The Relations of Household Chaos to Children's Language Development:

The Mediating Roles of Children's Effortful Control and Parenting

by

Bridget Maria Gaertner

A Dissertation Presented in Partial Fulfillment
Of the Requirements of the Degree
Doctor of Philosophy

Approved April 2012 by the
Graduate Supervisory Committee:

Tracy Spinrad, Chair
Nancy Eisenberg
Laura Hanish
Robert Bradley

ARIZONA STATE UNIVERSITY

May 2012

ABSTRACT

This study drew upon a bioecological framework to empirically investigate the relations between environmental chaos and preschoolers' language across time, including the potentially mediating roles of children's effortful control and parenting. Child sex also was examined as a moderator of these relations. For this study, the following data were collected at 30, 42, and 54 months of age. Household chaos and (at 30 months) socioeconomic status (SES) were reported by mothers. Children's effortful control (EC) was rated by mothers and nonparental caregivers, and was observed during a number of laboratory tasks. Maternal vocalizations were assessed during free play sessions with their children (at 30 and 42 months), and supportive and unsupportive parenting behaviors and affect were observed during free play and teaching tasks at each age. Mothers also reported on their own reactions to children's negative emotions. Finally, (at 54 months) children's expressive and receptive language was measured with a standard assessment. Structural equation modeling and path analyses indicated that SES at 30 months and greater levels of household chaos at 42 months predicted not only poorer language skills, but also deficits in children's EC and less supportive parenting in low-income mothers at 54 months, even when controlling for stability in these constructs. Children's effortful control at 42 months, but not parenting, positively predicted later language, suggesting that EC may play a mediating role in the relations between household chaos, as well as SES, and preschoolers' language abilities. Child sex did not moderate the pattern of relations. Post-hoc analyses also indicated that the negative relation between chaos and language was significant only for children who had low EC at 42 months. This study represents a much-needed addition to the currently limited longitudinal research examining environmental chaos and children's developmental outcomes. Importantly, findings from this study elucidate an important process

underlying the links between chaos and children's language development, which can inform interventions and policies designed to support families and children living in chaotic home environments.

ACKNOWLEDGMENTS

First and foremost, I would like to express my heartfelt thanks to my dissertation chair and the members of my committee for their encouragement, support, and time throughout this process. I would like to thank Dr. Tracy Spinrad for her enthusiasm, endless mentorship, and unwavering faith in me for so many years. I would also like to thank Dr. Nancy Eisenberg, whose expertise and guidance have helped me grow as a researcher. Likewise, I would like to thank Dr. Laura Hanish, who has provided leadership and mentorship to me in what have now become numerous arenas. Finally, I thank Dr. Robert Bradley for his inspiring work on children's environments and his thoughtful and thought-provoking conversations with me. I also thank the many faculty, students, and staff in the School of Social and Family Dynamics whom I have been fortunate to know, learn from, and grow with throughout this time.

My sincerest appreciation to all of the families who shared their time in this project. Without them this research would not be possible.

I am also extremely grateful for the supportiveness and encouragement of my family and friends throughout the years. I especially thank my husband Scott and my children Jaime, Lexi, Lindsey, Abby, Keil, Jack, and Jahna for their love and for tolerating our chaotic household throughout this process.

TABLE OF CONTENTS

Page

LIST OF TABLES

Table Page

Table Page

LIST OF FIGURES

INTRODUCTION

In recent years, there has been increasing demand for high standards of academic performance for children, beginning in the earliest years of formal schooling. Of great concern among developmentalists, educators, policymakers, and parents is the number of children who come to school ill-prepared to learn (e.g., Kagan, Moore, & Bredekamp, 1995; Rimm-Kaufmann & Pianta, 2000). There is wide variation in mastery of basic cognitive and socioemotional skills at school entry, and children who lack fundamental school readiness competencies generally struggle with learning and achievement in their early years, with these problems tending to persist throughout elementary school (Duncan et al., 2007; La Paro & Pianta, 2000; Zhao & Brooks-Gunn, 2002). In fact, cognitive development at the beginning of kindergarten predicts greater academic achievement and lower levels of grade retention and special education services several years later (Pianta & McCoy, 1997). Therefore, it is important to better understand the factors that contribute to school readiness in preschoolers, including critical language skills, in order to support successful transitions and performance in the early years of school and beyond.

