January 2019

The Influence Of Household Chaos And The Home Language Environment On Preschool-Age Children's School Readiness

Laura Mary Northerner
Wayne State University, lnortherner@yahoo.com

THE INFLUENCE OF HOUSEHOLD CHAOS AND THE HOME LANGUAGE ENVIRONMENT ON PRESCHOOL-AGE CHILDREN'S SCHOOL READINESS

by

LAURA MARY NORTHERNER

DISSERTATION

Submitted to the Graduate School

of Wayne State University,

Detroit, Michigan

in partial fulfillment of the requirements

for the degree of

DOCTOR OF PHILOSOPHY

2019

MAJOR: PSYCHOLOGY (Clinical)

Approved by:

_____

Advisor Date

_____

_____

_____

_____

DEDICATION

I dedicate my dissertation to my family.

Marland, when we got married eighteen years ago I was a recent college graduate with a major in English working in a bakery. A lot has changed since then! Everything seems possible with you by my side, and I am excited to see what the future holds next.

Samuel, Jonah and Oliver, I hope you see that you are never too old to follow your dreams. I know you will soar!

Dad and Mom, you are my greatest champions, and I am incredibly fortunate to have you as my parents.

ACKNOWLEDGEMENTS

To my advisor, Dr. Christopher Trentacosta: Thank you for choosing me to be in your research lab! Throughout this graduate school experience, I have reflected many times on how lucky I am to have such a brilliant, kind, and hard-working advisor. I have learned a tremendous amount from you.

To my committee members, Dr. Douglas Barnett, Dr. Marjorie Beeghly and Dr. Erika Bocknek: Your input, suggestions and ideas were instrumental in the development of this project.

To the Family Emotions Lab and the many talented research assistants: Your dedication to the lab is invaluable. I am especially grateful to the coding team who worked tirelessly to code and transcribe thousands of audio files.

To the participants, the mothers and their children: Thank you for allowing us to come into your homes. I am incredibly appreciative of your openness and willingness to participate in this study.

To my husband, Marland Moore: You are the greatest spouse and an amazing father to our beautiful boys, Samuel, Jonah and Oliver. Thank you for taking this journey with me. Without your endless help and encouragement this path would not have been filled with such joy, love, and fun.

To my parents, Ralph and Mary Northerner: Thank you for believing in me since the day I was born. I am incredibly grateful for the love and support you have provided me throughout my life. Mom, these graduate school years were made exponentially easier knowing that my sons were often in your hands when I was studying, in class or on internship. Their immense love for you reflects the unconditional love you have given them. And a special shout-out for the t-shirts you made for the participants to wear. Tiny fingers could no longer remove the iPods and data collection improved. You are my hero!

Finally, to my children, Samuel, Jonah and Oliver: Thank you for keeping me present and mindful. No matter how many tasks I was juggling in graduate school, you always reminded me that it was important to stop and play.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION

Study Context

In 1990, a National Education Goals Panel was established by the United States government to move towards the goal that "all children in America will start school ready to learn" (Shore, 1998, p. 5). One challenge that has persisted towards this goal is defining school readiness. Simply put, school readiness is a child's preparedness to learn upon entry into kindergarten (Lewit & Baker, 1995); however, the components, or factors, contributing to school readiness have been debated throughout history. In the 1950s, cognitive skills were considered the measure and standard of school readiness (Zigler & Bishop-Josef, 2006). This conceptualization of school readiness was eventually considered too simplistic, and when Head Start was introduced in 1965 a more holistic view of school readiness emerged (Zigler & Bishop-Josef, 2006). The Head Start founders' conceptualization of school readiness included multiple domains, such as children's motivation, social-emotional development, health, cognition, as well as academic preparedness (Raver, 2003; Raver & Zigler, 1997; Zigler & Trickett, 1978; Zigler & Bishop-Josef, 2006). This multidimensional construct has expanded even further and now includes the aforementioned factors, as well as qualities of the family, the home environment, and the surrounding community (Blair, 2002). Furthermore, research has indicated that measures of school readiness predict later achievement (Duncan et al., 2007; La Paro & Pianta, 2000). This suggests that school readiness is a meaningful indicator of a child's preparedness for school entry, as well as an important predictor of later academic success (Duncan et al., 2007).

Though school readiness includes multiple domains, most often cognitive and pre-academic skills are the focus of research. For example, research by Claessens, Duncan, and Engel (2009) found that basic academic skills at kindergarten entry predicted fifth-grade

achievement. Meta-analytic research by Duncan et al. (2007) found support for school-entry math, reading and concentration as being important predictors of later academic achievement. Likewise, meta-analytic research by La Paro and Pianta (2000) found a moderate effect size for the academic/cognitive domain of school readiness on early school outcomes. More recently, executive functioning has been included as an aspect of cognitive readiness for school. Executive function is an integral aspect of self-regulation and it includes working memory, inhibition, and mental flexibility (Garon, Bryson & Smith, 2008), all of which are important goal-directed processes that enable a child to remember, think before they act, and remain focused and attentive in class (Razza & Raymond, 2014). In a large nationally representative sample of children between the ages of 5 and 17 years old, executive functions and academic achievement, specifically math and reading skills, were highly correlated (Best, Miller, Naglieri, 2011), and executive functions have been found to predict reading, writing, and math skills (Neuenschwander, Röthlisberger, Cimeli, & Roebers, 2012). In summary, extensive research has provided support for the importance of early cognitive and academic readiness in later academic achievement.

Children's social and emotional skills are also considered important components of school readiness (Raver, 2003). Social-emotional competence is described as a child's ability to maintain a positive engagement with peers/teachers, as well as positive, regulated emotions; these are viewed as important contributors to a child's success in a classroom (Denham, 2006). For example, Fantuzzo, Bulotsky-Shearer, McDermott, and McWayne (2007) investigated social-emotional behavior and school readiness in low-income urban Head Start children and found that two social-emotional dimensions, regulated behavior and academically disengaged behavior, predicted early mathematic ability, as well as overall classroom competency. The

regulated behavior dimension included positive loadings on attention and attitude toward learning, and negative loadings on inattentive/hyperactivity and aggression (Fantuzzo et al., 2007). Regulated behavior was related positively to mathematic ability and classroom competency (Fantuzzo et al., 2007). In contrast, the academically disengaged behavior dimension, which included withdrawn behavior and social reticence, was found to be negatively related to mathematic ability and classroom competency (Fantuzzo et al., 2007). Social-emotional competence also includes the ability to understand emotions, and research by Izard et al. (2001) found that emotion knowledge predicted positive and negative social behavior, as well as academic competence in a low-income sample of children.

Although social-emotional competence is viewed as important for academic success, meta-analytic evidence has been somewhat weak with either no support (Duncan et al., 2007) or small effect sizes (La Paro & Pianta, 2000). The rather small and weak effect sizes may be due to the primarily indirect associations between social-emotional competence and academic achievement. More specifically, research suggests that the role of children's social and emotional skills in later academic achievement might be mediated by attention, as well as other early learning-related behaviors (Rhoades, Warren, Domitrovich, & Greenberg, 2011; Trentacosta & Izard, 2007). Rhoades et al. (2011) found that the relationship between preschool emotion knowledge and first grade academic achievement was mediated by kindergarten attention skills in an economically disadvantaged sample. In a low-income, urban sample, Trentacosta and Izard (2007) found that the relationship between teachers' ratings of kindergarteners' emotion regulation and children's first grade academic competence was mediated by teachers' ratings of children's attention. In summary, although cognitive and pre-academic aspects of readiness tend to be more robustly linked to later achievement, social-emotional aspects of readiness are also

important to examine. Therefore, the current study focused on multiple aspects of school readiness, including both cognitive (e.g., academic, executive functioning, vocabulary) and social-emotional components.

There are a number of difficulties and barriers that children face, which can impact their development and subsequent readiness for school. In a large national sample of kindergarten teachers, 46% of the teachers reported that children entering kindergarten had difficulty following directions, 36% said students lacked academic skills, 34% said the students came from disorganized home environments, 30% of the teachers noted children's difficulty working in groups, 20% said the children had problems with social skills, and 13% said that students had difficulty communicating/language problems (Rimm-Kaufman, Pianta, & Cox, 2000). These teachers' judgments suggest that kindergarten teachers are perceiving multiple problems and barriers across domains, such as home, peer interactions and school that are influencing cognitive and social-emotional school readiness at school entry (Rimm-Kaufman et al., 2000). An ecological perspective emphasizes the impact and importance of multiple contexts (e.g., school, peers, home, neighborhood) on children's development, and specifically their school readiness (Rimm-Kaufman & Pianta, 2000). The physical home environment is an important context that can influence children's development directly and indirectly (Evans, 2006). Therefore, the current study examined the impact of multiple characteristics of the home environment, especially household chaos and the language within the home, on the development of multiple indicators of children's school readiness, including cognitive skills (e.g., academic, executive functioning, vocabulary) and social-emotional competence (e.g., emotional knowledge, social-emotional protective factors).

Additionally, school readiness is particularly important to study in the context of poverty and at-risk populations. Numerous studies have found that poverty can negatively impact children's school readiness and language development (Ryan, Fauth, & Brooks-Gunn, 2006). The poverty gap in school readiness emerges as early as 9 months, is notable by 24 months (Halle et al., 2009), and this gap grows larger by kindergarten entry (Duncan et al., 2007). Children and families living in poverty are facing social inequalities and are more likely to encounter stressors that impact school readiness, and later academic success (McLoyd, 1998). More cumulative risk across infancy and toddlerhood has been found to significantly predict children's lower school readiness (Pratt, McClelland, Swanson & Lipscomb, 2016).

The poverty gap in school readiness can be seen in both cognitive and social-emotional aspects of school preparedness (Halle et al., 2009). For example, research has found that children growing up in poverty are more likely to enter school with delays in social-emotional skills (Bierman et al., 2008). One study exploring language and behaviors of 3-year-old children in Head Start found that 40% of the children were delayed on social-emotional competencies, and the children with these delays were more likely to have lower language scores (Kaiser, Hancock, Cai, Xinsheng, Foster, & Hester, 2000). However, it is also important to note that many children living in poverty and experiencing stressors have numerous resiliencies and enter school prepared across school readiness domains, despite facing social inequalities. This study examined the impact of features of the home environment on school readiness in an at-risk population of low-income families.

Home Environment

The home environment is comprised of multiple facets, including, but not limited to, the home learning environment and household chaos. Both of these facets appear to play important roles in the development of children's readiness for school.

In the bio-ecological model, interactions in the immediate environment are referred to as proximal processes (Bronfenbrenner & Evans, 2000).

> A proximal process involves a transfer of energy between the developing human being and the persons, objects, and symbols in the immediate environment. The transfer may be in either direction or both; that is, from the developing person to features of the environment, or in both directions, separately or simultaneously (Bronfenbrenner & Evans, 2000, p. 118).

The characteristics of the environment are thought to influence the power and direction of the proximal processes (Bronfenbrenner & Evans, 2000). At a proximal level, parents are important teachers to their children and parents structure the home learning environment, which influences developmental outcomes (Rodriguez & Tamis-LeMonda, 2011). A stimulating home learning environment was found to be directly associated with school readiness, as well as indirectly associated with school readiness through its impact on language development; this process was found to be primarily environmental rather than genetic (Forget-Dubois et al., 2009). A key aspect of the home learning environment is a high-quality language environment; the current study explored the home language environment and its impact on children's school readiness. Household chaos, another aspect of the home environment that includes characteristics such as lack of structure and unpredictability, is thought to impact exposure to proximal processes, thus potentially interrupting them and threatening dysfunctional developmental outcomes in children

(Bronfenbrenner & Evans, 2000). The current study explored both broad and specific characteristics of household chaos, and examined its impact on children's school readiness.

Household Chaos

Household chaos is thought to comprise of two main constructs: instability and disorder (Evans & Wachs, 2010). Within the physical home environment, Wachs and Evans (2010) described household disorder as being characterized by noise, overcrowding, and lack of structure and routines. Instability has been conceptualized as household moves, people moving in and out of the home, and changes in parent figures (Ackerman, Kogos, Youngstrom, Schoff, & Izard, 1999). The present study is focused on indicators of disorder/disorganization within the home. While household chaos exists across socio-economic status, in comparison to more affluent homes, low-income family home environments have been found to be more chaotic, unpredictable, noisier, and crowded (Evans, 2004). Factors such as shifting work schedules, single parenting, financial insecurity, and less resources have been found to contribute to the differences in household chaos across socio-economic statuses (Bronfenbrenner & Evans, 2000; Vernon-Feagans, Garrett-Peters, Willoughby, Mills-Koonce, and the Family Life Project Key Investigators, 2012). Despite these numerous challenges, there are still many families with lower incomes that maintain orderly homes with consistent, predictable, routines. Research has found that chaos influences children's development in a number of ways (Wachs & Evans, 2010). Early research focused specifically on noise levels, and suggested that children in highly noisy homes habituate to sounds in the home, including language, and therefore miss out on the benefits of the language in the home (Cohen, Glass, & Singer, 1973). Research by Cohen et al. (1973) measured the decibels of sound specific to traffic noise in a high-rise housing, and found that children living in the lower floors showed greater deficits in auditory discrimination and impairment in

reading skills than children living on the higher floors, which had less traffic noise inside the home. This early research captured noise naturalistically through the measurement of sound decibels outside and inside of the participants' housing (Cohen et al., 1973). This research also illuminated the interaction of noise and language in the home.

More recent research using broader measures of chaos have found that chaos in the home influences development by reducing quality parenting, especially in the areas of responsiveness, involvement, and language (Wachs & Evans, 2010). In a study by Vernon-Feagans, Willoughby, and Garrett-Peters (2016), household chaos was found to have a direct effect on parenting behaviors, such as parental responsiveness, which in turn had a direct effect on behavioral regulation in kindergarten. Additional mechanisms have also been proposed, such that chaos interferes with the children's development of self-regulation skills, emotional and behavioral control, and attention regulation (Wachs & Evans, 2010). For example, in research by Evans, Gonnella, Marcynyszyn, Gentile, and Salpekar (2005), parental self-report of household chaos was found to mediate the relationship between poverty and socio-emotional development.

Research has also found that chaos is associated with children's cognitive outcomes (Ackerman & Brown, 2010). One study of twins in middle- to upper-class families found that parent-report of household chaos was negatively associated with children's pre-academic knowledge (Micalizzi, Brick, Flom, Ganiban & Saudino, 2019). A longitudinal study of twins found that SES and parent-report of household chaos predicted children's cognitive ability, as well as accounted for a significant proportion of the shared environmental variance on a cognitive test (Hart, Petrill, Deckard, & Thompson, 2007). Another longitudinal twin study found SES and household chaos predicted behavioral and cognitive adjustment when the children were four years old (Pike, Iervolino, Eley, Price, & Plomin, 2006). Research by Hur,

Buettner, and Jeon (2015) found that household chaos was directly and negatively associated with children's cognitive skills (including measures of academic school readiness) and behavioral self-regulation, as well as positively associated with behavior problems and social-emotional deficits. In all of these studies, chaos was measured via a parental self-report measure (Hart et al., 2007; Hur et al., 2015; Pike et al., 2006).

In addition to impacting children's cognitive outcomes, household chaos has been found to impact children's language development. Chaos within the home predicted poorer receptive and expressive language in a sample of low-income, rural children assessed from 2-months to 36 months old (Vernon-Feagans et al., 2012). The researchers identified two composites of chaos: household disorganization and household instability (Vernon-Feagans et al., 2012). Household disorganization included household overcrowding, TV exposure, household cleanliness, preparation by the family for a home visit and neighborhood noise, and it predicted both receptive and expressive language abilities (Vernon-Feagans et al., 2012). Instability included changes in relationships and settings in the home, as well as irregular routines (Vernon-Feagans et al., 2012). This research points to the important relationship between chaos within the home and children's language development. In addition to focusing on broad measures of chaos, research has focused on specific components of household chaos, such as noise, overcrowding, and lack of rituals and routines.

Household Noise. As mentioned above (Cohen, et al., 1973), household noise has long been considered a factor that could interfere with child development, and it is one aspect of household chaos. Household noise can include noise from inside the house (e.g., TV, people talking over each other) and noise from outside the house (e.g., traffic noise, neighborhood noise). Early research found that ambient noise, measured via research observation and a sound

meter, had a negative association with infant's cognitive development, and this was particularly true for boys and children with difficult temperaments (Wachs, 1986). Wachs (1986) also found that this relationship was mediated by noise interfering with both language development and the development of attentional mechanisms. High noise levels appear to interfere with information-processing skills, which then can impact attention, reading, and language skills (Evans, 2006; Heft, 1979; Wachs & Evans, 2010). In comparison to a matched control group of children not exposed to high noise levels, children chronically exposed to elevated noise levels performed poorer on reading comprehension tasks (Haines, Stansfeld, Job, Berglund, & Head, 2001).

Television, a specific type of noise inside the home, has also been found to relate negatively to children's developmental outcomes. Television exposure has been linked to attention problems (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004; Landhuis, Poulton, Welch, & Hancox, 2007). In a longitudinal study, television exposure at ages one and three, as self-reported by mothers, was associated with attention difficulties at age seven in a nationally representative sample (Christakis et al., 2004). Research by Martin, Razza, and Brooks-Gunn (2012) on a diverse sample of urban families found that, based on maternal report, children whose TV was generally on in the house at the age of two scored higher on attention and aggressive problems at age five.

Television exposure has also been found to relate to school readiness (Pagani, Fitzpatrick, Barnett, & Dubow, 2010; Wright et al., 2001). Research by Wright et al. (2001) collected diaries of television viewing over three years in two cohorts: from age two to five, and from age four to seven. In both cohorts, children who frequently watched general-audience entertainment programs performed poorer on school-related readiness measures and receptive language skills (Wright et al., 2001). Another study found that television exposure when the children were 29

months old predicted less classroom engagement and poorer math achievement in the fourth grade (Pagani et al., 2010).

Household Crowdedness. Household overcrowding is also considered a characteristic of chaos, and is often measured by the number of people in the house per rooms; crowding has been found to be associated with negative childhood outcomes (Evans, 2006). In a longitudinal study of urban children, household overcrowding had a negative effect on academic readiness and on behavior problems (Solari & Mare, 2012). A study that investigated the impact of household overcrowding on children's school readiness in Latin America, found that overcrowding was significantly negatively associated with children's math and reading achievement in the 6th grade (Contreras, Delgadillo & Riveros, 2019). In research that investigated a sample of children between the ages of ten to twelve years old in India, children in crowded homes had more behavioral adjustment problems at school, as well as lower academic standing than their counterparts living in less dense housing (Evans, Lepore, Shejwal, & Palsane, 1998). In a sample in France, the probability of being held back a grade in primary or junior high school increased as the number of people per room in a house increased, regardless of overall family size or SES status (Goux & Maurin, 2005).

