language and reading developmental patterns in children exposed to maltreatment.

Appendix C



Note. A conceptual model of how maltreatment exposure can affect language at ages three and under and later reading in children ages eight and older.

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Research Experience

Graduate Research Assistant, The Survey Research Center, University Park, PA 2022-2024
Graduate Assistant, Trauma Informed Pedagogy, Penn State, University Park, PA 2020-2022
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Teaching Experience

Learning Specialist, The Rashi School, Dedham, MA 2024
Teaching Assistant, Undergraduate Research Training Program, Penn State, PA 2021
Teaching Assistant, Dean's GA for Engaged Scholarship & Research in Ed. 2020

Presentations and Publications

Ellner, S., Selin, C., & Panlilio, C. (2023, April). *Verbal and nonverbal intelligence development in children with maltreatment histories*. Poster presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Ellner, S., Selin, C., & Panlilio, C. (2023, April). *Language skills predicting later reading achievement for welfare-involved children*. Poster presented at the annual meeting of the American Educational Research Association, Chicago, IL.

Ellner, S., Ferrara, A. M., & Panlilio, C. C. (2022, August). *Relationship between receipt of accommodations and childhood maltreatment in college students*. Poster presented at the 130th Annual Convention of the American Psychological Association, Minneapolis, MN.

Ellner, S. (2022). Self-regulated learning: In real life. *AERA SIG: Studying and Self-Regulated Learning*. 5(1), 10.

Ellner, S., & Knox, J. (2022). Multigenerational Reflections on APSAC—Thirty-Five Years in Review: An Interview with Deborah Daro. *Advisor*, 35(1), 17–21.