Throughout the last decades of the 20th century, increasing attention was paid to the role of the physical environment in human development, and how characteristics and conditions within the physical environment could support or hinder children's learning and adjustment. *Environmental chaos* refers to qualities of the physical environment that reflect high levels of ambient noise, household density, and foot traffic, as well as a sense of disorganization or lack of structure in routines and schedules. Although chaos is not a new phenomenon in the lives of children and families, it has been argued that throughout the past several decades there has been a movement from the occurrence of chaos in broader macrosystem levels (e.g., economic upheaval, war, large-scale social dislocation) to its manifestation in children's more immediate microenvironments, such as the family home—suggesting the presence of a "growing chaos amid stability in America" (Lichter & Wethington, 2010, p. 25). Environmental chaos has been associated with poor outcomes in both adults and children, including impaired cognitive performance and school achievement (Evans, Hygge, & Bullinger, 1995; Gottfried & Gottfried, 1984; Maxwell & Evans, 2000), psychological distress (Compan, Moreno, Ruiz, & Pascual, 2002), motivational deficits (Evans et al., 1995; Maxwell & Evans, 2000; Wachs, 1987) behavioral problems and noncompliance (Maxwell, 1996; Wachs, Gurkas, & Kontos, 2004), physiological consequences (Evans, Bullinger, & Hygge, 1998), and deficits in physical health (Matheny, 1986). One of the most robust findings regarding environmental chaos is its links with poor language, pre-literacy, and literacy skills (Evans & Maxwell, 1997; Haines et al., 2001; Maxwell & Evans, 2000).

The current study utilized a bioecological framework to explore the relations between chaos within the home and the development of language in children, considering both mediating processes (i.e., effortful control, parenting) thought to be responsible for disruptions in language learning as well as person characteristics, such as sex, which may moderate these relations. There is a great impetus to conduct research with an eye toward developing appropriate and effective interventions and policies for families with children, which are supported by a clear understanding the specific processes through which phenomena impact children's outcomes. As noted by Winkel, Saegert, & Evans (2009, p. 318) in discussing environmental chaos, there is a "need for theory and research that addresses real world problems."

Few investigations of environmental chaos have included all aspects of the bioecological model of development. In the current longitudinal study, all four elements—*process, person, context,* and *time*—were considered in an examination of the development of language during the early years of life. It was hypothesized that the negative effects of household chaos on children's language would be explained by child-environment transactions characterized by decrements in children's effortful control and in parenting (i.e., decreases in parental speech and supportive parting, and increases in nonsupportive parenting; see Figure 1). Additionally, children's sex was hypothesized to play a role in the strength of these associations, with potentially stronger relations for boys rather than girls across time.

Review of the Literature

The following review of the literature will address several themes. The developmental significance of language skills emerging during early childhood will be considered, particularly with respect to later competencies and achievement. Next, the bioecological model of development which underlies this work will be reviewed. Relations between the broader construct of contextual risk, including sociodemographic risk, and child development will be examined, followed by a review of empirical research on aspects of environmental chaos and its relations with children's outcomes. Potentially mediating processes will be discussed, including the development of children's effortful control and qualities of parenting. Finally, the role of children's gender in moderating these relations will be considered.

Language Development in Young Children

Children's ability to understand language and communicate is essential in supporting transactions with the social and physical environments. Language learning begins prior to birth (DeCasper & Spence, 1986), and language competencies emerge rapidly across early childhood. During infancy, babies produce communicative vocalizations and gestures (Sachs, 2009) and begin to understand the meaning of words (i.e., receptive language), even earlier than they can express words (i.e., expressive language; Pan & Uccelli, 2009). Word production typically begins in late infancy, and a marked spurt often occurs at approximately 18 months, with children's spoken vocabulary including around 50 words at this age and increasing rapidly thereafter (Bloom, Lifter, & Broughton, 1985). Across the next few years, children continue to advance in their language development, including expanding their vocabulary, combining words into multi-word utterances, and applying rules of syntax (Berko-Gleason & Ratner, 2009).

Language is a critical foundation for continued learning and contributes to school readiness. In fact, language abilities are thought to be largely responsible for the relations between general intelligence and academic achievement (Neisser, Boodoo, Bouchard, Boykin, Brody, Ceci, et al., 1996). Early mastery of language skills predicts improved reading ability (NICHD ECCRN, 2002, 2005; Dickinson & Tabors, 2001) and other markers of academic performance (Whitehurst & Lonigan, 1998) during the early and later elementary years. In one study of African American children, language skills at school entry mediated the associations between early social risk (i.e., an index comprised of low income, single parent household, low maternal education, large household size, life stress, and maternal depression) and mathematics (but not reading) ability during the first four years of schooling (Burchinal, Roberts, Zeisel, Hennon, & Hooper, 2006). On the other hand, early language skills also provide unique prediction of later academic outcomes, independent of family socioeconomic status (Walker, Greenwood, Hart, & Carta, 1994).