Family Rituals. An aspect of a less chaotic home environment is participation in family routines and rituals. Routines and rituals provide structure and predictability, which are key to stability in the home (Evans, Eckenrode & Marcynyszyn, 2010; Spagnola & Fiese, 2007). Family routines specify what behavior needs to be done and occur with a relatively high frequency (Fiese, 2006). Family rituals hold symbolic significance within a family's culture, are less frequent than family routines, and are social interactions where people have prescribed roles (Fiese, 2006; Fiese & Kline, 1993). Additionally, rituals occur at predictable times and places,

such as family mealtime, on the weekends, or during annual celebrations/holidays (Fiese, 2006; Fiese & Kline, 1993). The present study is focused on family rituals. Research has suggested that stable and consistent rituals within the home are protective and beneficial to children's development (Spagnola & Fiese, 2007). For example, research has found that parents' report of rituals, specifically rituals that helped connect the family to past generations, was related to toddlers' increased distress regulation (Bocknek, 2018). Rituals have also been found to relate to children's academic achievement. A longitudinal study conducted by Fiese (2002) followed families over the course of five years starting when the children were four years old. Fiese (2002) found that children in families that were committed to family rituals and followed them stably across time performed higher on academic achievement measures than children whose families had either low levels of rituals, or had declining rituals across time. Spagnola and Fiese (2007) wrote, "When routines are disrupted, it may be a hassle; when rituals are disrupted, family cohesion is threatened" (p. 285). Family routines and rituals can be difficult to maintain when parents work low-wage jobs, which are often marked by less autonomy, more irregular schedules and frequent changes (Evans et al., 2010). These barriers can impact a family's ability to have, for example, dinner together regularly, thus impeding consistent dinnertime rituals. Yet many parents working low-wage jobs still maintain consistent and stable rituals, even with these additional barriers.

Home Language Environment

Children's exposure to language is an especially important aspect of the home learning environment, and the quality and quantity of language can vary greatly across homes. Early research by Hart and Risley (1995) found significant differences in children's exposure to language from infancy to three years old across the homes of higher SES, middle/lower SES, and

what they described as “welfare families.” The researchers transcribed and coded over 1,318 hours of audio recordings across 42 American families over two years (Hart & Risley, 1995). Based on averages of the words observed in the homes, linear extrapolation suggested that the average child from a professional (high SES) family was exposed to 215,000 words of language experience in a week, while the average child from a working-class family was exposed to 125,000 words, and the average child from a family on welfare was exposed to 62,000 words (Hart & Risley, 1995).

Moreover, the researchers found that the quality of the language varied within the homes (Hart & Risley, 1995). They found that children in the families on welfare heard more discouragements (e.g., “don’t,” “stop,” “shut up,” “quit”) and less encouragements (e.g., “right,” “good”) than children in working-class and professional families; thus, the sheer number of utterances varied within the homes, as well as the content of the discourse (Hart & Risley, 1995). These findings corresponded with a widening gap in the vocabulary growth of the children in the study (Hart & Risley, 1995). When the children were three years old, the researchers measured the children’s vocabulary growth, vocabulary use, and IQ, and they found that parent talkativeness (e.g., all utterances said within an hour) was strongly related to the children’s vocabulary growth, vocabulary usage, and general accomplishments, as measured by the Stanford-Binet Intelligence Scale (Hart & Risley, 1995). Additionally, they found that aspects indicating the richness of language (e.g., variety of vocabulary) was also associated with these outcome measures (Hart & Risley, 1995). This study indicated that differences in language within the home are associated with childhood outcomes, such as receptive and expressive language, as well as academic success and academic failure (Britto, 2001; Greenwood, Thiemann-Bourque, Walker, Buzhardt, & Gilkerson, 2011; Hart & Risley, 1995).

Greenwood et al. (2011) sought to replicate and extend the work of Hart and Risley (1995) by using the Language Environment Analysis (LENA) system, an audio recorder and speech processing software, in the homes of middle- and upper-class families. A number of the researchers' findings were similar to those of Hart and Risley (1995); moreover, the researchers found a positive association between children's expressive and receptive language and child vocalizations and conversational turns, again supporting the importance of the home language environment in children's development (Greenwood et al., 2011).

Though Hart and Risley (1995) conducted a seminal naturalistic study, the researchers emphasized between group differences, and some have questioned the study's assertion that the children in the welfare families would hear over 30 million words less than children from professional families. A more recent study sought to replicate Hart and Risley's (1995) research; the researchers did not find strong support for between group differences across SES, and instead found significant variation in language within SES groups (Sperry, Sperry, & Miller, 2018). This longitudinal study examined extant data across five time points from the 1970s to the 1990s among 42 families living in five different American communities (Sperry et al., 2018). Sperry et al. (2018) reported a range of SES including 14 poor children, 22 working-class children, and 6 middle-class children; thus, the researchers' sample did not include upper-class children as Hart and Risley (1995). Sperry et al. (2018) coded language spoken in 157.5 hours across the families. When the researchers compared the primary caregiver's mean number of words spoken to their child to those found in Hart and Risley (1995), they found no clear pattern related to SES (Sperry et al., 2018). Overall, the researchers found weak support for a relationship between SES and words addressed to the children when analyzing primary caregiver's mean number of words spoken to the target child (Sperry et al., 2018). When the researchers expanded the language to

include mean number of words spoken by all caregivers they found that children in some of the poor and working-class communities had an advantage in words heard over middle-class children (Sperry et al., 2018). Furthermore, this study found considerable variation in language within each SES group (Sperry et al., 2018). This more recent study highlights that within group differences can be vast and meaningful, and it also emphasized that lower SES families have a wide breadth of language quantity spoken in the home. Given early research and more recent findings, the current study examined multiple aspects of language in the home and its relationship to children's school readiness.

Features of Quality Language in the Home. Naturalistic research has investigated what it is specifically within the home language experience that might facilitate or hinder children's development; overall and mean length of utterances, as well quality of the language have emerged as two of the important aspects of the home language environment. Early studies have indicated that children of more advantaged and educated parents are exposed to more language and have greater verbal abilities and vocabulary size than their counterparts with less advantaged and less educated parents (Hart & Risley, 1995; Hoff-Ginsberg, 1991; Ninio, 1980). However, more recent research suggests that this gap might not be as pronounced as this early research suggests, and that within group variability is vast (Sperry et al., 2018). In addition, studies have provided evidence that the relationship between SES and children's language development is explained, in part, by the content and type of the parent's speech (Hoff, 2003). Child-directed speech has been found to be particularly important (Hoff & Tian, 2005; Rowe, 2008; Weisleder & Fernald, 2013). Rowe (2008) found that the child-directed speech of parents from a higher SES had a greater vocabulary size, longer utterances, more overall words spoken, as well as less directives than the lower SES parents, and these communication patterns were associated with

children's larger vocabulary size. The researchers found that the relationship between SES and child-directed speech was mediated by parents' knowledge of child development (Rowe, 2008). Hoff (2003) examined the maternal speech of mid- and high-SES mothers and their toddler-aged children and found that the high SES mothers had more utterances, a higher mean length of utterances, more word types, and more topic-continuing replies to their children than mid-SES mothers. Furthermore, mean length of utterances mediated the relationship between SES and child vocabulary size (Hoff, 2003). These studies have pointed to the importance of both the quantity of words heard in the home, as well as the expansiveness of parental vocabulary in the development of children's language abilities.

Other research has focused on more nuanced aspects of language within the home that appears to relate to children's language development. Weizman and Snow (2001) found that mother's use of sophisticated words (e.g., vehicle, tusks, gulping, predictability) when the children were five years old related to the children's vocabulary performance in kindergarten and again in 2nd grade, above and beyond the quantity of language used by the mothers. In addition to "sophisticated" vocabulary, mother verbal scaffolding (e.g., using questions, labeling emotions) has also been found to be an important feature of the home language environment (Dieterich, Assel, Swank, Smith, & Landry, 2006). Dieterich et al. (2006) found that mother verbal scaffolding when their children were three-years-old predicted later decoding and comprehension skills. An even more specific aspect of parental speech, *wh*-questions, have also emerged as an important language feature utilized by parents (Rowe, Leech, & Cabrera, 2016). In a sample of low-income African American fathers and their toddler children, researchers found that the overall quantity of words used did not relate to children's vocabulary or reasoning skills; however, the fathers' use of *wh*-questions did relate to both outcomes (Rowe et al., 2016).

Finally, there are additional factors that relate to children's vocabulary and language development including mother's education level (Hoff & Tian, 2005) and father's speech (Pancsofar & Vernon-Feagans, 2006). The current study included whether fathers were present in the home as a covariate.

Emotion Language. In addition to quality (e.g., vocabulary) and quantity (e.g., talkativeness) of language within the home, the emotional content of the speech is also of particular note in relationship to children's social-emotional competence. Emotion language is part of the emotion socialization of children and the development of emotion regulation (Calkins & Mackler, 2011). There is a broad array of research on the importance of emotion language in the home as it relates to child outcomes. Many of the research studies utilized experimental designs, in either the laboratory and home, as well as detailed, nuanced coding systems (Brophy-Herb et al., 2015; Brownell, Svetlova, Anderson, Nichols, & Drummond, 2013; Denham, Cook, & Zoller, 1992; Denham, Zoller, & Couchoud, 1994; Garner, Dunsmore, Southam-Gerrow, 2008; Garner, Jones, Gaddy, & Rennie, 1997). Another way to examine emotion language in the home is naturalistically; this research often includes a researcher visiting the home to observe the family as they engage in a typical routine (Denham & Kochanoff, 2002; Denham, Mitchell-Copeland, Strandberg, Auerbach, & Blair, 1997; Dunn, Brown, & Beardsall, 1991; Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991). For example, Dunn et al. (1991) audio recorded and transcribed conversations in the home of mothers, their 36-month old children, and siblings. The researchers coded a number of aspects of the conversations, including feeling states (e.g., "happy," "sad") used by the speaker within the conversations (Dunn et al., 1991). The researchers found that children in families that frequently engaged in feeling-state talk were better at making judgments of the emotions of unfamiliar adults and better at an affective

perspective-taking task than children with a lower frequency of feeling-state talk (Dunn et al., 1991). Naturalistic observations of the emotion language have evolved further with new tools. The Electronically Activated Recorder (EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001), a tool that unobtrusively samples audio in a naturalistic setting, as well as the Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001) system, a computerized text analysis program, have been used in previous research to examine children's day-to-day use of negative affective words (Slatcher & Trentacosta, 2011; Slatcher & Trentacosta, 2012). Though these studies coded and measured negative affective words spoken by the children, the current study applied this same procedure to naturalistically measure the emotion language spoken by the adult caregivers in the home.

Language and Household Chaos

Language spoken within the home and household chaos do not appear to work in isolation; these constructs seem to interact together to influence children's development. The early research by Hart and Risley (1995), which collected over one thousand hours of audio recordings of families in various SES, noted such a relationship with regards to family size in a home, which is a key aspect of household overcrowding. Hart and Risley (1995) wrote, "Family size made a difference because, to our surprise, more people present did not lead to more talking; each person just got a lesser share, including the baby" (p. 62). This observation illuminates the connection between features of the home environment and language development.

Research has focused on the direct impact of various aspects of household chaos on early reading and language development. In a sample of middle-class twins, Johnson, Martin, Brooks-Gunn, and Petrill (2008) examined the relationship between household chaos and early reading achievement. The researchers conducted factor analysis of the Confusion, Hubbub, and Order

Scale (CHAOS; Matheny, Wachs, Ludwig, & Phillips, 1995), and two components emerged: household confusion (e.g., lack of order) and household noise. Johnson et al. (2008) found that early reading was associated with household confusion, but not associated with household noise. This was contrary to previous research studies, which have found that early reading skills and language were affected by noise (Evans & Lepore, 1993). Overall, these studies suggest that various aspects of chaos may operate on language and reading skills differently, even within different samples (Brooks-Gunn, Johnson, & Leventhal, 2010).

Though previous research has explored the impact of household chaos on early reading skills and language, less research has investigated features of the home language/literacy environment as a mechanism between household chaos and aspects of school readiness. Research by Evans, Maxwell and Hart (1999) found that parents were less verbally responsive in overcrowded homes, which then accounted for less diverse speech in their children. Longitudinal research by Martin et al. (2012) explored pathways that link specific measures of household chaos to developmental outcomes. Specifically, the researchers investigated the independent contributions of five indicators of household chaos (noise, crowding, family instability, lack of routine, and television usually on) on children's receptive vocabulary, attention and behavior problems, and effortful control. The indicators of chaos were measured when the children were two years old, and the outcome measures were obtained when the children were five years old (Martin et al., 2012). The researchers found that children with a lack of routines scored lower on receptive vocabulary and delay of gratification, and children in homes with the television generally on scored lower on aggression and attention problems, even after controlling for the other indicators of household chaos (Martin et al., 2012). Furthermore, the researchers tested two mediators of the relationship between indicators of household chaos

and the developmental outcomes; the two mediators tested were maternal warmth (e.g., mother's praise of child during visit) and the provision of learning materials (e.g., toys, books and games in the home that promote learning) all measured via the HOME Inventory (Martin et al., 2012). Here the researchers found that the provision of learning materials mediated a small part of the relationship between routines and receptive vocabulary, such that mothers who reported fewer routines scored lower on having age-appropriate learning materials in the home, and, in turn, fewer learning materials in the home predicted lower receptive vocabulary abilities (Martin et al., 2012). This research points to both the importance of the independent contributions of household chaos indicators, and the importance of understanding the mechanisms through which chaos impacts children's development. The current study expanded on the research by Martin et al. (2012) by considering whether features of quality language within the home environment might function as mechanisms linking household chaos and children's school readiness.

Current Study

A majority of the existing research on household chaos focuses on self-report measures and, with less frequency, research assistants' observations. Therefore, the current study expanded on the research by collecting multiple measures of household chaos, including parental self-report, research assistants' observations, as well as naturalistic observations via the EAR. This tool allowed the current study to uniquely sample specific aspects of household chaos, such as noise in the home, and television and electronic noise. In addition, this study also coded for more general features of household chaos using these naturalistic observations. Moreover, the current study measured naturalistic features of the home language environment (e.g., talkativeness, emotion language) via the EAR and the LIWC system. Though there is a breadth of naturalistic research evaluating language quality in the home environment, this study added to the research

by utilizing these tools to study both features of household chaos and the home language environment. The current study then examined the impact of both features of household chaos and features of the language quality in the home on children's school readiness. This study examined multiple aspects of school readiness (e.g., cognitive and social-emotional outcomes), thus employing a broad conceptualization of this construct. Furthermore, few studies have evaluated the mechanisms through which household chaos impacts children's school readiness. As such, the current study explored whether language quality within the home might function as a mechanism through which household chaos impacts children's school readiness.

Aims and Goals

1. This first aim was to explore the feasibility of uniquely measuring household chaos with the EAR, and examine how this assessment of household chaos relates to more traditional measures of household chaos (e.g., self-report, research assistant observations). Therefore, the sub aims were as follows:

    a. Establish the feasibility of measuring both specific (e.g., television noise, electronic noise, noisiness of each audio sample) and global aspects of household chaos using the EAR.

    b. Investigate whether these naturalistic observations of household chaos via the EAR are related to the self-report measures of household chaos, as well as the observations of household chaos made by the research assistants at the time of the home visit.

2. The second aim examined whether household chaos, including measures of specific facets and overall measures of household chaos, contributes to cognitive and social-emotional measures of school readiness. The specific hypotheses were as follows:

a. The main hypothesis was that higher overall levels of household chaos were expected to predict lower cognitive and social-emotional school readiness.

b. A secondary aspect of this aim was to look at specific aspects of household chaos (e.g., noise, household overcrowding, lack of rituals) and examine how these specific features are related to school readiness outcomes. Based on the literature, some of these features of household chaos appear to be related to certain aspects of school readiness (e.g., executive functioning, verbal ability, academic readiness) (Christakis et al., 2004; Evans, 2006; Solari & Mare, 2012; Wachs & Evans, 2010). For example, household overcrowding has been found to have an effect on academic readiness (Solari & Mare, 2012), noise has been found to impact attention (Evans, 2006; Heft, 1979; Wachs & Evans, 2010), and TV noise specifically has been linked to attention problems (Christakis et al., 2004).

3. The third aim was to examine the impact of the language quality within the home on measures of school readiness. As such, talkativeness and emotion language used by adults within the home were examined as predictors of measures of school readiness. Specific hypotheses were as follows:

a. Higher levels of the adults' talkativeness would predict children's greater receptive vocabulary.

b. Greater use of emotion language by adults in the home would predict greater social-emotional competence in the children.

c. Exploratory analysis was conducted to investigate whether use of positive and negative emotion words operate differently when predicting social-emotional competence.

4. The purpose of the fourth aim was to build on research that has explored mechanisms through which household chaos impacts children's development (Martin et al., 2012). As such, it was hypothesized that less quality language in the home would mediate the association between household chaos and poorer school readiness. Figure 1 shows the aims of the study.

CHAPTER 2: METHODS

Overview

The current study recruited participants from Toddlers' Emotional Development in Young Families (TEDY Study; PI: E. Bocknek), an earlier study of children between the ages of 24 and 30-months and their families, as well as the University-Parent Partnership (UPP) registry. For the purpose of this study, the families participated in a home-visit assessment when the children were between 3 ½ and 4 ½ years old. The goal of the current project was to examine the relationship between features of the home environment and school readiness. The influence of the physical environment (e.g., noise, chaos, overcrowding), as well as the influence of language in the home learning environment were explored.

Study Design and Setting

Participants. Originally, the current study anticipated a sample size of 100 as part of the recruitment plan for a broader study from which these data were drawn (Wayne State University IRB# 022815B3F; PI: C. Trentacosta). Power analysis for a linear multiple regression model was conducted in G-POWER to determine a satisfactory sample size using an alpha of 0.05, a power of 0.80, a total number of four predictors, and an effect size of $f^2 = 0.15$, which is a medium effect size (Faul, Erdfelder, Buchner & Lang, 2008). Based on these assumptions, the desired sample size was 77.

The current study had planned to only recruit from the TEDY study, but expanded recruitment mid-way through data collection to include participants from the UPP registry to attempt to reach an adequate sample size. Due to logistical challenges with recruiting families that largely stemmed from difficulty contacting families (e.g., disconnected phone numbers), the current project completed a total of 55 home visits with African-American mother-child dyads from the TEDY (n = 47) and UPP (n = 8) recruitment sources.

The current study assessed the children (males = 29, females = 26) at approximately 3.83 years (M age = 46.27 months, SD = 3.53). Approximately 60% of the mothers reported a household income of $15,000 or less per year. About 27% of mothers reported working full-time, 20% worked part time, 35% were not employed, 15% reported being on disability or unable to work, and about 2% were students. Education history was collected from 38 participants. Of those participants, approximately 13% completed part of high school, approximately 37% graduated high school/obtained GED certificate, approximately 32% attended part of college, about 13% completed a 2-year degree and about 5% completed college. Similarly, preschool/daycare information was collected from 38 participants. Of those 38 participants, approximately 34% (n = 13) reported that their children were in a preschool or daycare for an average of 32 hours per week in settings such as preschool, home daycare, and Head Start.