Because of the critical importance of foundational language skills for reading and other domains of academic achievement (Dickinson & Tabors, 2001; Snow, Porche, Tabors, & Harris, 2007) and the rapid growth in vocabulary across the first years of life

(Farkas & Beron, 2004), it is important to focus attention on the development of these competencies during early childhood, prior to school entry. A differentiation has been made in the literature between oral language skills (e.g., receptive and expressive vocabulary, syntactical knowledge, narrative discourse skills) and code-based skills (e.g., letter recognition, knowledge of letter-sound correspondence), and although these two types of skills are strongly associated during the preschool years, each relates uniquely to later literacy outcomes (Storch & Whitehurst, 2002). Language researchers have recently argued that although code-based skills are often disproportionately emphasized in current educational efforts to promote children's literacy, oral language skills are equally important in supporting the development of reading, which is critical for academic outcomes (Dickinson, Golinkoff, & Hirsh-Pasek, 2010). However, a solid foundation in multiple aspects of oral language is a better predictor of later cognitive skills than vocabulary size alone (NICHD ECCRN, 2005).

Although all children have the capacity to develop language, there is a great deal of variability across the first years of life and beyond in the acquisition of specific language competencies (e.g., Fenson, Dale, Reznick, Bates, Thal, & Pethick, 1994). Numerous studies have examined child characteristics, qualities of parenting and the family home, and broader contextual factors that may contribute to the development of language. This study used a bioecological perspective to consider how one important contextual influence—environmental chaos—relates to oral language (i.e., expressive and receptive vocabulary) during early childhood, and to explore potentially mediating and moderating factors.

The Bioecological Model of Development

The guiding theory for this investigation was Bronfenbrenner's bioecological model of human development. The bioecological model provides an interpretive framework for understanding the multiple, interrelated contextual as well as intrapersonal influences on child development, most notably mediated through the dynamic transactions that occur between the child and the environment (Bronfrenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998). This model is comprised of four key elements: *process, person, context*, and *time* (PPCT). These elements are conceived as jointly contributing to—and driving—the course of development over time.

Process. Proximal processes are the transactions between the individual and the persons, objects, and symbols in the environment (Bronfenbrenner, 1999; Bronfenbrenner & Ceci, 1994; Bronfenbrenner & Morris, 1998). An important feature of these processes is derived from the fact that they are regularly occurring. In fact, for proximal processes to be effective in supporting optimal development, they must occur consistently over extended periods and become more complex over time (Bronfenbrenner & Evans, 2000). Proximal processes can either support or hinder healthy adaptation, and can also render an individual more protected or vulnerable to qualities of the environments experienced (Bronfenbrenner, 1999). Proximal processes are the fundamental mechanisms through which development occurs, but operate in tandem with characteristics and properties of the person, context, and time.

Person. Person characteristics are attributes such as temperament, biogenetic predispositions, gender, or developmental abilities that can drive the nature of proximal processes or alter their influence on the individual's outcomes (Wachs & Evans, 2010). These attributes include 1) *dispositions*, which can create or maintain particular proximal processes and can influence an individual's response to the environment, 2) *resources*, which include development-dependent competencies necessary to effectively support proximal processes, and 3) *demand characteristics*, which elicit or discourage particular responses from the environment and thus influence the nature of proximal processes

(Bronfenbrenner & Morris, 1998). Person characteristics underscore the idea that individuals are contributing agents in shaping their own development (Bronfenbrenner & Morris, 1998).

Context. In the bioecological model, human development occurs within a nested, interrelated set of contextual systems that encompass multiple levels of social and physical environmental influence, both immediate and distal. Bronfenbrenner (1999; Bronfenbrenner & Morris, 1998) outlined four contexts which impact proximal processes and, in turn, child development. The *microsystem* is comprised of the immediate contexts that the individual experiences, such as the home and school environments. Microsystems develop across time, being impacted by the proximal processes occurring within them as well as by external factors (e.g., qualities of and processes within other contextual systems). The *mesosystem* refers to the connections among the various microsystems that an individual experiences, and reflects the amount and quality of these linkages. The *exosystem* encompasses other microsystems that the individual does not directly experience but that impact the proximal processes within their own microsystem. For example, characteristics of a parent's workplace (a microsystem of the parent) can (positively or negatively) impact the microsystem of the child by impacting parental availability, mood, or ability to provide necessary resources. Finally, the *macrosystem* includes broader social, cultural, political, and economic factors that influence the nature of other contextual systems and, ultimately, the proximal processes that shape development. The macrosystem can include such things as the economic climate, religions, or institutional policies and practices (e.g., social welfare systems) of a society.

Time. Time can refer to a number of temporal characteristics that relate to an individual's experience of proximal processes (Bronfenbrenner & Morris, 1998). The *chronosystem* is comprised of 1) *microtime* (within individual/context transactions), *mesotime* (across episodes of transaction, and 3) *macrotime* (across the lifecourse or across history). The occurrence, unfolding, and patterns of consistency in proximal processes across these elements of time can have important implications for development. For example, the duration of exposure to particular experiences or the chronological age at which they occur may differentially impact on development (Duncan, Brooks-Gunn, & Klebanov, 1994; Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Molfese, Modglin, & Molfese, 2003).

The bioecological model provides a useful framework for exploring and understanding the relations among environmental chaos and children's outcomes, as well as the processes that underlie the emergence of these developmental phenomena across time. The PPCT elements of the bioecological perspective emphasize that the role of an individual factor in children's development must be examined, and is better understood, within an interrelated set of contextual, individual, and temporal attributes. A strength of the present study is that, unlike much prior research, it incorporated all of the elements of the PPCT model in order to more fully understand the processes and factors that underlie the relation between the context of environmental chaos within the home and the development of young children's language. This study examined both mediating processes (i.e., temperamental effortful control, parenting) and moderating person characteristics (i.e., gender) in a longitudinal design with three assessments across two years of early childhood (from 30 to 54 months of age).

Contextual Risk and Child Development

Risk refers to conditions that increase the likelihood of experiencing negative developmental outcomes, amplify their severity, or lengthen their duration (Coie et al., 1993). In concordance with the bioecological model of development, risk conditions can be present at various contextual levels or within person characteristics, making individuals more vulnerable to the emergence of maladaptive functioning and adjustment. Models of *cumulative risk* suggest that it is not just the type, but the number of risks present that predict children's outcomes (Gutman, Sameroff, & Cole, 2003; Rutter, 1983; Sameroff, Seifer, Baldwin, & Baldwin, 1993). As the risk factors in a child's life accumulate, the greater the chance that a child will fail to acquire the necessary skills and experiences that support healthy development. This is an important understanding, given that risks often occur in clusters rather than in isolation (Evans, 2003; Rutter, 1993). On the other hand, a related perspective suggests that there are other contextual conditions, processes, and individual characteristics that can contribute to *resilience,* buffering children against the potentially deleterious effects of adversity or harmful environments (Luthar, Cicchetti, & Becker, 2000; Masten, 2001).

Particularly in regard to the development of intervention practices and policies, it is of great interest to determine qualities of contextual systems that provide optimal support versus those that are likely to compromise children's development. One of the most frequently studied categories of contextual risk is sociodemographic risk, generally represented by socioeconomic status (SES; e.g., family income, parental education) or related demographic characteristics (e.g., family structure, parental age). Given current economic conditions in the United States, this is a germane area of research investigation. In 2010, more than one fifth of American children were living in poverty, the highest rate in almost a decade (U.S. Census Bureau, 2011). This proportion climbs to over one third for Black and Hispanic children.

Children and youth whose families struggle with economic hardship and related social risks are more likely to experience a host of negative outcomes that span the cognitive, socioemotional, behavioral, and physical domains of development (Bradley &

Corwyn, 2002; Evans, 2004; Luthar, 1999; McLoyd, 1998). They are more likely than their more affluent peers to have deficits in cognitive and language development at school entry and to experience persistent difficulties in academic achievement (Duncan & Brooks-Gunn, 1997; Entwisle & Alexander, 1992; Raver, 2004; Stipek & Ryan, 1997; West, Denton,& Reaney, 2000). These children also have more behavioral, socioemotional, and self-regulatory difficulties (Duncan & Brooks-Gunn, 1997; Evans & English, 2002; Howse, Lange, Farran, & Boyles, 2003; McLoyd, 1998; Qi & Kaiser, 2003; Shaw, Keenan, Vondra, Delliquadri, & Giovannelli, 1997), and have a higher incidence of developmental delays (Brooks-Gunn & Duncan, 1997; Scarborough, Spiker, Mallik, & Hebbeler, 2004).

Specific to young children's language development, low-income children have more language difficulties and slower rates of vocabulary growth (Alexander & Entwisle, 1988; Arriaga, Fenson, Cronan, & Pethick, 1998; Burchinal et al., 2006; Hart & Risley, 1995). Sociodemographic risk factors for poor language development include poverty, family size, and low parental education or IQ (Hoff, 2003; McClelland et al., 2007; Smith, Brooks-Gunn, & Klebanov, 1997). However, although research examining the associations between risk and children's development often focuses on families experiencing high levels of risk (e.g., extreme poverty), it is also important to understand these relations in populations less at risk. For example, in research examining the home language experiences and language development of children from welfare, working class, and professional families, mean-level differences were found in these constructs across the three socioeconomic levels, but relations between the constructs were similar for all types of families (Hart & Risley, 1995). Thus, the consequences associated with variations in family sociodemographics and other contextual risk factors clearly represent an important area to further understand, even in relatively low-risk populations.