Procedure. Home visits began in January of 2016, and for the purpose of this study, the visits ended in July of 2018. The current study utilized measures obtained when the children were between 3 ½ to 4 ½ years old. Trained research assistants visited the homes. At the home visits, consent was obtained. Additionally, the caregivers completed a demographic interview, and various self-report questionnaires, including a measure of household chaos, a measure of

children's social-emotional protective factors, and a measure of family rituals. Children completed measures of school readiness, cognitive abilities, emotion knowledge, and executive functioning. Lastly, the research assistants' setup the EAR "app" and instructed the parent on use of the EAR. The child wore the EAR for approximately two days within the following week. The EAR "app" runs through an iPod Touch device and has an internal microphone. In the current study, the EAR "app" was setup to record 30 seconds of sound every nine minutes. Approximately one week later, research assistants returned to collect the EAR and the audio files were transcribed and coded by trained research assistants. The families were compensated for participating in this study.

Measures of Interest.

Cognitive School Readiness.

Pre-academic knowledge. The Bracken School Readiness Assessment – Third Edition (BSRA-3; Bracken, 2007) was used to measure the children's pre-academic school readiness. Five subtests measure the following academic school readiness categories: colors, letters, numbers, counting, sizes, comparisons, and shapes. These core concepts have been found in literature to be relevant to the success of a child upon entry into formal education. The BSRA-3 was individually administered to the child, and the test took approximately 10-15 minutes to administer. It is a receptive measure; during administration, the examiner asked the child to point to images that demonstrate the concept. The BSRA-3 can be administered to children from 3 years, 0 months to 6 years, 11 months. Standard scores, with a mean of 100 and a standard deviation of 15, were obtained.

Vocabulary. The Peabody Picture Vocabulary Test (PPVT-4; Dunn & Dunn, 2007) is a norm-referenced test that was used to measure the children's receptive verbal language abilities.

Four images were presented to the child on each test item. Then the examiner asked the child to point to the picture that best shows the word that was being tested. It assesses twenty content areas (e.g., vegetables, actions) and parts of speech (e.g., nouns, attributes). The PPVT-4 was administered individually to the child by a trained research assistant. It took approximately 10-15 minutes to complete. The test can be administered to individuals age 2 years and 6 months through 90 years and older. Standard scores, with a mean of 100 and a standard deviation of 15, were obtained.

Executive function. The children attempted to complete three executive function computer tasks contributed by Willoughby, Blair, Wirth, and Greenberg (2012). Throughout these tasks, the child was seated at a table in front of a touchscreen monitor. The child was guided through the tasks by a trained research assistant. All three tasks had a training trial that was administered by the research assistant. If during the training trial a child did not understand the task, then the research assistant proceeded to the next task. Each task took approximately 5 minutes to complete, and they were administered in succession.

The first task, a working memory (WM) span Houses task is based upon principles outlined by Engle, Kane, and other collaborators (e.g., Conway et al., 2005). In the Houses task, the child was presented with a line drawing of an animal and a colored dot; these images were located inside an outline of a house. The child was asked to name the animal and color. The following screen showed the same outline of the house and the child's task was to tell the examiner what animal lived in that house. This task included three training trials and 24 scored trials. During this task, the child had to temporarily hold in mind information (animal and colored dot) and then recall the animal, while simultaneously disregarding the interference created by the colored dot that was also originally presented in the house.

Something's the Same (STS) was the second task and it was modeled on the Flexible Item Selection Task (FIST) created by Jacques and Zelazo (2001). This computerized task was a measure of attention shifting. The child was presented with two-line drawn items that were similar in shape, size, or color. The research assistant would draw the child's attention to what makes these two items similar by stating, "See, here are two pictures. The pictures are the same, they are both (cats, blue, big, etc.)." Next, the child saw a screen with those same two line-drawn items, and in addition, a third item that was similar to the original items presented. The research assistant stated "See, here is a new picture. The new picture is the same as one of these two pictures. Show me which of these two pictures is the same as this new picture?" There were three training trials and then 25 scored trials.

Silly Sounds Stroop (SSS) was the third task. It was modeled after the Day-Night task created by Gerstadt, Hong, and Diamond (1994). This computerized task measured inhibitory control and the child's reaction time. In this task, line drawings of dogs and cats were presented in random order. The child was instructed to touch a line drawing of a cat after hearing "woof" and to touch a line drawing of a dog after hearing "meow." This task had two training trials followed by 17 trials.

In the current study, the proportion correct score was used for each task. Out of 55 participants, 44 completed at least one of the executive functioning tasks. Missing data was a result of technical difficulties with the computer touchscreen, as well as behavior difficulties that resulted in home visits ending early. In the current study, 30 children completed (i.e., children passed training and were administered full set of items) the Houses task, 36 completed Silly Sounds task, and 44 completed Something's the Same task. This completion rate is comparable to prior research from the Family Life Project (Willoughby, Blair, Wirth, & Greenberg, 2010),

which found that 9% of their 3-year-old sample was unable to complete the task, and for those children who were administered the tasks, they completed an average of 3.6 out of 5 tasks.

Social-Emotional School Readiness.

Emotion knowledge. A brief version of the Emotion Matching Task was used to measure emotion knowledge (EMT; Izard, Haskins, Schultz, Trentacosta, & King, 2003). Within the EMT, there are four subparts, with six items per subpart in the brief version. The four subparts are as follows: emotion matching, receptive emotion labeling, expressive emotion labeling, and emotion situation knowledge. The emotion matching part was multiple choice, and involved the child matching a target emotion expression to a face with that same expression. With receptive emotion labeling, the child identified the emotion expression for an associated emotion label via multiple choice. In the expressive emotion labeling subpart, the child provided a verbal response of the emotion label for an emotion expression. The emotion situation knowledge subpart was multiple choice and involved having the child identify an emotion expression prompted by a social situation. The pictures presented in the EMT include ethnically diverse boys and girls with various emotional facial expressions (e.g., happiness, sadness, fear, anger, no expression). There is support for the construct validity of the EMT (Morgan, Izard, & King, 2010). The EMT was strongly correlated with other commonly used measures of emotion knowledge in a sample of three to six-year-olds (Morgan et al., 2010).

Social-emotional protective factors. The Devereux Early Childhood Assessment (DECA; LeBuffe & Naglieri, 1999) is a 37-item norm-referenced, standardized parent-rating scale. It measured children's social-emotional protective factors by evaluating within-child protective factors. This behavior rating scale was designed for children from ages 2 to 5 years old, and it took about 15 to 20 minutes to complete. On the measure, parents rated how often they had

observed a behavior in the past four weeks. The items were rated on the following scale: *never, rarely, occasionally, frequently,* or *very frequently*. Two different scores can be obtained: behavioral concerns and total protective factors. For the purpose of this study, the total protective factors score was used. The total protective factors score included three subscales: initiative (e.g., "start or organize play with other children," "show an interest in what children/adults are doing," "do things for himself/herself"), self-regulation (e.g., "shows patience," "listen to or respect others," "share with other children"), and attachment (e.g., "seek help from children/adults when necessary," "respond positively to adult comforting when upset," "show affection for familiar adults"). Subscale and total protective factors score were converted to T-scores, which have a mean of 50 and a standard deviation of 10. In the DECA standardization sample, the protective factors had a reported internal consistency of .91 (LeBuffe & Naglieri, 1999). In a Head Start sample, the internal consistency of the protective factors, as well as the three subscales that comprise the protective factors, was found to be comparable to the DECA standardization sample (Lien & Carlson, 2009). In the current study, internal consistency of the total protective factors was .85.

Household Chaos.

Broad measures of household chaos. Five items were completed by research assistants on the day of the home visit at the conclusion of the visit to measure indicators of household chaos. A consensus procedure was utilized amongst the research assistants, as used in Vernon-Feagans et al., 2012. The five items were as follows:

(1) *House was noisy from the outside* (0 = no, 1 = yes) and (2) *House was noisy from the inside* (0 = no, 1 = yes) (Martin et al., 2012, p. 5). (3) *Home visit preparation by the household* (0 = cannot rate, 1 = surprise/difficulty, 2 = aware, but unprepared, 3=

aware/ready, 4 = good hosts), (4) *The cleanliness of the household* (0 = cannot rate, 1 = very dirty, 2 = slightly dirty, 3 = messy, 4 = clean), and (5) *The neighborhood noise level around the home* (0 = cannot rate, 1 = very quiet, 2 = average, 3 = noisy, 4 = very noisy) (Vernon-Feagans et al., 2012, p. 344).

The research assistants completed these observations for 49 out of 55 participants as a result of these questions being added to the study protocol after data collection had begun.

Household chaos was also measured with the Confusion, Hubbub, and Order Scale (CHAOS) (Matheny et al., 1995), which was completed by parents. This 15-item self-report survey measures environmental confusion in the home, including such features as high noise levels and overcrowding. Sample items include, "there is very little commotion in our home," "we can usually find things when we need them," "it's a real zoo in our home," "you can't hear yourself think in our home," and "I often get drawn into other people's arguments at home." The items were rated on the following scale, 1 (*very much like your own home*), 2 (*somewhat like your own home*), 3 (*a little bit like your home*), and 4 (*not at all like your home*). In the current study, the internal consistency was .84 across the scale. For the purpose of the current study, a mean score was used.

Finally, household chaos was measured by coding the naturalistic recordings captured by the EAR in the home. A global system of coding chaos in the home was adapted from Matheny et al.'s (1995) CHAOS. Six items were selected from the CHAOS that could be appropriately used by the coders, as well as be minimally changed to maintain consistency across the scales. The following items were coded after the trained researchers had listened to all recordings associated with a particular family: "There is very little commotion in the home," "It's a real zoo in the home," "At this home, people can talk to each other without being interrupted," "There is

often a fuss going on at this home," "This home is a good place to relax," and "The atmosphere in this home is calm." The coders rated these items on a 4-point Likert scale, similar to the CHAOS scale. The 4-point scale was as follows: 1 (*very much like this home*), 2 (*somewhat like this home*), 3 (*a little bit like this home*), and 4 (*not at all like this home*). The zoo item and fuss item were reverse scored, and then the 6 items were summed to create a total score that ranged from 6 to 24. Coders were trained on this system. Once training was complete and the coders had a thorough understanding of the categories, they worked independently to code the EAR recordings. In the current study, the 6-item scale had an internal consistency of .90 (inter-rater reliability information is provided in the Results section).

Other specific features of household chaos. Household overcrowding was determined first by subtracting the total number of rooms in the home, not including bathrooms or hallways, from the total number of people living in the home. See Figure 2 for graph of frequencies. The score was then dichotomized, with overcrowding being defined as more people in the home than rooms; about 55% of participants meeting this criterion.

The Family Ritual Questionnaire (FRQ) was developed to assess family rituals across seven settings (e.g., dinnertime, weekends; Fiese & Kline, 1993). This survey was completed by the mothers at the home visit. Five of the seven settings were assessed. These settings included: dinnertime, weekends, annual celebrations, special celebrations, and religious holidays. For the purpose of present study, only the dinnertime setting was used because it is both a daily routine and ritual, as well as a time where language develops in the home environment (Aukrust, 2002; Ely, Gleason, MacGibbon, & Zaretsky, 2001; Spagnola & Fiese, 2007). Examples of dinnertime items include, "Family members regularly eat dinner together," "Everyone has a specific role and job to do at dinnertime," and "Dinnertime is flexible. People eat whenever they can." The

items were rated on the following scale, 1 (*very much like your own home*), 2 (*somewhat like your own home*), 3 (*undecided)*, 4 (*a little bit like your home*), and 5 (*not at all like your home*). In the present study, a mean score was used. In the current study, internal consistency of the dinnertime setting was .67.

The EAR audio files were also coded for television (TV) noise, electronic noise, and household noise. Frequency of TV noise was coded from the EAR files by trained coders in order to capture a naturalistic measure of television noise in the homes. TV noise was coded by indicating whether the television was on at any time within each 30 second audio recording. Frequency of electronic noise was also coded from the EAR files. Electronic noise was coded by indicating whether there were any electronics on during each 30 second audio recording, including the TV. Additionally, the trained coders measured the overall noise level of each 30 second recording. The coders rated "House was noisy from the inside" on the following scale (*0 = no, 1 = yes*). This item was adapted from the research by Martin et al. (2012).

Of the 55 participants in the current study, 36 participants were included in EAR analyses. Missing data was a result of a number of factors, including: nine participants declining to complete the EAR, two participants with insufficient audio files to include in analyses, and eight failed attempts where iPods were returned without audio files or no talking/sound was observed in the limited number of recordings. Independent-samples t-tests were conducted to compare families with sufficient EAR data to be included in analyses (n = 36) to those who had no EAR data or insufficient EAR data for inclusion (n = 19). There were no significant differences in scores across the following measures: children's receptive vocabulary, three executive functioning tasks, social-emotional protective factors, emotion knowledge task, and three measures of research assistants' observations of chaos (inside noise, outside noise, and

broad chaos). There was a significant difference in the scores for families with sufficient EAR data (M = 94.00, SD = 18.27) and those with no/insufficient EAR data (M = 78.72, SD = 9.64) on the measure of children's pre-academic readiness; $t(49) = 3.30$, $p < .01$. Additionally, there was a significant difference in the scores for families with sufficient EAR data (M = 1.68, SD = .50) and those with no/insufficient EAR data (M = 1.98, SD = .53) on the parents' self-report of household chaos; $t(53) = -2.08$, $p < .05$.

To be included in analyses that focused on data from EAR recordings, a family had to have at least 40 audio files collected. Additionally, only 2 days of recordings were included in analyses for 10 participants where multiple attempts to obtain EAR recordings resulted in over two days of audio files captured. The number of audio files used in the current study ranged from 41 to 173 (*Mean* = 116.6). Furthermore, bivariate correlations were run between all of the study variables and a variable that represented the number of audio files used in the current study to ascertain whether there were unique associations and patterns between the study variables and the number of audio files collected from participants. There was only one significant negative correlation between the number of audio files and proportion of caregivers' words that were anger words ($r = -0.35$, $p < .05$).

Home learning environment. Recordings captured with the EAR were transcribed by trained research assistants. The transcriptions were then analyzed using the Linguistic Inquiry and Word Count (LIWC) coding system developed by Pennebaker, Francis, and Booth. The LIWC measures words in text objectively, and in the current study it was used to capture language in the home that contributes to school readiness. LIWC is a computer text-analysis program designed to analyze written text on a word-by-word basis, and then assign each word to a language dimension within the LIWC program. In addition to consisting of the rudimentary

dimension, word count, the LIWC also contains a wide range of dimensions, including: functional words (e.g., pronouns, articles, prepositions), affect words (e.g., positive emotion, negative emotion), social words (e.g., family, friends), cognitive processes (e.g., insight, cause), perceptual processes (e.g., seeing, hearing, feeling), biological processes (e.g., body, health), core drives and needs (e.g., affiliation, achievement), time orientation (e.g., past focus, present focus), relativity (e.g., motion, space), personal concerns (e.g., money, religion), and informal speech (e.g., swear words) (LIWC Inc., n.d.). Each word is analyzed and assigned to a dimension, then an overall percentage is calculated to control for the length of the sample. Depending on the scale and/or dimension being measured, interrater reliability for the LIWC ranges from 86% to 100% (Pennebaker et al., 2001). Furthermore, it has an alpha ranging from .55 to .92 (LIWC Inc., n.d.). Approximately 36% of the participants' audio collections were transcribed for reliability by a 2nd research assistant.

Talkativeness. The LIWC was also used to measure the total word count captured through the random sampling of the EAR. Total word count was divided by the number of audio files captured in a family to create a mean score. Pennebaker et al. (2015) calculated alphas when examining reliability, as did the current study. In the current study, coding of talkativeness had an alpha of .90.

Emotion Language. The overall percentage of total affective words from the EAR was also measured. Within the affective word category in the LIWC, there are both positive and negative emotion words. The negative emotion words also include subcategories of anxiety, anger and sadness. Positive affective words coded in LIWC include words such as "love," "nice," and "sweet" (Pennebaker, Boyd, Jordan, & Blackburn, 2015). Negative affective words coded in LIWC include words such as "dummy," "alone," and "angry" (Pennebaker et al., 2015).

Additionally, the percentage of negative affective words was combined with the percentage of positive affective words to create a total affective words score. In the current study, coding of positive emotion words had an alpha of .93, while negative emotion words had an alpha of .94. Anger, anxiety and sadness words had the following alphas: .98, .58, and .55, respectively. Given the lower alphas for sadness and anxiety, only anger words were included in subsequent analyses.

Demographics. Demographic variables of family income, child's gender, and whether or not the fathers were present in the home were included as covariates in all analyses. Maternal education was originally proposed as an additional covariate, but due to missing data, the current study focused on family income instead. The family income demographic item stated, "What was your total family income in the past 12 months (before taxes and deductions)." It included seven levels: 1. None (n = 5; 9.1%); 2. $1-$5,000 (n = 15; 27.3%); 3. $5,001-$10,000 (n = 8; 14.5%); 4. $10,001-$15,000 (n = 5; 9.1%); 5. $15,001-$20,000 (n = 5; 9.1%); 6. $20,001-$30,000 (n = 8; 14.4%); 7. More than $30,000 ($n$ = 9; 16.4%). Father present was recoded as a dichotomous variable, which was defined as 1 = child's biological father lives with child full time or lives with child part-time (n = 27; 49%) or 2 = does not live with child but has regular contact, has inconsistent contact, or has no contact with child (n = 28, 51%).

Analytic Plan

Means, standard deviations, skew and kurtosis were examined for each variable. Data was screened for outliers and normality. Missing data values were analyzed.

In order to address the feasibility aim, the coding and ratings of household chaos constructs from EAR files were assessed for reliability using intraclass correlations (ICCs) to measure interrater reliabilities. In order to measure whether the naturalistic observations of

household chaos via the EAR related to the other measures of household chaos (self-report measures and research assistant home-visit observations), bivariate correlations were run entering all of the variables, and correlations were evaluated to ascertain whether these measures were related and whether there were unique associations and patterns between them. The extent to which individual measures of household chaos were related then guided how they were handled for later aims (e.g., whether a single chaos measure was created as an aggregate, or whether individual chaos measures were examined separately).

In order to address the main hypothesis that higher levels of household chaos would predict children's lower school readiness, separate hierarchical regressions were conducted for each school readiness variable, with the covariates (family income, child's gender, and father involvement) entered in Block 1, and the broad household chaos measure entered in Block 2. Family income, child's gender, and whether or not the fathers are present were included as covariates in this set of analyses, as well as all other analyses in this study. It was expected that household chaos would significantly predict each indicator of children's school readiness, with greater household chaos expected to predict lower school readiness scores.