Environmental Chaos

In considering the implications of contextual risk for children's development, e*nvironmental chaos* (also termed *environmental stress*) has garnered the attention of researchers in recent years, and has become increasingly identified as an important correlate of family functioning and children's adjustment. Key indices of environmental chaos within children's microsystems include high levels of ambient noise, crowding and excessive traffic within the home, and disorganization in structure and routines (Wachs & Evans, 2010). Environmental chaos has been examined within various contexts, including both households (e.g., Petrill, Pike, Price, & Plomin, 2004; Valiente, Lemery-Chalfant, & Reiser, 2007) and nonresidential settings such as childcare and elementary classrooms (e.g., Maxwell, 1996; Wachs et al., 2004) and hospital environments (Als, 1992).

Children (and adults) exposed to chronic environmental chaos exhibit a number of maladaptive outcomes across a range of domains (see Evans & Wachs, 2010, for a review). In considering the bioecological model, environmental chaos may affect children's outcomes by disrupting the nature and consistency of the proximal processes that drive development (Bronfenbrenner & Evans, 2000; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005). In the presence of chaos, developmentally-facilitative transactions between the child and the social and physical microcontexts may be attenuated due to lack of duration, regularity, or intensity. As described by Evans et al., (2005, p. 560),

> "Frenetic activity, lack of structure, and unpredictability, in conjunction with intense background stimulation, take their toll by depriving the developing organism of the kinds of well-structured, predictable, and sustained exchanges of

energy with the persons, objects, and symbols in the environment critical to fostering and sustaining healthy development."

Although chaos often occurs at the macrosystem level (e.g., war, economic upheaval, large-scale geographic mobility), this study examined chaos within children's most primary microsystem—the family home.

Aspects of Environmental Chaos

In considering the role of context in human development, initial conceptualizations of the physical environments of individuals were defined in terms of inanimate objects and properties (Wohlwill & Heft, 1987). Wachs (1989) expanded this definition to include person-related variables, by including *environmental chaos* as a quality of proximal physical environments typified by high levels of noise, residential crowding, high traffic patterns (e.g., many people coming and going), and lacking in physical and temporal structure (e.g., lack of routines and schedules). Wohlwill and Heft (1987) argued that prior developmental researchers had disproportionately emphasized the social environment, assuming that it mediated any effects of the physical environment. However, investigators have since demonstrated numerous times that features of the physical environment, such as environmental chaos, provide unique predictive variance in terms of developmental outcomes and, in some cases, entirely account for initial prediction by aspects of the social environment (Wachs, 1990).

Many studies of environmental chaos have examined individual aspects of environmental chaos, such as exposure to chronic noise (i.e., unwanted sound; Evans, 1999) or crowding, in both naturalistic and experimental conditions. Researchers have used objective measures of ambient noise levels within an environment, such as noise intensity as measured in decibels (e.g., Hygge, et al., 2002). Other investigators have utilized observer ratings or self-reports of noise within the home (Matheny, Wachs, Ludwig, & Phillips, 1995; Wachs & Gruen, 1982), or have asked individuals about their annoyance with community or household noise (Evans et al., 1995). It should be noted that even when noise is generated at the community level (e.g., by aircraft or other transportation traffic), it is experienced by individuals within their immediate microsystems, such as homes and classrooms.

Residential crowding refers to conditions in which there is inadequate space for the number of residents in a household or living space, and the principle measure is residential density, or the ratio of persons to room. Crowded living conditions are typically defined as having greater than 1.0 persons per room (U.S. Census Bureau, Census of Housing, 2011). In 2000, over 5% of American residences were crowded, with approximately half of these severely crowded (i.e., > 1.5 persons/room) and some states having crowding rates as high as 15%. Although overall group size within a household is sometimes examined, crowding as indicated by residential density is most related to physical and psychological outcomes in children and adults and may have more impact than measures of community or population density (Baum & Paulus, 1987). Relatedly, some measures of environmental chaos index the foot traffic (e.g., "comings and goings") within the home (Baum & Paulus, 1987), which can depend on the number of residents as well as the presence of visitors. Evans (2001) suggests that it is the repeated experience of unwanted or uncontrollable social interaction within crowded or highly trafficked homes that is responsible for the impacts on health and functioning. Moreover, these homes also tend to have more noise and stimulation, as well as a restriction of free movement (Evans, 2006; Saegert, 1978, 1981).

More recently, researchers of environmental chaos have begun to consider qualities of microenvironments (e.g., homes, childcare settings) that reflect calmness and order versus confusion and disorganization (Matheny et al., 1995). Ackerman and Brown (2010) emphasized the distinction between psychosocial and physical chaos experienced by families. Psychosocial chaos includes events and ongoing stressors such as partner instability or conflict, changes in residence, family composition, or foster care arrangements, parental mental disorders or substance abuse, dynamic income changes, or other family trauma. These conditions can create or exacerbate turmoil within families, impact caregiver mood, or impair parenting, and, in turn, lead to adjustment and achievement problems in children (Ackerman, Brown, D'Eramo, & Izard, 2002; Ackerman, Kogos, Youngstrom, Schoff, & Izard, 1999; Conger et al., 2002). However, little research has empirically tested the relations of these types of family instabilities and stressors to measures of physical chaos within the home (Ackerman & Brown, 2010), which is the topic of the current investigation.

Household chaos, as conceptualized in this study and other research, refers to aspects of the home environment that represent temporal and structural organization versus commotion and disorder. Some of these characteristics are captured by the regularity of household routines (e.g., family meals, bedtime routines), which are recurring activities that are recognized by family members and that create a sense of predictability and continuity of behavior (Fiese, Tomcho, Douglas, Josephs, Poltrock, & Baker, 2002). In fact, it has been suggested that the establishment or maintenance of family routines can be a stabilizing, protective factor in the presence of other aspects of environmental chaos (Fiese & Winter, 2009). On the other hand, when families experience dynamic stress (e.g., due to sudden changes in household composition or income), disruptions in family routines frequently occur first and may mediate some of the impact on children's well-being (Steinglass, Bennett, Wolin, & Reiss, 1987).

In addition to a lack of family routines, other aspects of household chaos include high levels of ambient noise and other background stimuli, high levels of traffic within the home, lack of maintained schedules, an unkempt physical environment, and/or a general sense of disorganization and confusion in daily experiences (Bronfenbrenner & Evans, 2000; Matheny et al., 1995; Dunifon, Duncan, & Brooks-Gunn, 2004). Families reporting their households to be chaotic often perceive them to be “hectic, unstructured, unpredictable, and, at times, simply out of control” (Evans et al., 2005, p. 560).

As discussed, researchers of environmental chaos have often examined individual variables, such as community or ambient household noise (e.g., Evans, Bullinger, & Hygge, 1998; Evans, Hygge, et al., 1995) or residential density (e.g., Evans, Lepore, Shejwal, & Palsane, 1998; Evans, Maxwell, & Hart, 1999; Wachs & Gruen, 1982). However, as with other types of risk, aspects of environmental chaos tend not to occur in isolation (Winkel et al., 2009). As noted by Bradley (1999), environmental influences are most powerful when they emanate from numerous sources, occur at multiple levels, and exist in a range of forms. Different aspects of chaos may interact with one another, so that examining only one variable may underestimate the cumulative effects on children’s development (Evans, 2001; Lepore & Evans, 1996). On the other hand, exposure to a single indicator of chaos may not be experienced as detrimentally as when other harmful conditions are not present as well (Ackerman & Brown, 2009).

Recently, Matheny and colleagues (Matheny et al., 1995) developed the Confusion, Hubbub, and Order Scale (CHAOS) as a self-reported, aggregate measure of chaos experienced within the home. This scale taps a number of chaos indices (i.e., ambient noise, foot traffic, disorganization, confusion), with some researchers finding two factors reflecting 1) noise/confusion and 2) disorganization/routines (i.e., using a shortened version of the CHAOS; Johnson, Martin, Brooks-Gunn, & Petrill, 2008). It has been suggested that capturing a variety of indicators can create an improvement in measuring environmental phenomena, such as chaos (Bradley, 1999). The CHAOS measure has established validity, correlating with observer ratings of noise, crowding, and traffic patterns within the home (Matheny et al., 1995). Chaos also has been assessed in the context of childcare settings, using the Life in Early Childhood Programs Scale (LECP; Kontos & Wachs, 2000), which is based on constructs captured in the CHAOS. These measures offer an additional perspective in the measurement of environmental chaos by tapping not only levels of ambient stimulation, but also the overall structure and order (or, conversely, disorganization and confusion) within children's microsystem. This investigation utilized the CHAOS as a key indicator of chaos within the home environment.

Environmental Chaos and Developmental Outcomes

As many researchers have proposed, environmental chaos is likely to disrupt the proximal processes that support healthy development and adaptation in individuals (Evans et al., 2005). Across the range of studies examining different facets of environmental chaos, common themes have emerged. In general, children exposed to environmental chaos are at risk for more negative interpersonal relationships and poorer developmental outcomes across a number of domains (Evans & Wachs, 2010).