In order to test the secondary hypotheses that features of household chaos (e.g., noise, overcrowding, and rituals) would predict specific aspects of school readiness (e.g., pre-academic, executive function, academic, vocabulary), separate hierarchical regressions were conducted for each school readiness variable, with the covariates (family income, child's gender, and father involvement) entered in Block 1, and the feature of household chaos variable entered in Block 2. It was expected that higher levels of features of household chaos would predict poorer school readiness.

In order to address the hypothesis that higher levels of adult caregivers' talkativeness would predict children's greater receptive vocabulary, a hierarchical linear regression was conducted with the covariates (family income, child's gender, and father involvement) entered in Block 1, and adult caregivers' talkativeness variable entered in Block 2. It was expected that greater levels of adult caregivers' talkativeness would predict greater children's receptive vocabulary.

In order to test the hypothesis that use of emotion language by adults in the home would predict children's social-emotional competence, separate hierarchical regressions were conducted for each social-emotional competence variable, with the covariates (family income, child's gender, and father involvement) entered in Block 1, and the adults' emotion language entered in Block 2. It was expected that greater use of emotion language by adults in the home would predict greater children's social-emotional competence. Finally, exploratory analyses were conducted to determine whether adult caregivers' use of positive emotion words or negative emotion words impact children's social-emotional competence differently. Two sets of hierarchical regressions were conducted (one set with positive emotion words, one set with negative emotion words) in order to determine whether they impact children's social-emotional competence differently.

Exploratory analyses were conducted to explore potential mechanisms through which household chaos impacts children's school readiness. First, bivariate correlations were run entering household chaos and language variables. Given the results of these analyses, the PROCESS macro (Hayes, 2013) would be used to test whether household chaos is indirectly related to children's school readiness via associations with the home language environment. More recent mediation guidelines have suggested that a direct effect between an independent and

dependent variable is not required in order to investigate an indirect effect (Preacher, Rucker, & Hayes, 2007).

CHAPTER 3: RESULTS

Preliminary Results

Means and standard deviations for the school readiness study variables can be found in Table 1. Overall, the mean score of the children on the measure of pre-academic readiness (M = 88.61, SD = 17.30) fell in the high end of the Delayed range. The mean score of the children on the measure of receptive vocabulary (M = 87.14, SD = 14.33) fell in the low end of the Average range. Furthermore, the executive function task that measured working memory (Houses) had a relatively low mean level. Variables were also inspected for normality by examining skew and kurtosis. The pre-academic readiness measure was slightly positively skewed (0.94), but fell below the two-point cut-off proposed by Curran, West and Finch (1996), above which transformation is necessary. All other school readiness variables were relatively normally distributed.

Means and standard deviations for the household chaos variables can be found in Table 2. Parents reported relatively high levels of dinnertime routines in their family. Overall, the coders reported relatively low household noise in the EAR audio files of participants. In contrast, the coders reported a relatively high rate of electronic noise in the EAR audio files. Frequency bar charts for household overcrowding, RAs' report of noise inside the home, and RAs' report of noise outside the home can be found in Figure 3, Figure 4, and Figure 5, respectively. The research assistants reported relatively low levels of noise, both inside and outside, at the home visits. Additionally, variables were inspected for normality through inspection of skew and kurtosis. House noise reported by EAR coders was positively skewed (1.06); however, these

values fell below the cutoff and transformation was not necessary (Curran, West, & Finch, 1996).

Means and standard deviations for the home language study variables can be found in Table 3. Overall, results indicate that, on average, each EAR audio file had about 9 words spoken by adults (M = 8.95, SD = 4.72). Across audio files, on average approximately 2.6% of words spoken were positive emotions words, 1.4% were negative emotion words, and 0.82% were anger words. Negative emotion words were positively skewed (2.44). This skew was addressed through winsorization, which transforms data by changing the value of extreme outliers and setting them to the highest value in the data set just below the value of the outlier. After winsorizing the top two high outlier scores and setting them at the value of the third highest score, this variable was still positively skewed (.84), but within the acceptable range. Similarly, anger words were positively skewed (2.79). After winsorizing the top two outlier scores, this variable was still positively skewed (1.34), but also within the acceptable range.

Additionally, bivariate correlations between the school readiness study variables were examined. Results from this analysis can be found in Table 4. The measure of pre-academic school readiness was significantly positively correlated with children's receptive vocabulary, emotion knowledge and the executive functioning tasks measuring working memory and attention shifting (Houses and STS). The measure of children's receptive vocabulary was significantly positively correlated with emotion knowledge, as well as with all three measures of executive functioning, including the working memory task (Houses), attention shifting task (STS), and inhibitory control task (SSS). The working memory task (Houses) was significantly positively correlated with emotion knowledge and social-emotional protective factors, while the attention shifting task (STS) was significantly positively correlated with emotion knowledge.

Emotion knowledge was significantly positively correlated with social-emotional protective factors. Bivariate correlations between the remaining study variables are discussed within the sections below that review findings related to the study's specific aims.

Aim #1: Naturalistic Measure of Household Chaos

In order to address the feasibility aim, the EAR codings were assessed for reliability. Approximately thirty percent of the participants' audio collections were coded for reliability by a 2nd research assistant. Intraclass correlations (ICCs) were computed to measure interrater reliabilities for the household chaos measure coded by trained research assistants from EAR files. ICCs based on a two-way random effects model were computed for the chaos scale score, and the ICC interrater reliability was .92. Cohen's Kappa were computed for trained research assistants' coding of electronic noise, TV noise, and household noise. Values were interpreted based on the following recommendations by Landis and Koch (1977): poor agreement = <.01, slight agreement = .01-.20, fair agreement = .21-.40, moderate agreement = .41-.60, substantial agreement = .61-.80, and almost perfect agreement = .81-1.00. Cohen's Kappa for electronic noise, TV noise, and household noise were .85 (almost perfect agreement), .79 (substantial agreement), and .60 (moderate agreement), respectively.

Next, correlations within rater for the EAR files and those for the research assistants were examined to determine whether items should be aggregated or used separately in subsequent analyses. TV noise coded from EAR audio files was significantly positively correlated with both house noise ($r = 0.34$, $p < .05$) and electronic noise ($r = 0.95$, $p < .01$). TV noise was removed from subsequent analyses due to its high positive correlation with electronic noise, which was expected given that electronic noise encompassed TV noise, as well as noise from cell phones, video games, etc. Electronic noise was chosen because it encapsulated a greater breadth of noise

from devices and it had the higher agreement among raters with a Cohen's Kappa of.85.

In terms of the items rated by research assistants at the home visits, report of noise outside the home was significantly positively correlated with their report of neighborhood noise ($r = 0.53$, $p < .01$). Additionally, research assistants' report of home cleanliness was significantly positively correlated to their report of the participant's preparation for the home visit ($r = 0.47$, $p < .01$). Given these findings, it was determined that the home visit preparation item and home cleanliness item would be summed into one score due to the significant positive correlation; this new score represented the research assistants' report of household chaos at the home visit. The research assistants' report of noise outside the home, as well as their report of neighborhood noise, were rescored due to the significant positive correlation as well as the overlap in measurement of the two items. The new score was dichotomized; either a score of "1 = yes" on the noise outside the home item or a score of either "3 = noisy" or "4 = very noisy" on the neighborhood noise item became a "1," and the other scores were a zero.

In order to measure whether the naturalistic observations of household chaos via the EAR audio files related to the other measures of household chaos (self-report measures and research assistant home-visit observations), bivariate correlations, and where applicable Chi-square tests of independence, were examined. Results from this analysis can be found in Table 5. Household chaos rated from EAR audio files was significantly positively correlated with house noise coded from EAR audio files. A Chi-square test of independence indicated that there was a significant association between household overcrowding and RAs' report of noise inside the home ($X^2(1) = 4.37$, $p < .05$) (Table 6). Next, the extent to which individual measures of household chaos were related were examined to determine whether a single chaos measure would be created as an aggregate, or whether individual chaos measures would be examined separately. Given that

correlations among the household chaos measures were mostly non-significant and small in magnitude, it was determined that individual chaos measures would be examined separately in subsequent analyses.

Aim #2: Household Chaos and School Readiness

Bivariate correlations between global measures of household chaos (parent report and coded EAR audio files) and school readiness were examined. Results from this analysis can be found in Table 7. The measure of children's receptive vocabulary was significantly negatively correlated with household chaos coded from EAR audio files. The executive functioning task measuring working memory (Houses) was significantly negatively correlated with parents' self-report of household chaos.

In order to further address the main hypothesis that higher levels of household chaos would predict children's lower school readiness, hierarchical linear regressions were conducted with measures of children's school readiness as the dependent variable in separate analyses. The covariates (family income, child's gender, father involvement) were entered in Block 1 and the household chaos variable entered in Block 2.

Regressions were conducted only for combinations of independent and dependent variables that had a significant bivariate correlation. Family income, child's gender, and whether or not the fathers were present were included as covariates in this set of analyses, and in all subsequent regression analyses.

First, a hierarchical linear regression was conducted with household chaos from EAR audio files as the independent variable and receptive vocabulary as the dependent variable. As hypothesized, household chaos significantly predicted receptive vocabulary, with greater household chaos predicting lower receptive vocabulary scores. See Table 8 for results from the

final block of the model, after covariates and the predictor were added. Before the addition of household chaos into the model, the covariates did not significantly predict receptive vocabulary; however, gender approached significance (p = .05). Household chaos coded from EAR audio recordings and the covariates predicted 36.7% of the total variance in receptive vocabulary, with household chaos uniquely predicting 16.8% of the variance.

A hierarchical linear regression was also conducted with parents' self-report of household chaos as the independent variable, and children's performance on a working memory task (Houses) as the dependent variable. Before the addition of parent's report of household chaos, the covariates did not significantly predict a working memory task of executive functioning. Additionally, household chaos did not significantly predict executive functioning in this analysis when it was entered in the final model. See Table 9 for results of the final model.

Next, bivariate correlations between more specific features of household chaos (e.g., noise, overcrowding, and rituals) and school readiness were examined. Results from this analysis can be found in Table 10. The measure of pre-academic school readiness was significantly negatively correlated with household overcrowding. Contrary to expectations, research assistants' report of neighborhood noise at the home visit was significantly positively associated with two executive functioning tasks: the work memory task (Houses) and the task that measured inhibitory control (SSS).

In order to further evaluate the secondary hypothesis that specific features of household chaos would predict lower school readiness, separate hierarchical linear regressions were conducted with the covariates entered into Block 1, specific feature of household chaos entered into Block 2, and school readiness domain as the dependent variable. Regressions were conducted only for variables that had a significant bivariate correlation.

First, a hierarchical linear regression was conducted with household overcrowding as the independent variable and pre-academic knowledge as the dependent variable. As hypothesized, household overcrowding significantly predicted pre-academic knowledge, with greater household overcrowding predicting lower pre-academic knowledge. See Table 11 for results from the final block of the model, after covariates and the predictor were added. Before the addition of household overcrowding into the model, family income significantly predicted pre-academic knowledge; however, with the addition of household overcrowding it no longer significantly predicted pre-academic knowledge. Household overcrowding and the covariates predicted 26.4% of the total variance in pre-academic knowledge, with household overcrowding uniquely predicting 10.5% of the variance.

Next, a hierarchical linear regression was conducted with research assistants' report of neighborhood noise as the independent variable and the executive function task measuring working memory (Houses) as the dependent variable. It was expected that greater neighborhood noise would predict lower executive functioning. Research assistants' report of neighborhood noise did not significantly predict performance on the working memory task. The covariates also did not significantly predict the working memory task performance. See Table 12 for results from the final block of the model, after covariates and the predictor were added.

Finally, a hierarchical linear regression was conducted with research assistants' observation of neighborhood noise as the independent variable and the executive function task measuring inhibitory control (SSS) as the dependent variable. It was expected that greater neighborhood noise would predict lower executive functioning; however, contrary to the hypothesis, greater neighborhood noise observed by research assistants predicted greater inhibitory control. See Table 13 for the final model, including covariates and predictor. Prior to

entering research assistants' report of neighborhood noise into the model, the covariates did not significantly predict executive functioning. Research assistants' observation of neighborhood noise and the covariates predicted 32.2% of the total variance in executive functioning, with neighborhood noise uniquely predicting 19.5% of the variance.

Aim #3: Home Language Environment and School Readiness

Bivariate correlations between features of home language and features of school readiness were examined. Results from this analysis can be found in Table 14. The measure of children's receptive vocabulary was significantly negatively correlated with negative emotion words used in the home by caregivers, as well as anger words. Social-emotional protective factors were significantly negatively correlated with caregivers' use of anger words in the home. Finally, an executive function task measuring attention shifting was significantly positively correlated with both total emotion words and positive emotion words used in the home by caregivers.

Cognitive school readiness outcomes and home language. In order to address the specific hypothesis that higher levels of adult caregivers' talkativeness would predict children's greater receptive vocabulary, a hierarchical linear regression was conducted with talkativeness of adults in the home as the independent variable, and children's receptive vocabulary as the dependent variable, while controlling for the covariates. It was expected that greater levels of adult caregivers' talkativeness would predict greater children's receptive vocabulary. However adult caregivers' talkativeness did not significantly predict children's receptive vocabulary. The covariates also did not significantly predict receptive vocabulary. See Table 15 for results from the final block of the model, after covariates and the predictor were added.

Given the significant negative correlation between children's receptive vocabulary and both negative emotion words and anger words expressed in the home, follow up analyses were pursued to further investigate these relationships. A hierarchical linear regression was conducted with adult caregivers' use of negative emotion words as the independent variable, and children's receptive vocabulary as the dependent variable. Greater use of negative emotion words by adult caregivers predicted lower children's receptive vocabulary. See Table 16 for results from the final block of the model, after covariates and the predictor were added. Prior to entering caregivers' use of negative emotion words into the model, the covariates did not significantly predict receptive vocabulary. Caregivers' use of negative emotion words and the covariates predicted 31.7% of the total variance in receptive vocabulary, with negative emotion words uniquely predicting 12.7% of the variance. A hierarchical linear regression was also conducted with caregivers' use of anger words as the independent variable and children's receptive vocabulary as the dependent variable. See Table 17 for results from the final block of the model, after covariates and the predictor were added. Caregivers' use of anger words in the home and the covariates did not significantly predict children's receptive vocabulary.

Furthermore, given the significant positive correlation between children's performance on an executive function task measuring attention shifting (STS) and both total emotion words and positive emotion words expressed in the home by caregivers, exploratory analyses were pursued to further investigate these relationships. Two separate hierarchical linear regressions were conducted with caregivers' total emotion words and positive emotions words as separate independent variables and children's performance on an attention-shifting task as the dependent variable. Greater use of total emotion words by caregivers predicted greater performance on the attention shifting task (final model presented in Table 18), and the same pattern was found for

positive emotion words (final model presented in Table 19). In both regressions, gender significantly predicted attention shifting performance before the language variables were entered into the model; however, after the addition of the language variables it no longer significantly predicted. Caregivers' total use of emotion words and the covariates predicted 37.3% of the total variance in attention shifting, with total emotion words uniquely predicting 19.1% of the variance. Moreover, caregivers' use of positive emotion words and the covariates predicted 38.7% of the total variance in attention shifting, with positive emotion words uniquely predicting 20.5% of the variance.

Social-emotional school readiness outcomes and home language. In order to test the specific hypothesis that use of emotion language by adults in the home would predict indicators of children's social-emotional competence (social-emotional protective factors and emotion knowledge) two hierarchical linear regressions were conducted. First, a hierarchical linear regression was conducted with adult caregivers' total use of emotion language as the independent variable, and children's emotion knowledge as the dependent variable. It was expected that greater use of emotion language by adults in the home would predict greater children's emotion knowledge. However, adult caregivers' emotion language did not significantly predict children's emotion knowledge (final model presented in Table 20). The covariates did not significantly predict children's emotion knowledge, as well. Second, a hierarchical linear regression was conducted with adult caregivers' use of emotion language as the independent variable, and children's social-emotional protective factors as the dependent variable. It was expected that greater use of emotion language by adults in the home would predict greater social-emotional protective factors. Adult caregivers' emotion language did not significantly predict children's social-emotional protective factors (final model presented in

Table 21). Also, the covariates did not significantly predict children's social-emotional protective factors.

Exploratory analyses were conducted to determine whether adult caregivers' use of positive emotion words or negative emotion words (including anger words specifically) impact children's social-emotional competence, specifically social-emotional protective factors. Three sets of regressions were conducted (one set with positive emotion words, one set with negative emotion words, and one set with anger words) in order to determine whether they impact children's social-emotional competence differently. Neither positive emotion language (final model presented in Table 22), negative emotion language (final model presented in Table 23), or anger words (final model presented in Table 24) predicted children's social-emotional protective factors. The covariates did not predict social-emotional protective factors either.

Aim #4: Mediation Analysis

Aim 4 was intended to test a potential mechanism through which household chaos impacts children's school readiness, specifically to test whether household chaos is indirectly related to children's school readiness via associations with the home language environment. In order to test this aim, there would first need to be an association between household chaos and home language. Bivariate correlations between household chaos variables and home language variables are presented in Table 25. The present study found the following associations: Talkativeness in the home was significantly positively correlated with both household chaos coded from audio EAR files and house noise coded from audio EAR files. All other correlations between household chaos and language variables were non-significant. In addition, in order to conduct mediation analysis there needs to be sufficient power, and in the case of the present study, the small sample size precluded formally testing mediation.

CHAPTER 4: DISCUSSION

The current study examined the relation between household chaos, the home language environment, and school readiness in preschool-age children. First, several measures and methods of household chaos were collected from multiple informants. This study expanded on research by including the use of EAR recordings to collect naturalistic observations of household chaos. Then the measures of household chaos were examined individually and collectively. Next, the impact of household chaos on multiple features of children's school readiness was explored. The current study also measured the home language environment, including caregivers' talkativeness and emotion language, by transcribing EAR recordings and then using the LIWC system to analyze the text. Next, the impact of the home language environment on children's school readiness was explored.

Naturalistic Measurement of Household Chaos

The current study reliably assessed multiple features of household chaos via various informants and methods. In terms of the feasibility of measuring household chaos with the EAR, the EAR audio files were coded reliably between raters. Overall, inter-rater reliability was high for ratings of electronic noise, TV noise, as well as a more global measure of chaos. Household noise had moderate agreement among two raters, which might have been a result of recording quality that impacted sound volume and possibly the raters' ability to discern the noisiness of the home. Though EAR files were reliably coded, the feasibility of measurement with the EAR was somewhat impacted by difficulties obtaining the data. Several families opted not to participate in the EAR portion of the study, and several other families encountered technical difficulties, thus impeding the overall collection rate. The current study found a few differences between families whose EAR files were included in analyses and those who either opted not to complete the EAR

portion of the study or who had insufficient audio files to be included in analyses. Children in families that had sufficient EAR audio files performed significantly better on a measure of pre-academic readiness, and their parents reported significantly lower levels of household chaos. This suggests that participants from homes that parents perceived as more chaotic were less likely to complete the EAR portion of the study.