Health and socioemotional adjustment. Excessive sensory and social stimulation activates psychophysiological resources throughout multiple systems of the body, as individuals attempt to respond to the demands presented by the environment. Although adaptive in the short term, with chronicity these continual mobilizations of stress responses require greater expenditures of effort and place strain upon the physiology of the human body, most notably by altering cardiovascular and neuroendocrine activity

(McEwen, 2000). Allostatic load refers to the cumulative physiological costs of such persistent conditions (McEwen & Stellar, 1993), and can result in marked damage to biological development (Johnson, Bruce, Tarullo, & Gunnar, 2011), and increased risk of disease (McEwen, 2000). Both crowding and chronic exposure to noise have been associated with indicators of elevated stress responses in adults and children (Evans, 2001; Evans et al., 1995; Evans, Bullinger et al., 1998; Regecova & Kellerova, 1995), often controlling for neighborhood and household demographics. However, it should be noted that the clinical significance of these physiological outcomes is not known.

In additional to the potentially negative effects of environmental chaos on physical health, greater levels of psychological distress have been reported by children experiencing residential crowding (Lepore, Evans, & Schneider, 1991) and chronic noise (Haines et al., 2001), and adolescents in families lacking consistent routines and rituals report having more psychological problems (Compan, Moreno, Ruiz, & Pascual, 2002). A number of studies have indicated that individuals experiencing acute or chronic environmental stressors have a diminished sense of control, exhibit a "learned helplessness" response, and persist less at challenging tasks (Evans & Carrere, 1991; Evans, Lepore, et al., 1998; Evans, Hygge et al., 1995; Evans, Saegert, & Harris, 2001; Evans & Stecker, 2004; Lepore, Evans, & Schneider, 1992; Wachs, 1987).

Exposure to environmental chaos has been related to aspects of children's self-regulation, including impaired performance on a delay of gratification task (Evans et al., 2005), deficits in children's attention focusing and persistence (Dumas et al., 2005; Evans et al., 2005; Evans, Lepore et al., 1998; Wachs & Gruen, 1982), lower levels of compliance (Wachs et al., 2004), and teacher reports of poor self-control (Evans et al., 2005). Not surprisingly, consistent associations also are found between household chaos and behavioral problems in young children (Pike, Iervolino, Eley, Price, & Plomin, 2006;

Supplee, Unikel, & Shaw, 2007), elementary-aged children (Coldwell, Pike, & Dunn, 2006; Dumas et al., 2005; Shamama-tus-Sabah & Gillani, 2011), and adolescents (Evans et al., 2005). These associations often remain after taking into account the effects of parenting (Coldwell et al., 2006) or other environmental risk factors (Pike et al., 2006). Further, parent-child and sibling interactions and relationships are generally more negative and conflictual and less cooperative when homes are more crowded and chaotic (Booth & Edwards, 1976; Coldwell et al., 2006; Dumas et al., 2005; Evans, Lepore, et al., 1998).

Cognitive skills. One of the most robust findings of empirical studies of environmental chaos is that exposure to aspects of chaos often relates to deficits in children's cognitive development, including language, pre-literacy skills, reading, and academic achievement. Aircraft noise has been a commonly-studied environmental stressor, and there are converging findings indicating that it is associated with poor cognitive performance in both preschoolers and school-aged children in residential areas surrounding airports. Delayed abilities include language, pre-literacy and literacy skills, speech perception, attention, and memory, and these have been documented in laboratory tasks as well as in the field (Evans & Lepore, 1993; Evans & Maxwell, 1997; Hygge et al., 2002; Evans et al., 1995; Haines et al., 2001; Maxwell & Evans, 2000). These effects are apparent at community noise levels far below those capable of producing hearing damage, and study participants are typically screened for hearing ability prior to testing.

In addition, young children raised in high-density homes have poorer vocabulary and less-developed cognitive abilities, concurrently and across time (Evans, Riccuiti, Hope, Schoon, Bradley, Corwyn, & Hazan, 2010; Hart & Risley, 1995), and older children in similar living situations have been found to have lower levels of academic achievement (Evans, Bullinger, et al., 1998). In another study, the number of people in the home during the observation (an indicator of home traffic) negatively predicted infants' nonverbal communication (i.e., efforts to obtain adult attention) (Wachs & Chan, 1986).

Studies examining the quality of organization versus disorder within the home provide further evidence that chaotic environments are detrimental for children's developing cognition and language. In a study of three-year-old twins, parents reported on a number of indices of what was termed "environmental risk", including sociodemographic risk, household chaos, mothers' negative feelings toward each child, and mothers' harsh discipline with each child. A year later, parents completed measures assessing behavioral problems, expressive vocabulary, and nonverbal cognitive abilities in their children. In additive regression models including all of the risk factors, chaos uniquely and negatively predicted each outcome assessed at age four—and, in fact, was the strongest predictor (Pike et al., 2006). However, in this investigation parenting (and only negative parenting) was similarly considered as a general "risk" factor, rather than as a potentially mediating pathway between chaos and child outcomes, as was a focus of this longitudinal study. Moreover, in a study of kindergarten and first graders, household disorganization (but not noise), as measured with a shortened version of the CHAOS scale, was related to lower early reading skills, including expressive vocabulary, even after taking into account aspects of the home literacy environment (Johnson et al., 2008). Finally, in a striking longitudinal research study, observed cleanliness within the family home was predictive of children's educational attainment over 25 years later (Dunifon et al., 2004).