This study found few significant associations between the naturalistic observations of household chaos via the EAR and other measures, such as parent's self-report measures, an objective measurement of overcrowding, and research assistant's observations at the home visit. House noise coded from the EAR was positively significantly related to household chaos coded from the EAR. This is similar to prior research, which has found a relationship between observations of household noise and the CHAOS measure, from which the EAR measure of chaos was adapted (Matheny et al., 1995). Additionally, an objective measure of household overcrowding was positively significantly related to research assistants' report of noise inside the home at the visit. It might be that the researchers' observations of inside noise were impacted by the objective presence of more people in the home than rooms, such that in the homes with overcrowding the research assistants reported noise more often than in homes without overcrowding.

Besides the two beforementioned significant associations, the present study did not find significant evidence of relatedness among household chaos measures. There are a number of potential reasons why these measures did not converge. First, the lack of association could partially be explained by the small sample size of the present study; though the associations are not significant, many are trending in the expected direction. Second, the research assistants' observations were not as methodical as the protocol for coding the EAR files; a consensus

procedure was utilized after the home visits consistent with the procedure employed by Vernon-Feagans et al. (2012), which was not as systematic as the rigorous training and inter-rater reliability employed with the EAR. Additionally, research assistants observed features of chaos at one timepoint. Though this type of observational data is rich, it can also be misguided if the visit occurs on a day where there is uncharacteristically low/high noise in the home or neighborhood. Furthermore, it is notable that parent's perception of household chaos, measured by a well-validated self-report survey (CHAOS; Matheny et al., 1995), was not significantly associated with the following: an objective measure of crowding, research assistants' observations, and EAR raters who coded several days of audio recordings. This indicates that each measurement tapped into a unique aspect of household chaos, which has implications for future research. Finally, with the exception of electronic noise, there was also considerable variability across scores in the measures of household chaos within this at-risk population. This suggests that many families in the present study have household order despite facing barriers and obstacles to maintaining routines and structure. This is consistent with previous research, which has found a wide range in reports of household chaos, regardless of SES (Dumas et al., 2005).

The present study expanded on previous literature by obtaining a naturalistic observation of household chaos sampled across several days in the home. In prior research, the parent self-report CHAOS measure (Matheny et al., 1995) has typically been used as the sole approach to assess household chaos. This measure is brief, relatively easy to collect, well-established, and it has been linked to numerous negative childhood outcomes in research (Coldwell, Pike, Dunn, 2006; Evans et al., 2005). There is yet another body of work that obtained observations of household chaos, such as research assistants' observations of noise in the home, and objective data, such as sound meter readings and household overcrowding (Evans, 2006; Heft, 1979;

Vernon-Feagans et al., 2012; Wachs, 1986; Wachs & Evans, 2010). Though there are numerous studies where research assistants have observed house noise, it is important to note that most research on TV noise specifically has relied on parent self-report measures or diaries completed by parents (Christakis et al., 2004; Wright et al., 2001). Moreover, there are studies, though fewer, which have combined both parent self-report measures along with observations of household chaos, typically those of research assistants at the home visit (Martin, Razza, & Brooks-Gunn, 2012). Thus, the present study is not the first to include multiple methods and multiple informants of household chaos; however, it is novel in its approach to obtain naturalistic samples across several days in the homes of participants using the EAR. The current study demonstrated feasiblity in the measurement of chaos, TV noise, electronic noise, and house noise by coding EAR audio files. Furthermore, the lack of relatedness among household chaos measures suggests that this method of measurement is providing new information to this large body of literature.

Household Chaos and School Readiness

The current study found few significant associations between global measures of household chaos and children's school readiness across multiple domains (i.e., cognitive and social-emotional). Consistent with expected results, there was a significant negative bivariate correlation between the parents' self-report of household chaos and an executive functioning task that measured working memory; however, parent's report of household chaos did not significantly predict executive functioning while accounting for covariates. Moreover, there was a significant negative association between household chaos measured by the EAR and a measure of children's receptive vocabulary. Consistent with the hypothesized results, there was a significant association between household chaos measured by the EAR and children's receptive

vocabulary while accounting for covariates. This finding can also be interpreted that children living in homes with lower levels of household chaos performed better on a measure of receptive vocabulary. This is consistent with prior literature, which has found that household order was significantly positively associated with expressive vocabulary (Johnson et al., 2008). The research conducted by Johnson et al. (2008) studied monozygotic and dizygotic twin pairs, and it included over 400 children in either kindergarten or first grade in a metropolitan area. The CHAOS (Matheny et al., 1995) measure was also utilized, though the researchers re-scored the measure to have high scores indicate household order (Johnson et al., 2008). While the current study measured children's receptive vocabulary, Johnson et al. (2008) measured expressive vocabulary. Thus, findings from the current study and Johnson et al. (2008) suggest that both expressive and receptive language could be impacted by household chaos.

The current study also found few significant associations between specific features of household chaos and children's school readiness. Consistent with expected results, there was a significant negative association between household overcrowding and children's pre-academic readiness, which held while accounting for covariates. Previous research has similarly found that household overcrowding had negative effects on children's reading and mathematics while controlling for several dimensions of SES (Solari & Mare, 2012). Unlike the current study, Solari and Mare (2012) had a longitudinal design that spanned across two waves, and included 3,563 children between 0 and 12 years old in the first wave, and 2,908 children between 5 and 18 years old in the second wave. The sample contained families living in both rural and urban areas; though the neighborhood settings were diverse, the study over-sampled poor neighborhoods (Solari & Mare, 2012). Household overcrowding was a continuous measure of people per rooms, rather than a dichotomized variable, as in the current study. Similar to the current study, the

researchers found that household overcrowding had a significant negative impact on children's academic achievement (Solari & Mare, 2012).

Contrary to expected results, there was a significant positive association between research assistants' report of neighborhood noise and two executive functioning tasks (Houses and Silly Sounds Stroop), one of which (Silly Sounds Stroop) held while accounting for covariates. One possible reason for this unexpected finding is the measurement of neighborhood noise by the research assistants; a less systematic consensus process was used, which might have rendered the scores lower in reliability.

The largely non-significant findings between measures of household chaos (global and specific) and school readiness were likely impacted by a number of factors, including, but not limited to, the small sample size and missing data across measures. This is partially supported by a review of the associations, which suggests that they are mostly in the expected direction, albeit non-significant. Additionally, it is notable that two of the significant regressions included well-established and validated outcome measures (BSRA-3 and PPVT-4); these measures also had some of the least amount of missing data in the current study. Furthermore, these two measures relate more specifically to cognitive school readiness, and there is a breadth of literature that has found a link between household chaos and cognitive outcomes. (Ackerman & Brown, 2010; Dumas et al., 2005; Hart et al., 2007; Hur et al., 2015; Pike et al., 2006; Solari & Mare, 2012). Thus, the current study's limited significant findings are well-supported in the literature, and the analyses included established outcome measures with little missing data.

Home Language Environment and School Readiness

The current study reliably transcribed and analyzed EAR audio files with the LIWC system. Reliability was high among two raters for the following categories: caregivers'

talkativeness, total emotion words, positive emotion words, negative emotion words and anger words. In the current study, caregivers' talkativeness was not significantly related to the measures of school readiness. This was unexpected given previous research that has found a link between parent's speech (i.e., mean utterances, child-directed) and children's cognitive outcomes, in particular receptive vocabulary (Hart & Risley, 1995; Hoff, 2003; Rowe, 2008). One possible explanation is that the current study contained all caregivers' speech in its examination of language. Thus, instead of focusing on parent-only speech, any speech by an adult captured by the EAR was included. This was partially a result of transcribing numerous 30-second audio files captured in participants' homes while the child wore the device, which sometimes made it difficult for a researcher to differentiate a parent's voice from another caregiver/adult, especially when the adults were talking in the distance. In addition to including more caregivers, all words expressed by adults were transcribed, even those not directed towards the child. Consequently, the current study measured talkativeness of adults around and towards the child, rather than measuring specifically parent-only, child-directed speech. Though both mean utterances and child-directed speech have been found to be advantageous, the specific features of speech could be especially meaningful. These nuances to the measurement of talkativeness in the present study were a result of capturing multiple audio samples of language in a naturalistic setting with the EAR "app," which can make it challenging to identify speakers, as well as the targets of their speech. Had the current study utilized an approach such as the Language ENvironment Analysis (LENA) system, some of these challenges would have been addressed. The LENA software accounts for all exchanges of speech and non-speech within a given block of time, rather than randomly selected 30-second intervals that the EAR "app"

captured (Xu, Yapanel, & Gray, 2009). The current study might have benefited from software that captured more nuanced aspects of speech.

Though talkativeness was not associated with school readiness variables, there were significant associations between emotion words and cognitive school readiness variables. Caregivers' use of negative emotion words, and anger words specifically, were significantly negatively associated with children's receptive vocabulary, and the negative association between negative emotion words and receptive vocabulary held while accounting for covariates. It might be that when children hear higher levels of negative emotion words it is suggestive of a negative emotional climate that can be problematic and undermine language development. Furthermore, caregivers' total emotion words and positive emotion words were significantly positively related to an executive functioning task that measured attention shifting, which held while accounting for covariates. According to Izard (1992), interest is considered a frequently experienced positive emotion that leads a person to attend to and explore a target stimuli. It might be that a positive emotional climate in the home facilitates development of children's executive function, in particular attention shifting, through increased interest in attending to tasks.

The current study did not find much support for emotion language being significantly related to, or predictive of, social-emotional school readiness, though the trends of these correlations were generally in the expected direction. One noteworthy reason for the limited findings in the current study was the small sample size. In particular, the analyses specific to the social-emotional school readiness measures were notably hindered by missing data, which substantially reduced the already small sample size. The only significant negative correlation was between caregivers' use of anger words and children's social-emotional protective factors, which did not hold while accounting for covariates. Previous research has found that parents'

greater display of negative emotions predicted lower social competence in preschool-aged children (Denham et al., 1997). Similar to the current study, Denham et al. (1997) coded an observation of parents' negative emotions, which included vocalizations, but the researchers also coded facial expressions, behaviors, and postures to capture a broader measure of negative emotion expression.

Home Language Environment and Household Chaos

In the current study, naturalistic observations of the home language environment and household chaos were both reliably coded; however, there were few significant correlations found between these measures. There were just two significant correlations; talkativeness was significantly positively related to house chaos and house noise, as coded with the EAR, which was somewhat contrary to expectations. In addition, talkativeness did not significantly positively relate to school readiness measures, which precluded formal tests of mediation. These findings provide further evidence that the talkativeness in the current study was measuring language unique from specifically parent's child-directed speech, which has been found to be related to positive child outcomes in previous research (Hart & Risley, 1995; Hoff & Tian, 2005; Rowe, 2008; Weisleder & Fernald, 2013). The current study had conceptualized talkativeness as a benefit and asset to children's cognitive school readiness development, which is supported by prior research (Hart & Risley, 1995; Hoff-Ginsberg, 1991; Ninio, 1980). Though previous research has indicated that it is advantageous for children to hear more words, the content and target of the speech are also important considerations. As such, it is possible that by including all adult speech, the talkativeness category encompassed a mixture of beneficial child-directed speech and emotion socialization, as well as aspects of less beneficial speech, such as adults'

negative affectivity through verbal expressions of anger or adults talking over one another, which taps into features of house chaos.

Limitations

There are multiple limitations and strengths to this study. Collecting naturalistic observations of children is both rich and valuable, but it is often difficult and labor intensive. As a result, the current study had a small sample size, which was further impacted by an even smaller subset of participants that completed the EAR portion of the study. There were a number of barriers to recruiting a larger sample, such as changes to participants' contact information, which made it challenging to obtain the desired sample size. Additionally, the EAR portion of the study was declined by some participants while others experienced technical difficulties; this further reduced the *n* in the analyses. Based on power analysis, the current study was underpowered, which made it difficult to explore associations between variables and predictors of child school readiness outcomes. Given that many of the associations were in the expected direction, with a larger sample size these associations could have been explored with more statistical power to detect statistically significant associations. Still, studies that attempt novel measurements of naturalistic features of children's home life are valuable. Even given the beforementioned challenges, the current study's EAR methodology was a strength.

Additionally, there are features of the family that were not assessed in the current study, such as the family's cultural beliefs aspects, parenting practices, and other resiliencies that are especially important when studying at-risk families. Though the current study focused on the richness of language in the home, household chaos, by definition, is a negative construct that can be stigmatizing. It is notable that within the current study's sample there was great variation across families on the numerous measures of household chaos. Thus, many families and homes

were ordered, low in noise, and followed routines, even while facing social inequalities. Had there been more extensive measurement of unique features of the family and the broader cultural context, this study could have explored strengths within the families that may have led to substantial variation in household chaos/order among the participants.

Conclusions and Future Directions

One notable strength of the current study was the utilization of multiple informants and various methodologies when investigating household chaos and language. In the present study, the EAR was utilized to naturalistically and reliably capture household chaos and household language in participants' homes over the course of approximately two days. Though previous research has collected naturalistic observations of language and household chaos, this methodology was novel for the measurement of household chaos. The other key strength is that this study demonstrated the feasibility of this methodology.

Future research could expand upon this work by increasing the sample size. A larger sample size would allow for further exploration of the aims of the current study, as well as the ability to test moderator and mediator variables, such as parenting practices, that might help to explain the mechanisms at play. With a larger sample and a longitudinal design, future studies could also investigate the interplay of household chaos and language, which was not possible given the current study's limited sample size. Notably, the current study also found limited associations between household chaos variables from multiple informants. Prior research also did not find a significant association between observations of noise and maternal perceptions of house chaos; however, they did find a significant positive association between maternal perception and a measure of household chaos (Wachs, 2013). This study also found that mother's with higher sensitivity to environmental stimulus rated higher levels of household chaos (Wachs,

2013). From a measurement perspective, a larger scale study could further investigate differences found among informants, especially related to childhood outcomes and parent traits that might impact perceptions of chaos. It could be that parents' perception of chaos in their home differs from research assistants' observations at the visit and from research assistants' coding of EAR audio files; it would be important to learn how these measurements of chaos from different informants impact the child.

The objective measure of household overcrowding and the house chaos measure coded from the EAR emerged as predictors of children's school readiness. Interestingly, there is a striking difference when it comes to the data collection procedure of these two measures. House chaos measured from the EAR audio files involved a child wearing an iPod device for two days followed by labor-intensive training and coding by research assistants. In contrast, household overcrowding was obtained with two simple pieces of information provided by the caregiver: number of people living in the home, and number of rooms (not including bathrooms and hallways). When designing tertiary and secondary prevention programs targeting children's school readiness in at-risk communities, including these two items to assess household overcrowding could prove beneficial. School readiness interventionists might quickly and easily gauge an important aspect of chaos within the home environment from these two items. Furthermore, these two items could help the interventionists screen for whether the family might benefit from tools and resources to increase household order, which would help them address the broader goal of reducing educational disparities prior to school entry in families facing social inequalities.

APPENDIX A

Table 1

Descriptives - School Readiness

	n	*M*	*SD*	Range
BSRA-3	51	88.61	17.30	60.00-128.00
PPVT-4	50	87.14	14.33	59.00-134.00
Executive Function - Houses	30	0.34	0.19	0.06-0.67
Executive Function - Silly Sounds	36	0.46	0.27	0.00-0.94
Executive Function -Something's the Same	44	0.58	0.12	0.37-0.87
Emotion Matching Task Total Score	43	10.51	4.55	3.00-20.00
DECA Total Protective Factors	53	45.77	10.37	28.00-72.00

Note. PPVT-4 = Peabody Picture Vocabulary Test Fourth Edition; BSRA-3 = Bracken School Readiness Assessment Third Edition; DECA = Devereux Early Childhood Assessment.

Table 2

Descriptives - Household Chaos

	n	*M*	*SD*	Range
CHAOS - parent rating mean score	55	1.79	0.53	1.00-3.27
FRQ - dinnertime rituals	55	3.77	0.81	2.00-5.00
RA observation of house chaos	49	4.39	1.47	2.00-7.00
Household chaos - coded from EAR	35	16.17	4.52	10.00-24.00
House noise - coded from EAR	36	0.21	0.21	0.00-0.92
Electronic noise - coded from EAR	36	0.61	0.23	.06-1.00

Note. CHAOS = Confusion, Hubbub, and Order Scale; FRQ = Family Ritual Questionnaire; RA = Research Assistant; EAR = Electronically Activated Recorder.

Table 3

Descriptives - Home Language

	n	*M*	*SD*	Range
LIWC - total word count / # of audio files	36	8.95	4.72	2.75-19.43
LIWC - total emotion words	36	3.86	1.43	1.41-8.00
LIWC - positive emotion words	36	2.60	1.36	0.94-6.55
LIWC - negative emotion words	36	1.40	1.19	0.13-6.02
LIWC- negative emotion words, winsorized	36	1.26	0.76	0.13-2.90
LIWC - anger words	36	0.82	1.10	0.00-5.26
LIWC - anger words, winsorized	36	0.69	0.68	0.00-2.39

Note. LIWC = Linguistic Inquiry and Word Count.

Table 4

Correlations - School Readiness Variables

Variable	1	2	3	4	5	6	7
1. BSRA-3	--						
2. PPVT-4	r = .59** (n = 49)	--					
3. Executive Function - Houses	r = .54** (n = 30)	r = .40* (n = 30)	--				
4. Executive Function - Silly Sounds	r = .33 (n = 33)	r = .47** (n = 32)	r = .20 (n = 24)	--			
5. Executive Function - Something's the Same	r = .40** (n = 42)	r = .38* (n = 41)	r = .27 (n = 26)	r = .11 (n = 33)	--		
6. Emotion Matching Task Total Score	r = .45** (n = 41)	r = .58** (n = 41)	r = .44* (n = 26)	r = .33 (n = 30)	r = .51** (n = 35)	--	
7. DECA Total Protective Factors	r = .12 (n = 49)	r = .16 (n = 48)	r = .38* (n = 29)	r = -.00 (n = 35)	r = .12 (n = 43)	r = .42** (n = 41)	--

Note. BSRA-3 = Bracken School Readiness Assessment Third Edition; PPVT-4 = Peabody Picture Vocabulary Test Fourth Edition; DECA = Devereux Early Childhood Assessment.
*p < 0.05; **p < 0.01.

Table 5

Correlations - Household Chaos

Variable	1	2	3	4	5	6	7	8	9
1. CHAOS - parent rating	--								
2. FRQ - dinnertime rituals	r = -.06 (n = 55)	--							
3. Chaos - coded from EAR	r = -.06 (n = 35)	r = .22 (n = 35)	--						
4. House noise - coded from EAR	r = -.16 (n = 36)	r = .23 (n = 36)	r = .34* (n = 35)	--					
5. Electronic noise - coded from EAR	r = -.07 (n =36)	r = .20 (n = 36)	r = -.02 (n = 35)	r = .28 (n = 36)	--				
6. Household Overcrowding	r = .17 (n = 50)	r = .01 (n = 50)	r = -.07 (n = 34)	r = -.09 (n = 35)	r = .14 (n = 35)	--			
7. RAs' report inside house noise	r = .05 (n = 49)	r = .06 (n = 49)	r = -.08 (n = 33)	r = .10 (n = 34)	r = .07 (n = 34)	χ^2 = 4.37* (n = 48)	--		
8. RAs' report neighborhood noise	r = .10 (n = 49)	r = .09 (n = 49)	r = -.07 (n = 33)	r = .04 (n = 34)	r = -.31 (n = 34)	r = -.03 (n = 48)	r = .02 (n = 49)	--	
9. RAs' report home chaos	r = .10 (n = 49)	r = -.13 (n = 49)	r = .23 (n = 33)	r = -.05 (n = 34)	r = -.10 (n = 34)	r = .02 (n = 48)	r = .09 (n = 49)	r = -.03 (n = 49)	--

Note. Superscript indicates result of Chi-square test of independence; CHAOS = Confusion, Hubbub, and Order Scale; FRQ = Family Ritual Questionnaire; EAR = Electronically Activated Recorder; RA = Research Assistant.

*p < 0.05.

Table 6

Chi-Square Test of Household Overcrowding by RAs' Report of Noise Inside the Home

	Household Overcrowding	
RAs' Report of Noise Inside Home	No	Yes
No	17 (35.4%)	18 (37.5%)
Yes	2 (4.2%)	11 (22.9%)

Note. RA = Research Assistant.

$X^2(1) = 4.37$, $p = .04$.

Table 7

Correlations - Household Chaos and School Readiness

Variable	BSRA-3	PPVT-4	EF - Houses	EF - SSS	EF - STS	EMT	DECA
1. CHAOS - parent rating	r = .03 (n = 51)	r =.16 (n =50)	r = -.38* (n = 30)	r = .08 (n =36)	r = .00 (n =44)	r = -.05 (n = 43)	r =-.22 (n = 53)
2. Chaos - coded from EAR	r = -.07 (n =32)	r =-.42* (n = 30)	r = .20 (n = 18)	r = -.30 (n = 27)	r = -.22 (n = 27)	r = -.30 (n = 27)	r = .01 (n = 34)

Note. CHAOS = Confusion, Hubbub, and Order Scale; EAR = Electronically Activated Recorder; BSRA-3 = Bracken School Readiness Assessment Third Edition; PPVT-4 = Peabody Picture Vocabulary Test Fourth Edition; SSS = Silly Sounds Stroop; STS = Something's the Same; EMT = Emotion Matching Task; DECA = Devereux Early Childhood Assessment.

*p < 0.05.

Table 8

Household Chaos Predicting Receptive Vocabulary

Predictor	B	SEB	β
Father present	5.13	5.06	0.17
Family income	1.32	1.12	0.20
Children's gender	8.23	4.96	0.28
Chaos - coded from EAR	-1.44	0.56	-0.43*
n		30	
R^2		0.37	
F for R^2 change after adding Chaos - coded from EAR		6.66*	

Note. EAR = Electronically Activated Recorder.

*$p < 0.05$.

Table 9

Household Chaos Predicting Executive Functioning (Houses)

Predictor	B	SEB	β
Father present	0.03	0.06	0.07
Family income	0.02	0.02	0.25
Children's gender	0.11	0.07	0.29
CHAOS - parent rating	-0.11	0.06	-0.31
n		30	
R^2		0.30	
F for R^2 change after adding CHAOS - parent rating		3.24	

Note. All standardized betas were statistically non-significant ($p > .05$); CHAOS = Chaos, Hubbub, and Order Scale.

Table 10

Correlations - Features of Household Chaos and School Readiness

Variable	BSRA-3	PPVT-4	EF - Houses	EF - SSS	EF - STS	EMT	DECA
1. Household Overcrowding	r = -.41** (n = 46)	r = -.20 (n = 46)	r = -.32 (n = 28)	r = -.02 (n =34)	r = -.29 (n = 40)	r = -.17 (n = 39)	r = -.20 (n = 48)
2. RAs' report of noise inside home	r = .21 (n = 46)	r = .15 (n = 46)	r = .32 (n = 28)	r = .14 (n = 33)	r = .10 (n = 39)	r = .01 (n = 39)	r = -.13 (n = 47)
3. RAs' report of neighborhood noise	r = .02 (n = 46)	r = .14 (n = 46)	r = .39* (n = 28)	r = .47** (n = 33)	r = -.12 (n = 39)	r = .12 (n = 39)	r = .11 (n = 47)
4. RAs' report of house chaos	r = -.14 (n = 46)	r = -.26 (n = 46)	r = -.14 (n = 28)	r = .14 (n = 33)	r = -.02 (n = 39)	r = .09 (n = 39)	r = .13 (n = 47)
5. Electronic noise - coded from EAR	r = .13 (n = 33)	r = -.10 (n = 31)	r = -.29 (n = 18)	r = .01 (n = 27)	r = -.03 (n = 28)	r = -.14 (n = 28)	r = .02 (n = 35)
6. House noise - coded from EAR	r = .12 (n = 33)	r = -.24 (n = 31)	r = .19 (n = 18)	r = .09 (n = 27)	r = -.33 (n = 28)	r = -.25 (n = 28)	r = -.13 (n = 35)
7. FRQ - dinnertime rituals	r = -.05 (n = 51)	r = .01 (n = 50)	r = .09 (n = 30)	r = -.09 (n = 36)	r = .03 (n = 44)	r = .04 (n = 43)	r = -.03 (n = 53)

Note. RA = Research Assistant; EAR = Electronically Activated Recorder; FRQ = Family Ritual Questionnaire; BSRA-3 = Bracken School Readiness Assessment Third Edition; PPVT-4 = Peabody Picture Vocabulary Test Fourth Edition; EF = Executive Function; SSS = Silly Sounds Stroop; STS = Something's the Same; EMT = Emotion Matching Task; DECA = Devereux Early Childhood Assessment.
*p < 0.05; **p < 0.01.

Table 11

Household Overcrowding Predicting Pre-Academic Knowledge

Predictor	B	SEB	β
Father present	0.36	4.79	0.01
Family income	2.08	1.12	0.25
Children's Gender	6.43	4.84	0.19
Household Overcrowding	-11.76	4.85	-0.33*
n		46	
R^2		0.26	
F for R^2 change after adding Household Overcrowding		5.87*	

*$p < 0.05$.

Table 12

RAs' Report of Neighborhood Noise Predicting Executive Functioning (Houses)

Predictor	B	SEB	β
Father present	0.01	0.07	0.02
Family income	0.02	0.02	0.22
Children's gender	0.09	0.08	0.24
RAs' observation of neighborhood noise	0.12	0.11	0.24
n		28	
R^2		0.25	
F for R^2 change after adding RAs' observation of neighborhood noise		1.23	

Note. All standardized betas were statistically non-significant ($p > .05$); RA = Research Assistant.

Table 13

RAs' Observation of Neighborhood Noise Predicting Executive Functioning (SSS)

Predictor	B	SEB	β
Father present	-0.11	0.09	-0.19
Family income	0.04	0.02	0.29
Children's gender	0.00	0.10	0.00
RAs' observation of neighborhood noise	0.38	0.14	0.50**
n		33	
R^2		0.32	
F for R^2 change after adding RAs' observation of neighborhood noise		8.04**	

Note. RA= Research Assistant; SSS = Silly Sounds Stroop.
**$p < 0.01$

Table 14

Correlations - Features of Household Language and Features of School Readiness

Variable	BSRA-3 (n = 33)	PPVT-4 (n = 31)	EF (Houses) (n = 18)	EF- (SSS) (n = 27)	EF - (STS) (n = 28)	EMT (n = 28)	DECA (n = 35)
1. LIWC - total word count/# audio files	r = .05	r = .07	r = .41	r = .34	r = -.33	r = -.13	r = -.04
2. LIWC - total emotion words	r = -.11	r = -.21	r = -.29	r = -.28	r = .52**	r = .12	r = .11
3. LIWC - positive emotion words	r = .06	r = .04	r = -.22	r = -.12	r = .59**	r = .33	r = .27
4. LIWC - negative emotion words	r = -.32	r = -.50**	r = -.18	r = -.32	r = -.09	r = -.36	r = -.28
5. LIWC - anger words	r = -.24	r = -.41*	r = -.23	r = -.24	r = -.00	r = -.23	r = -.37*

Note. LIWC = Linguistic Inquiry and Word Count; BSRA-3 = Bracken School Readiness Assessment Third Edition; PPVT-4 = Peabody Picture Vocabulary Test Fourth Edition; EF = Executive Function; SSS = Silly Sounds Stroop; STS = Something's the Same; EMT = Emotion Matching Task; DECA = Devereux Early Childhood Assessment.
*p < 0.05; **p < 0.01.

Table 15

Caregivers' Talkativeness Predicting Children's Receptive Language

Predictor	B	SEB	β
Father present	2.45	5.75	0.08
Family income	0.81	1.21	0.12
Children's Gender	10.73	5.35	0.37
LIWC - Talkativeness	0.15	0.59	0.05
n		31	
R^2		0.19	
F for R^2 change after adding LIWC - Talkativeness		0.06	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 16

Caregivers' Use of Negative Emotion Words Predicting Children's Receptive Vocabulary

Predictor	B	SEB	β
Father present	2.53	5.08	0.09
Family income	0.65	1.11	0.1
Children's gender	6.17	5.30	0.21
LIWC - Negative Emotion Words	-7.92	3.61	-0.39*
n		31	
R^2		0.32	
F for R^2 change after adding LIWC - Negative Emotion Words		4.82*	

Note. LIWC = Linguistic Inquiry and Word Count.
*$p < 0.05$.

Table 17

Caregivers' Use of Anger Words Predicting Children's Receptive Vocabulary

Predictor	B	SEB	β
Father present	2.44	5.33	0.08
Family income	0.38	1.20	0.06
Children's gender	7.92	5.49	0.27
LIWC - Anger Words	-6.13	4.38	-0.27
n		31	
R^2		0.25	
F for R^2 change after adding LIWC - Anger Words		1.96	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 18

Caregivers' Total Use of Emotion Words Predicting Executive Functioning (STS)

Predictor	B	SEB	β
Father present	-0.04	0.04	-0.15
Family income	0.01	0.01	0.13
Children's gender	0.07	0.04	0.31
LIWC - Total emotion words	0.04	0.01	0.45*
n		28	
R^2		0.37	
F for R^2 change after adding LIWC - Total emotion words		7.00*	

Note. STS = Something's the Same; LIWC = Linguistic Inquiry and Word Count.
*$p < 0.05$.

Table 19

Caregivers' Use of Positive Emotion Words Predicting Executive Functioning (STS)

Predictor	B	SEB	β
Father present	-0.03	0.04	-0.14
Family income	0.01	0.01	0.09
Children's gender	0.05	0.05	0.20
LIWC - Positive emotion words	0.04	0.02	0.51*
n		28	
R^2		0.39	
F for R^2 change after adding LIWC - Positive emotion words		7.67*	

Note. STS = Something's the Same; LIWC = Linguistic Inquiry and Word Count.
*$p < 0.05$.

Table 20

Caregivers' Total Emotion Words Predicting Children's Emotion Knowledge

Predictor	B	SEB	β
Father present	-0.70	1.82	-0.08
Family income	-0.13	0.38	-0.07
Children's gender	2.77	1.76	0.32
LIWC - Total emotion words	0.39	0.60	0.13
n		28	
R^2		0.11	
F for R^2 change after adding LIWC - Total emotion words		0.42	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 21

Caregivers' Total Emotion Words Predicting Children's Social-Emotional Competence

Predictor	B	SEB	β
Father present	-3.29	3.64	-0.18
Family income	1.21	0.76	0.29
Children's gender	0.94	3.51	0.05
LIWC - Total emotion words	0.75	1.15	0.11
n		35	
R^2		0.10	
F for R^2 change after adding LIWC - Total emotion words		0.42	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 22

Caregivers' Positive Emotion Words Predicting Children's Social-Emotional Competence

Predictor	B	SEB	β
Father present	-3.65	3.52	-0.20
Family income	1.16	0.74	0.28
Children's gender	-0.30	3.50	-0.02
LIWC - Positive emotion words	1.95	1.22	0.28
n		35	
R^2		0.16	
F for R^2 change after adding LIWC - Positive emotion words		2.52	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 23

Caregivers' Negative Emotion Words Predicting Children's Social-Emotional Competence

Predictor	B	SEB	β
Father present	-2.99	3.51	-0.16
Family income	1.11	0.75	0.27
Children's gender	-0.73	3.60	-0.04
LIWC - Negative emotion words	-3.38	2.23	-0.28
n		35	
R^2		0.15	
F for R^2 change after adding LIWC - Negative emotion words		2.31	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 24

Caregivers' Use of Anger Words Predicting Children's Social-Emotional Competence

Predictor	B	SEB	β
Father present	-3.32	3.44	-0.18
Family income	0.82	0.75	0.20
Children's Gender	-0.85	3.47	-0.05
LIWC - Anger words	-4.94	2.54	-0.36
n		35	
R^2		0.19	
F for R^2 change after adding LIWC - Anger words		3.79	

Note. All standardized betas were statistically non-significant ($p > .05$); LIWC = Linguistic Inquiry and Word Count.

Table 25

Correlations - Home Language and Household Chaos

Variable	LIWC - Total Word Count/# Audio Files	LIWC - Total Emotion Words	LIWC - Positive Emotion Words	LIWC - Negative Emotion Words	LIWC - Anger Words
1. CHAOS - parent rating	*r* = -.07 (*n* = 36)	*r* = .31 (*n* = 36)	*r* = -.30 (*n* = 36)	*r* = -.03 (*n* = 36)	*r* = .02 (*n* = 36)
2. FRQ - dinnertime rituals	*r* = .17 (*n* = 36)	*r* = .16 (*n* = 36)	*r* = .18 (*n* = 36)	*r* = -.03 (*n* = 36)	*r* = -.12 (*n* = 36)
3. Chaos - coded from EAR	*r* = .37* (*n* = 35)	*r* = .16 (*n* = 35)	*r* = .01 (*n* = 35)	*r* = .26 (*n* = 35)	*r* = .12 (*n* = 35)
4. House noise - coded from EAR	*r* = .36* (*n* = 36)	*r* = -.06 (*n* = 36)	*r* = -.06 (*n* = 36)	*r* = -.01 (*n* = 36)	*r* = .07 (*n* = 36)
5. Electronic noise - coded from EAR	*r* = -.21 (*n* =36)	*r* = -.16 (*n* = 36)	*r* = -.08 (*n* = 36)	*r* = -.16 (*n* = 36)	*r* = -.13 (*n* = 36)
7. Household Overcrowding	*r* = -.24 (*n* = 35)	*r* = -.30 (*n* = 35)	*r* = -.31 (*n* = 35)	*r* = -.02 (*n* = 35)	*r* = -.08 (*n* = 35)
8. RAs' report neighborhood noise	*r* = .05 (*n* = 34)	*r* = -.09 (*n* = 34)	*r* = .00 (*n* = 34)	*r* = -.19 (*n* = 34)	*r* = -.22 (*n* = 34)
9. RAs' report inside house noise	*r* = .06 (*n* = 34)	*r* = -.08 (*n* = 34)	*r* = -.03 (*n* = 34)	*r* = -.12 (*n* = 34)	*r* = -.17 (*n* = 34)
10. RAs' report house chaos	*r* = .04 (*n* = 34)	*r* = .21 (*n* = 34)	*r* = .06 (*n* = 34)	*r* = .30 (*n* = 34)	*r* = .21 (*n* = 34)

Note. LIWC = Linguistic Inquiry and Word Count; CHAOS = Confusion, Hubbub, and Order Scale; FRQ = Family Ritual Questionnaire; EAR = Electronically Activated Recorder; RA = Research Assistant.

*$p < 0.05$.

APPENDIX B

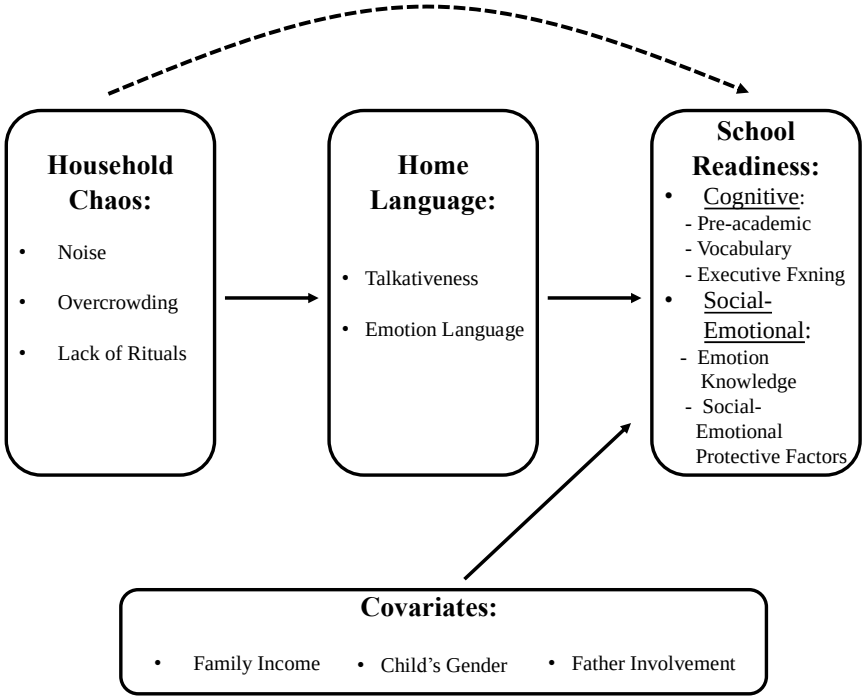

Figure 1. Household chaos, home language, and school readiness; a visual representation of aims being tested in the present study.

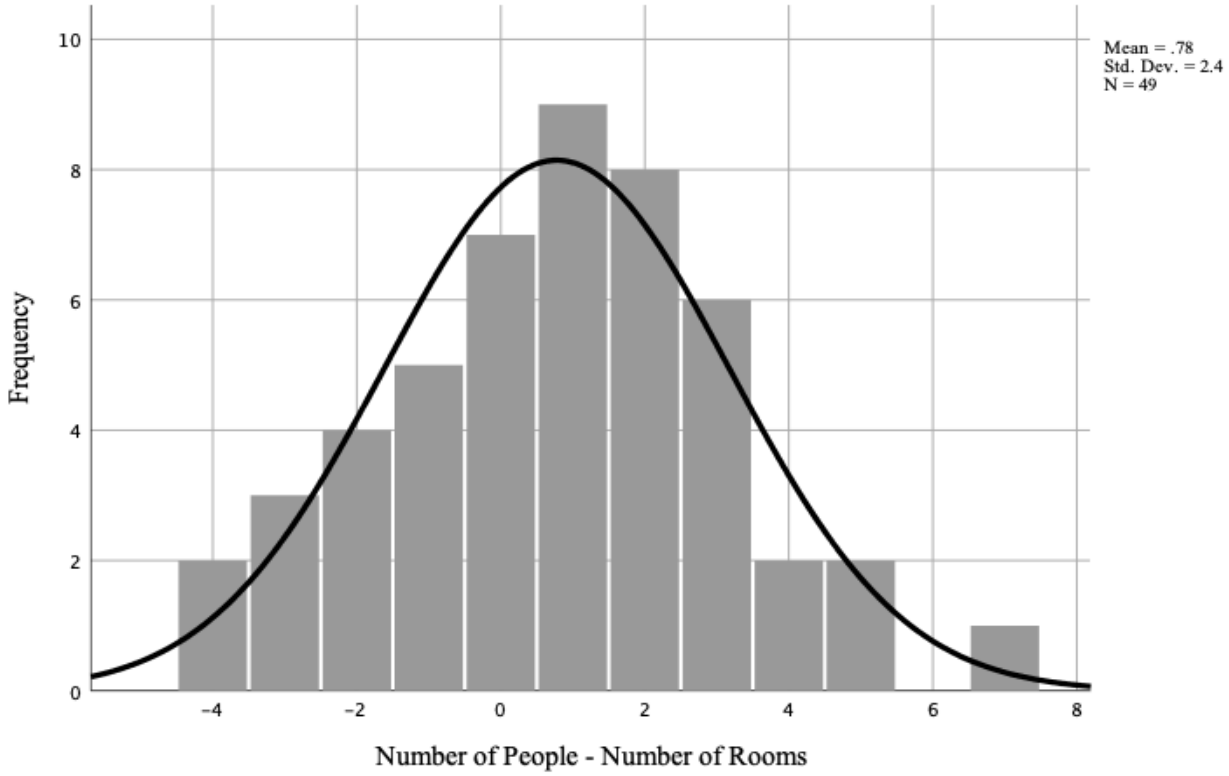

Figure 2. Histogram of household overcrowding, which was defined as when the number of people in the home exceeds the number of rooms, not including hallways and bathrooms.

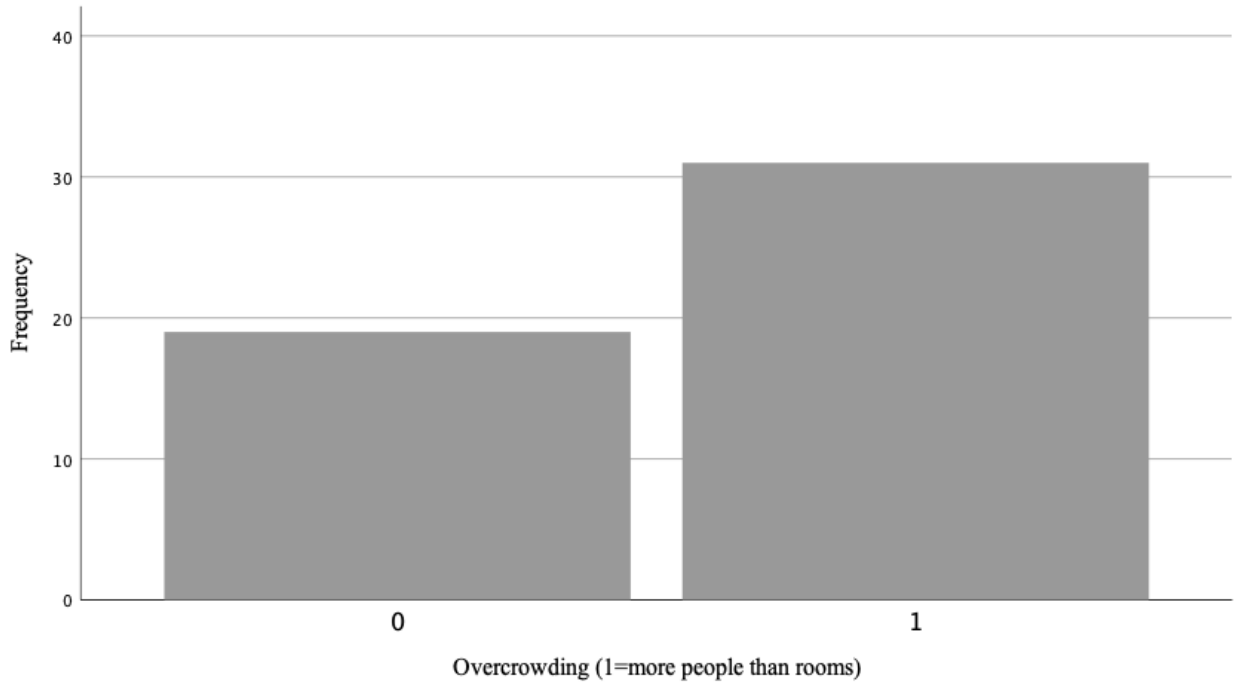

Figure 3. Bar chart of dichotomized household overcrowding.

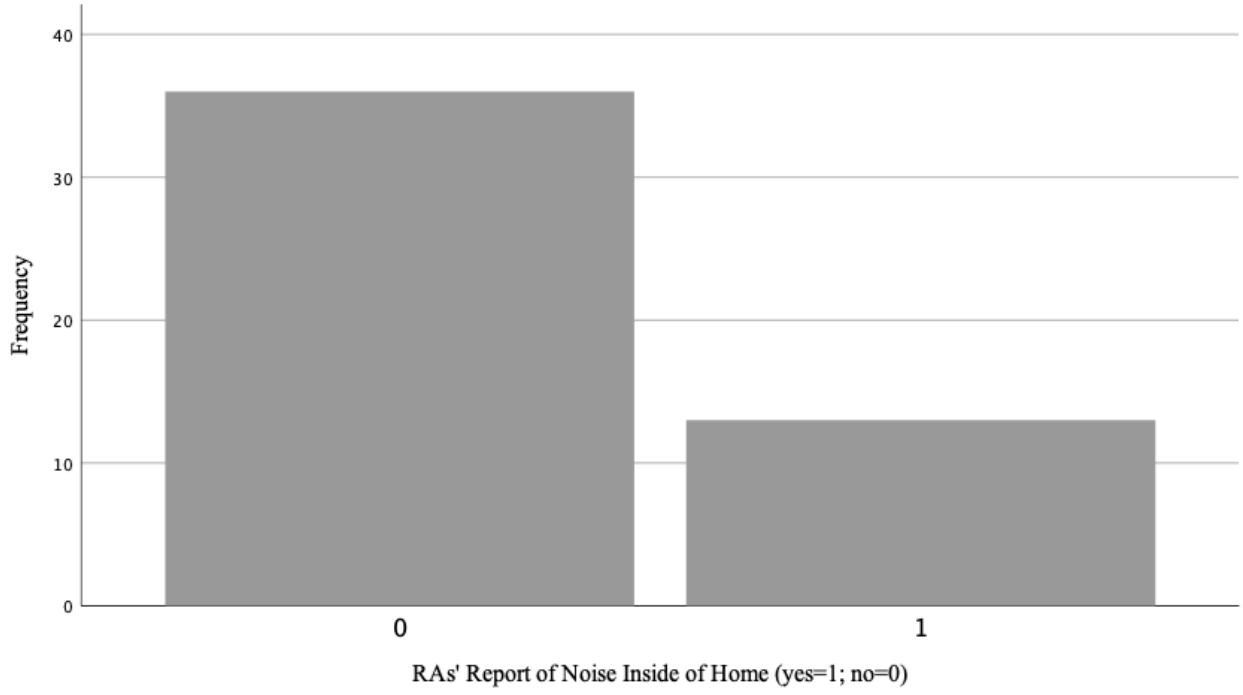

Figure 4. Bar chart of research assistants' report of noise inside the home at the home visit.

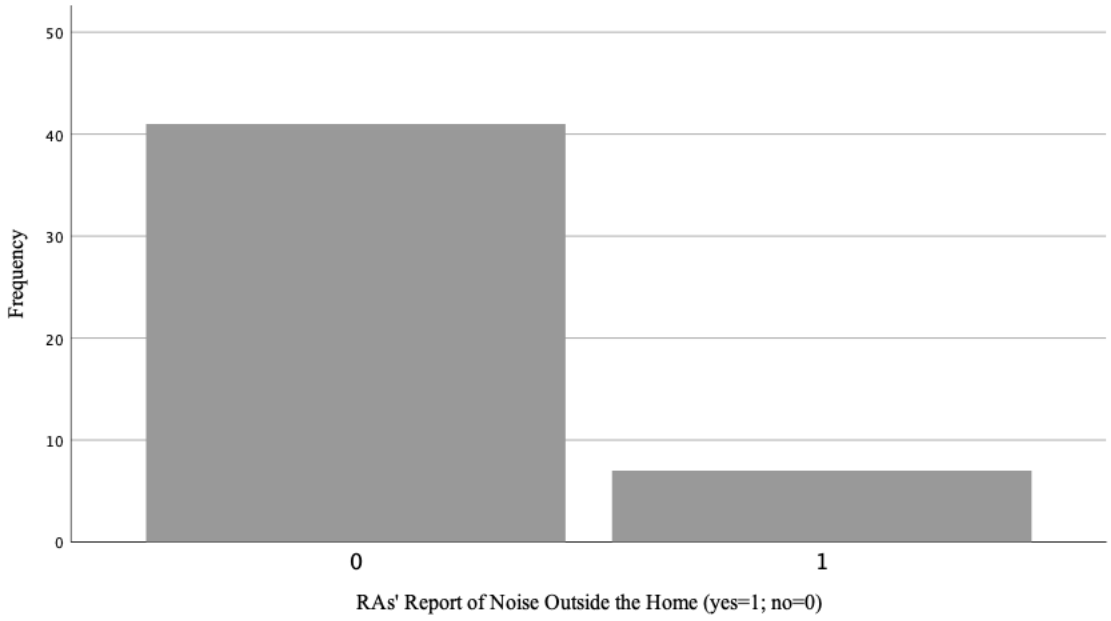

Figure 5. Bar chart of research assistants' report of noise outside the home at the home visit.

REFERENCES

Ackerman, B. P., & Brown, E. D. (2010) Physical and psychosocial turmoil in the home and cognitive development. In G. W. Evans & T.D. Wachs (Eds.). *Chaos and Its Influence on Children's Development* (pp. 35-47). Washington, DC: American Psychological Association.

Ackerman, B. P., Kogos, J., Youngstrom, E., Schoff, K., & Izard, C. (1999). Family instability and the problem behaviors of children from economically disadvantaged families. *Developmental Psychology*, *35*, 258-268.

Aukrust, V. (2002). "What did you do in school today?" Speech genres and tellability in multiparty family mealtime conversations in two cultures. In S. Blum-Kulka & C. Snow (Eds.), Talking to adults: The contribution of multiparty discourse to language acquisition (pp. 55–83). Mahwah, NJ: Erlbaum.

Best, J. R., Miller, P. H., & Naglieri, J. A. (2011). Relations between executive function and academic achievement from ages 5 to 17 in a large, representative national sample. *Learning and Individual Differences*, *21*, 327-336.

Bierman, K. L., Domitrovich, C. E., Nix, R. L., Gest, S. D., Welsh, J. A., Greenberg, M. T., ... & Gill, S. (2008). Promoting academic and social-emotional school readiness: The Head Start REDI program. *Child Development*, *79*, 1802-1817.

Blair, C. (2002). School readiness: Integrating cognition and emotion in a neurobiological conceptualization of children's functioning at school entry. *American Psychologist*, *57*, 111-127. doi: 10.1037/0003-066x.57.2.111

Bocknek, E. L. (2018). Family Rituals in Low-Income African American Families at Risk for

Trauma Exposure and Associations with Toddlers' Regulation of Distress. *Journal of marital and family therapy, 44*, 702-715.

Bracken, B. A. (2007). *School readiness assessment*. [San Antonio, TX]: Pearson.

Britto, P. R. (2001). Family literacy environments and young children's emerging literacy skills. *Reading Research Quarterly*, *36*, 346-347.

Bronfenbrenner, U., & Evans, G. W. (2000). Developmental science in the 21st century: Emerging questions, theoretical models, research designs and empirical findings. *Social Development, 9*, 115-125. doi: 10.1111/1467-9507.00114

Brooks-Gunn, J., Johnson, A. D., & Leventhal, T. (2010) Disorder, turbulence, and resources in children's home and neighborhoods. In G. W. Evans & T.D. Wachs (Eds.). *Chaos and its influence on children's development* (pp. 155-179). Washington, DC: American Psychological Association.

Brophy-Herb, H. E., Bocknek, E. L., Vallotton, C. D., Stansbury, K. E., Senehi, N., Dalimonte Merckling, D., & Lee, Y. E. (2015). Toddlers with early behavioral problems at higher family demographic risk benefit the most from maternal emotion talk. *Journal of Developmental & Behavioral Pediatrics*, *36*, 512-520.

Brownell, C. A., Svetlova, M., Anderson, R., Nichols, S. R., & Drummond, J. (2013). Socialization of early prosocial behavior: Parents' talk about emotions is associated with sharing and helping in toddlers. *Infancy*, *18*, 91-119.

Calkins, S. D., & Mackler, J. S. (2011) Temperament, emotion regulation, and social development. In M. K. Underwood & L. H. Rosen (Eds.). *Social development: Relationships in infancy, childhood, and adolescence* (44-70). New York, NY: Guilford Publications.

Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional problems in children. *Pediatrics, 113*, 708-713.

Claessens, A., Duncan, G., & Engel, M. (2009). Kindergarten skills and fifth-grade achievement: Evidence from the ECLS-K. *Economics of Education Review, 28*, 415-427. doi:10.1016/j.econedurev.2008.09.003

Cohen, S., Glass, D. C., & Singer, J. E. (1973). Apartment noise, auditory discrimination, and reading ability in children. *Journal of Experimental Social Psychology, 9*, 407-422. doi: 10.1016/S0022-1031(73)80005-8

Coldwell, J., Pike, A., & Dunn, J. (2006). Household chaos–links with parenting and child behaviour. *Journal of Child Psychology and Psychiatry, 47*, 1116-1122.

Contreras, D., Delgadillo, J., & Riveros, G. (2019). Is home overcrowding a significant factor in children's academic performance? Evidence from Latin America. *International Journal of Educational Development, 67*, 1-17.

Conway, A. R., Kane, M. J., Bunting, M. F., Hambrick, D. Z., Wilhelm, O., & Engle, R. W. (2005). Working memory span tasks: A methodological review and user's guide. *Psychonomic Bulletin & Review, 12*, 769-786.

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods, 1*, 16.

Denham, S. A. (2006). Social-emotional competence as support for school readiness: What is it and how do we assess it?. *Early Education and Development, 17*, 57-89.

Denham, S. A., Bassett, H. H., Brown, C., Way, E., & Steed, J. (2015). "I know how you

feel": Preschoolers' emotion knowledge contributes to early school success. *Journal of Early Childhood Research, 13,* 252-262.

Denham, S. A., Cook, M., & Zoller, D. (1992). 'Baby looks very sad': Implications of conversations about feelings between mother and preschooler. *British Journal of Developmental Psychology, 10,* 301-315.

Denham, S., & Kochanoff, A. T. (2002). Parental contributions to preschoolers' understanding of emotion. *Marriage & Family Review, 34,* 311-343.

Denham, S. A., Mitchell-Copeland, J., Strandberg, K., Auerbach, S., & Blair, K. (1997). Parental contributions to preschoolers' emotional competence: Direct and indirect effects. *Motivation and Emotion, 21,* 65-86.

Denham, S. A., Zoller, D., & Couchoud, E. A. (1994). Socialization of preschoolers' emotion understanding. *Developmental Psychology, 30,* 928-936.

Dieterich, S. E., Assel, M. A., Swank, P., Smith, K. E., & Landry, S. H. (2006). The impact of early maternal verbal scaffolding and child language abilities on later decoding and reading comprehension skills. *Journal of School Psychology, 43,* 481-494.

Dumas, J. E., Nissley, J., Nordstrom, A., Smith, E. P., Prinz, R. J., & Levine, D. W. (2005). Home chaos: Sociodemographic, parenting, interactional, and child correlates. *Journal of Clinical Child and Adolescent Psychology, 34,* 93-104.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., Pagani, L., Feinstein, L., Engel, M., Brooks-Gunn, J., Sexton, H., Ducksworth, K., & Japel, C., (2007). School readiness and later achievement. *Developmental Psychology, 43,* 1428-1446. doi: 10.1037/0012-1649.43.6.1428

Dunn, J., Brown, J., & Beardsall, L. (1991). Family talk about feeling states and children's later

understanding of others' emotions. *Developmental Psychology, 27,* 448-455.

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62,* 1352-1366.

Dunn, L. M., & Dunn, D. M. (2007). *PPVT-4: Peabody picture vocabulary test*. Pearson Assessments.

Ely, R., Gleason, J. B., MacGibbon, A., & Zaretsky, E. (2001). Attention to language: Lessons learned at the dinner table. *Social Development*, 10, 356– 373.

Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist, 59,* 77-92.

Evans, G. W. (2006). Child development and the physical environment. *Annu. Rev. Psychol., 57,* 423-451.

Evans, G. W., Eckenrode, J., Marcynyszyn, L. A. (2010) Chaos and the macrosetting: The role of poverty and socioeconomic status. In G. W. Evans & T.D. Wachs (Eds.). *Chaos and its influence on children's development* (pp. 225-238). Washington, DC: American Psychological Association.

Evans, G. W., Gonnella, C., Marcynyszyn, L. A., Gentile, L., & Salpekar, N. (2005). The role of chaos in poverty and children's socioemotional adjustment. *Psychological Science, 16,* 560-565.

Evans, G. W., & Lepore, S. J. (1993). Nonauditory effects of noise on children: A critical review. *Children's Environments,* 31-51.

Evans, G. W., Lepore, S. J., Shejwal, B. R., & Palsane, M. N. (1998). Chronic residential crowding and children's well-being: an ecological perspective. *Child Development, 69,* 1514-1523.

Evans, G. W., Maxwell, L. E., & Hart, B. (1999). Parental language and verbal responsiveness to children in crowded homes. *Developmental Psychology, 35*, 1020-1023.

Evans, G. W., & Wachs, T. D. (2010). Chaos and its influence on children's development. *Washington, DC: American Psychological Association*.

Fantuzzo, J., Bulotsky-Shearer, R., McDermott, P. A., & McWayne, C. (2007). Investigation of dimensions of social-emotional classroom behavior and school readiness for low-income urban preschool children. *School Psychology Review*, *36*, 44-62.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2008). G*Power Version 3.1.2 [computer software]. Uiversität Kiel, Germany. Retrieved from http://www.psycho.uniduesseldorf.de/abteilungen/aap/gpower3/download-and-register

Fiese, B. H. (2002). Routines of daily living and rituals in family life: A glimpse at stability and change during the early child-raising years. *Zero to Three, 22*, 10-13.

Fiese, B. H. (2006). *Family routines and rituals*. Yale University Press.

Fiese, B. H., & Kline, C. A. (1993). Development of the Family Ritual Questionnaire: Initial reliability and validation studies. *Journal of Family Psychology, 6*, 290-299. doi: 10.1037/0893-3200.6.3.290

Forget-Dubois, N., Dionne, G., Lemelin, J. P., Pérusse, D., Tremblay, R. E., & Boivin, M. (2009). Early child language mediates the relation between home environment and school readiness. *Child Development, 80*, 736-749.

Garner, P. W., Dunsmore, J. C., & Southam-Gerrow, M. (2008). Mother–child conversations about emotions: Linkages to child aggression and prosocial behavior. *Social Development, 17*, 259-277.

Garner, P. W., Jones, D. C., Gaddy, G., & Rennie, K. M. (1997). Low-Income mothers'

Conversations about emotions and their children's emotional competence. *Social Development*, *6*, 37-52.

Garon, N., Bryson, S. E., & Smith, I. M. (2008). Executive function in preschoolers: a review using an integrative framework. *Psychological Bulletin*, *134*, 31-60.

Gerstadt, C. L., Hong, Y., & Diamond, A. (1994). The relationship between cognition and action: Performance of children 3 1/2-7 years old on a Stroop-like day-night test. *Cognition*, 53, 129-153. doi:10.1016/0010-0277(94)90068-X

Greenwood, C. R., Thiemann-Bourque, K., Walker, D., Buzhardt, J., & Gilkerson, J. (2011). Assessing children's home language environments using automatic speech recognition technology. *Communication Disorders Quarterly*, *32*, 83-92.

Goux, D., & Maurin, E. (2005). The effect of overcrowded housing on children's performance at school. *Journal of Public Economics*, *89*, 797-819.

Haines, M. M., Stansfeld, S. A., Job, R. S., Berglund, B., & Head, J. (2001). Chronic aircraft noise exposure, stress responses, mental health and cognitive performance in school children. *Psychological Medicine*, *31*, 265-277.

Halle, T., Forry, N., Hair, E., Perper, K., Wandner, L., Wessel, J., & Vick, J. (2009). Disparities in early learning and development: lessons from the Early Childhood Longitudinal Study–Birth Cohort (ECLS-B). *Washington, DC: Child Trends*, 1-7.

Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Paul H Brookes Publishing.

Hart, S. A., Petrill, S. A., Deckard, K. D., & Thompson, L. A. (2007). SES and CHAOS as environmental mediators of cognitive ability: A longitudinal genetic analysis. *Intelligence*, *35*, 233-242.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY, US: Guilford Press.

Heft, H. (1979). Background and Focal Environmental Conditions of the Home and Attention in Young Children1. *Journal of Applied Social Psychology*, *9*, 47-69.

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*, 1368-1378.

Hoff, E., & Tian, C. (2005). Socioeconomic status and cultural influences on language. *Journal of Communication Disorders, 38*, 271-278.

Hoff-Ginsberg, E. (1991). Mother-child conversation in different social classes and communicative settings. *Child Development, 62*, 782-796.

Hur, E., Buettner, C. K., & Jeon, L. (2015). Parental Depressive Symptoms and Children's School-Readiness: The Indirect Effect of Household Chaos. *Journal of Child and Family Studies, 24*, 3462-3473.

Izard, C. E. (1992). Basic emotions, relations among emotions, and emotion-cognition relations.

Izard, C., Fine, S., Schultz, D., Mostow, A., Ackerman, B., & Youngstrom, E. (2001). Emotion knowledge as a predictor of social behavior and academic competence in children at risk. *Psychological Science, 12*, 18-23.

Izard, C. E., Haskins, F. W., Schultz, D., Trentacosta, C. J., & King, K. A. (2003). Emotion matching test. *Unpublished manuscript, University of Delaware. (Contains 182 standardized color photos of children's emotion expressions)*.

Jacques, S., & Zelazo, P. (2001). The Flexible Item Selection Task (FIST): A measure of executive function in preschoolers. *Developmental Neuropsychology*, 20, 573-591. doi: 10.1207/875656401753549807

Johnson, A. D., Martin, A., Brooks-Gunn, J., & Petrill, S. A. (2008). Order in the house! Associations among household chaos, the home literacy environment, maternal reading ability, and children's early reading. *Merrill-Palmer Quarterly (Wayne State University. Press), 54*, 445-472.

Kaiser, A. P., Hancock, T. B., Cai, X., Michael, E., & Hester, P. P. (2000). Parent-reported behavioral problems and language delays in boys and girls enrolled in Head Start classrooms. *Behavioral Disorders, 26*, 26-41.

La Paro, K. M., & Pianta, R. C. (2000). Predicting children's competence in the early school years: A meta-analytic review. *Review of Educational Research, 70*, 443-484.

Landhuis, C. E., Poulton, R., Welch, D., & Hancox, R. J. (2007). Does childhood television viewing lead to attention problems in adolescence? Results from a prospective longitudinal study. *Pediatrics, 120*, 532-537.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, 159-174.

LeBuffe, P. A., & Naglieri, J. A. (1999). *Devereux early childhood assessment: Technical manual*. Kaplan Early Learning Company.

Lewit, E. M., & Baker, L. S. (1995). School Readiness. *The Future of Children, 5*, 128-139.

Lien, M. T., & Carlson, J. S. (2009). Psychometric properties of the Devereux early childhood assessment in a head start sample. *Journal of Psychoeducational Assessment, 27*, 386-396.

LIWC, Inc. (n.d.). Retrieved from http://www.liwc.net.

Martin, A., Razza, R. A., & Brooks-Gunn, J. (2012). Specifying the links between household

chaos and preschool children's development. *Early Child Development and Care, 182,* 1247-1263.

Matheny, A. P., Wachs, T. D., Ludwig, J. L., & Phillips, K. (1995). Bringing order out of chaos: Psychometric characteristics of the confusion, hubbub, and order scale. *Journal of Applied Developmental Psychology, 16,* 429-444.

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

Mehl, M. R., Pennebaker, J. W., Crow, D. M., Dabbs, J., & Price, J. H. (2001). The Electronically Activated Recorder (EAR): A device for sampling naturalistic daily activities and conversations. *Behavior Research Methods, Instruments, & Computers, 33,* 517-523.

Micalizzi, L., Brick, L. A., Flom, M., Ganiban, J. M., & Saudino, K. J. (2019). Effects of socioeconomic status and executive function on school readiness across levels of household chaos. *Early Childhood Research Quarterly, 47,* 331-340.

Morgan, J. K., Izard, C. E., & King, K. A. (2010). Construct validity of the Emotion Matching Task: Preliminary evidence for convergent and criterion validity of a new emotion knowledge measure for young children. *Social Development, 19,* 52-70.

Muñiz, E. I., Silver, E. J., & Stein, R. E. (2014). Family routines and social-emotional school readiness among preschool-age children. *Journal of Developmental & Behavioral Pediatrics, 35,* 93-99.

Neuenschwander, R., Röthlisberger, M., Cimeli, P., & Roebers, C. M. (2012). How do different aspects of self-regulation predict successful adaptation to school?. *Journal of Experimental Child Psychology, 113,* 353-371.

Ninio, A. (1980). Picture-book reading in mother-infant dyads belonging to two subgroups in Israel. *Child Development*, 587-590.

Pagani, L. S., Fitzpatrick, C., Barnett, T. A., & Dubow, E. (2010). Prospective associations between early childhood television exposure and academic, psychosocial, and physical well-being by middle childhood. *Archives of Pediatrics & Adolescent Medicine, 164*, 425-431.

Pancsofar, N., & Vernon-Feagans, L. (2006). Mother and father language input to young children: Contributions to later language development. *Journal of Applied Developmental Psychology, 27*, 571-587.

Pennebaker, J. W., Francis, M. E., & Booth, R. J. (2001). Linguistic Inquiry and Word Count (LIWC): A computerized text analysis program. *Mahwah (NJ), 7*.

Pennebaker, J. W., Boyd, R. L., Jordan, K., & Blackburn, K. (2015). The Development and Psychometric Properties of LIWC2015. *UT Faculty/Researcher Works*.

Pike, A., Iervolino, A. C., Eley, T. C., Price, T. S., & Plomin, R. (2006). Environmental risk and young children's cognitive and behavioral development. *International Journal of Behavioral Development, 30*, 55-66.

Pratt, M. E., McClelland, M. M., Swanson, J., & Lipscomb, S. T. (2016). Family risk profiles and school readiness: A person-centered approach. *Early Childhood Research Quarterly, 36*, 462-474.

Preacher, K. J., Rucker, D. D., & Hayes, A. F. (2007). Addressing moderated mediation hypotheses: Theory, methods, and prescriptions. *Multivariate Behavioral Research, 42*, 185-227. doi:10.1080/00273170701341316

Raver, C. (2003). Young children's emotional development and school readiness. *Social Policy*

Report, 16, 3-19.

Raver, C., & Zigler, E. F. (1997). Social competence: An untapped dimension in evaluating head start's success. *Early Childhood Research Quarterly, 12*, 363-385. doi: http://dx.doi.org/10.1016/S0885-2006(97)90017-X

Razza, R. & Raymond, K. (2014). Executive functions and school readiness: Identifying multiple pathways for school success. In S. Robson & S. F. Quinn (Eds.). *The Routledge international handbook of young children's thinking and understanding*. (pp. 133-149) New York, NY: Routledge.

Rhoades, B. L., Warren, H. K., Domitrovich, C. E., & Greenberg, M. T. (2011). Examining the link between preschool social–emotional competence and first grade academic achievement: The role of attention skills. *Early Childhood Research Quarterly, 26*, 182-191.

Rimm-Kaufman, S. E., & Pianta, R. C. (2000). An ecological perspective on the transition to kindergarten: A theoretical framework to guide empirical research. *Journal of Applied Developmental Psychology, 21*, 491-511.

Rimm-Kaufman, S. E., Pianta, R. C., & Cox, M. J. (2000). Teachers' judgments of problems in the transition to kindergarten. *Early Childhood Research Quarterly, 15*, 147-166.

Rodriguez, E. T., & Tamis-LeMonda, C. S. (2011). Trajectories of the home learning environment across the first 5 years: Associations with children's vocabulary and literacy skills at prekindergarten. *Child Development, 82* 1058-1075.

Rowe, M. L. (2008). Child-directed speech: relation to socioeconomic status, knowledge of child development and child vocabulary skill. *Journal of Child Language, 35*, 185-205.

Rowe, M. L., Leech, K. A., & Cabrera, N. (2016). Going beyond input quantity: Wh-questions

matter for toddlers' language and cognitive development. *Cognitive Science, 41,* 162-179.

Ryan, R. M., Fauth, R. C., & Brooks-Gunn, J. (2006). Childhood poverty: Implications for school readiness and early childhood education. In B. Spodek & O. N. Saracho (Eds.). *Handbook of research on the education of young children, 2nd ed.*, (pp. 323-346). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Shore, R. (1998). Ready Schools. A Report of the Goal 1 Ready Schools Resource Group.

Solari, C. D., & Mare, R. D. (2012). Housing crowding effects on children's wellbeing. *Social Science Research, 41*, 464-476.

Slatcher, R. B., & Trentacosta, C. J. (2011). A naturalistic observation study of the links between parental depressive symptoms and preschoolers' behaviors in everyday life. *Journal of Family Psychology, 25*, 444-448.

Slatcher, R. B., & Trentacosta, C. J. (2012). Influences of parent and child negative emotionality on young children's everyday behaviors. *Emotion, 12,* 932-942.

Spagnola, M., & Fiese, B. H. (2007). Family routines and rituals: A context for development in the lives of young children. *Infants & Young Children, 20,* 284-299.

Sperry, D. E., Sperry, L. L., & Miller, P. J. (2018). Reexamining the verbal environments of children from different socioeconomic backgrounds. *Child Development.*

Trentacosta, C. J., & Izard, C. E. (2007). Kindergarten children's emotion competence as a predictor of their academic competence in first grade. *Emotion, 7,* 77-88.

Vernon-Feagans, L., Garrett-Peters, P., Willoughby, M., Mills-Koonce, R., & Family Life Project Key Investigators. (2012). Chaos, poverty, and parenting: Predictors of early language development. *Early Childhood Research Quarterly, 27,* 339-351.

Vernon-Feagans, L., Willoughby, M., & Garrett-Peters, P. (2016). Predictors of behavioral

regulation in kindergarten: Household chaos, parenting, and early executive functions. *Developmental Psychology, 52,* 430-441.

Wachs, T. D. (1986). Noise in the nursery: Ambient background noise and early development. *Children's Environments Quarterly, 3,* 23-33.

Wachs, T. D. (2013). Relation of maternal personality to perceptions of environmental chaos in the home. *Journal of Environmental Psychology, 34,* 1-9.

Wachs, T. D., & Evans, G. W. (2010) Chaos in context. In G. W. Evans & T. D. Wachs (Eds.). *Chaos and its influence on children's development* (pp. 3-13). Washington, DC: American Psychological Association.

Weisleder, A., & Fernald, A. (2013). Talking to children matters early language experience strengthens processing and builds vocabulary. *Psychological Science, 24,* 2143-2152.

Weizman, Z. O., & Snow, C. E. (2001). Lexical output as related to children's vocabulary acquisition: Effects of sophisticated exposure and support for meaning. *Developmental Psychology, 37,* 265-279.

Willoughby, M. T., Blair, C. B., Wirth, R. J., & Greenberg, M. (2010). The measurement of executive function at age 3 years: psychometric properties and criterion validity of a new battery of tasks. *Psychological Assessment, 22,* 306-317.

Willoughby, M. T., Blair, C. B., Wirth, R. J., & Greenberg, M. (2012). The measurement of executive function at age 5: psychometric properties and relationship to academic achievement. *Psychological Assessment, 24,* 226-239.

Wright, J. C., Huston, A. C., Murphy, K. C., St Peters, M., Pinon, M., Scantlin, R., & Kotler, J.

(2001). The relations of early television viewing to school readiness and vocabulary of children from low-income families: The early window project. *Child Development, 72,* 1347-1366.

Xu, D., Yapanel, U., & Gray, S. (2009). Reliability of the LENA Language Environment Analysis System in young children's natural home environment. *Boulder, CO: LENA Foundation*, 1-16.

Zigler, E., & Trickett, P. K. (1978). IQ, social competence, and evaluation of early childhood intervention programs. *American Psychologist, 33*, 789-798.

Zigler, E. F., & Bishop-Josef, S. J. (2006). The cognitive child versus the whole child: Lessons from 40 years of Head Start. In *Play= learning: How play motivates and enhances children's cognitive and social-emotional growth*, 15-35. Oxford: Oxford University Press.

ABSTRACT

THE INFLUENCE OF HOUSEHOLD CHAOS AND THE HOME LANGUAGE ENVIRONMENT ON PRESCHOOL-AGE CHILDREN'S SCHOOL READINESS

by

LAURA MARY NORTHERNER

August 2019

Advisor: Dr. Christopher J. Trentacosta

Major: Psychology (Clinical)

Degree: Doctor of Philosophy

School readiness, including both cognitive and social-emotional development, is an important indicator of a child's preparedness for school entry, and a meaningful predictor of future academic success (Duncan et al., 2007). The home environment plays a critical role in the development of children's school readiness, especially for children facing social inequalities. Within the home environment, household chaos and home language have been found to impact school readiness. The current study expanded on previous research on household chaos by collecting multiple measures of household chaos, including a naturalistic observation across several days. The current study also naturalistically investigated the home language environment to explore how these constructs impact numerous aspects of school readiness. A sample of 55 African-American mother-child dyads, primarily identifying as low-income, participated when children were between 3 ½ and 4 ½ years old. Mothers completed self-report measures of household chaos, children's social-emotional protective factors, and family rituals. Children completed measures of the following: pre-academic knowledge, receptive vocabulary, executive functioning, and emotion knowledge. Children also wore an iPod with the Electronically

Activated Recorder (EAR; Mehl, Pennebaker, Crow, Dabbs, & Price, 2001) "app" installed, which collected random naturalistic audio observations of the home environment. These audio files were coded for household chaos by trained research assistants, and were transcribed to analyze language (talkativeness and emotion words) with the Linguistic Inquiry and Word Count (LIWC; Pennebaker, Francis, & Booth, 2001) system. Household chaos was also measured with research assistants' observations at the home visit and with an objective measure of household overcrowding. The current study demonstrated the feasiblity of measuring household chaos with the EAR "app" and explored the relationship of this measure to other measures of household chaos; overall, there was limited support for significant associations among these measures. Contrary to expectations, the current study did not find much support for the relatedness of household chaos with indicators of school readiness, although there were a few significant associations that held while accounting for covariates. House chaos measured via the EAR was negatively associated with children's receptive vocabulary. Household overcrowding was negatively associated with pre-academic skills. Contrary to the hypothesis, research assistants' report of neighborhood noise was positively associated with children's executive functioning. There were also very few associations between characteristics of the home language environment and indicators of school readiness that held while accounting for covariates. Caregivers' use of negative emotion words was negatively associated with children's receptive vocabulary. Caregivers' use of total emotion words and positive emotion words were positively associated with executive functioning. This study included an extensive examination of household chaos and the home language environment, and investigated their association with a broad range of school readiness measures. These findings provide some support for the importance of assessing

household chaos, particularly household overcrowding, when addressing education disparities before school entry for families facing social inequities.

AUTOBIOGRAPHICAL STATEMENT

Laura Northerner was raised in Troy, Michigan with her parents, Ralph and Mary, and her sisters, Joanne and Jeanette. She is married to Marland Moore and has three children, Samuel, Jonah and Oliver. She attended college at Wayne State University in Detroit. She graduated with a major in English literature and a minor in anthropology, and used this degree to progress from intern, to proofreader, then editorial writer, and eventually marketing specialist for The Henry Ford. After careful deliberation, Laura decided to leave her position as a marketing specialist and return to Wayne State University to complete a second major in psychology. During this time, she sought out numerous research opportunities including serving as a research assistant in a study conducted at the Wayne State University School of Medicine. Next, Laura worked in the lab of Dr. Antonia Abbey in the Department of Psychology. In this lab, Laura had an opportunity to conduct her own research on insecure adult attachment styles.

Since her acceptance in the Clinical Psychology Doctoral Program at Wayne State University in 2011, Laura has continued to pursue her research and clinical interests. She is involved in the Family Emotion Lab under the supervision of her mentor, Dr. Christopher Trentacosta. Here she completed data collection for a longitudinal study that followed a sample of young at-risk mothers and their toddler children. She graduated with her Master of Arts in Clinical Psychology from Wayne State University in December of 2013. Additionally, she worked for several years as Psychological Services Intern at The Children's Center in Detroit, under the supervision of Dr. Angela Tzelepis. Next, Laura worked as a practicum student at McCaskill Family Services. Laura recently completed her pre-doctoral internship at the Mary A. Rackham Institute at the University of Michigan. There she provided psychological services for individuals across the lifespan.