In summary, research examining the associations between environmental chaos and human development has expanded dramatically in quantity and scope across the last several decades. Although a great deal of variability exists in the conceptualizations of chaos and the outcomes assessed, converging evidence indicates that exposure to chaotic environments is associated with impairments in children's health and development. Further, some studies have induced environmentally-stressful conditions in the laboratory (e.g., acute crowding or noise), and findings generally corroborate with those assessed in natural settings. The current study examined the longitudinal associations between household chaos and young children's language abilities, and was expected to replicate findings that preschoolers living in more chaotic homes exhibit deficits in their language development.

Direction of Effects

Unfortunately, the vast majority of studies of environmental chaos have been correlational, making it difficult to assume causality in the relations with developmental outcomes. Moreover, the limited longitudinal research available generally does not include measurements of *both* chaos and the outcomes of interest at each time point. However, some research designs have provided support for the idea that chaos does, in fact, result in negative consequences for children. For example, research by Maxwell (1996) suggests a dosage effect in exposure to crowding. She examined children from low- and high-density homes who attended either low- or high-density preschool settings. The children who experienced high levels of crowding both at home and at school fared most poorly, with the highest scores on teacher-reported measures of emotional and behavioral problems. Further, another interesting study examined the impact of noise in the home by assessing auditory speech discrimination in elementary-aged children living in high-rise apartments adjacent to a heavily-trafficked expressway. Poorer auditory discrimination, and in turn, lower reading achievement, was found in children on lower floors (i.e., in homes with more traffic noise, as measured in decibels), after controlling for class differences, and, importantly, in children with longer periods of residence in these high-noise homes (Cohen et al., 1973).

Other studies provide even stronger support for the idea that environmental chaos has causal effects on children's development. A prospective study was conducted with children living near the Munich International Airport in Germany, which subsequently was closed and relocated. Children living near the original airport, who were chronically exposed to community-based noise in their school and home environments, exhibited deficits in long-term memory and reading ability (Hygge et al., 2002). Children living near the new airport site developed similar impairments after the relocation to their community, and these relations became stronger across time, suggesting a cumulative effect. Strikingly, children at the old airport location improved in these formerly-impaired memory and reading abilities after the chronic noise exposure was removed. In a study with similar findings, preschool children in noisy classrooms performed more poorly on a measure of pre-reading skills (i.e., letter/number/word recognition), were rated by their teachers as having poorer abilities to understand and effectively use language, and demonstrated more helplessness on a challenging task of unsolvable puzzles than the following cohort of children who were in those very same classrooms after a successful school noise abatement project (Maxwell & Evans, 2000). Collectively, these studies suggest that there may indeed be a causal link between exposure to environmental chaos and negative outcomes in children over time, particularly those outcomes reflecting cognitive, language, and literacy skills.

Environmental Chaos and Socioeconomic Risk

As noted, it is often the case that risk factors do not exist in isolation. There are a multitude of factors that may render the lives of socioeconomically disadvantaged children more chaotic than those in wealthier families. For example, impoverished families often experience a number of stressors and negative life events, a lack of resources, and unpredictable schedules (Attar, Guerra, & Tolan, 1994; Dubow, Tisak, Causey, Hryshko, & Reid, 1991; Presser, 2003). Lichter & Wethington (2011) have suggested that increasing economic and social inequalities between subgroups of children in America are related to different experiences of aspects of chaos, and may, in turn, be responsible for varying developmental outcomes across these subgroups. Thus, it was of interest to determine whether environmental chaos relates uniquely to children's development, over and above socioeconomic risk.

In a review of the environments of children living in poverty, Evans (2004) described a number of experiences unique to this population. Families facing economic hardship often live in more noisy, crowded residences with substandard housing quality (Evans, Eckenrode, & Marcynszyn, 2007; Evans & English, 2002). Parents may have limited or inconsistent childcare arrangements and work nontraditional or variable schedules that can interfere with family routines (Evans, 2004). In fact, low-income families are less likely than wealthier families to maintain consistent and predictable routines around mealtimes and sleep (Britto, Fuligni, & Brooks-Gunn, 2002). It may be even more difficult for caregivers who are managing parenting responsibilities alone to establish organized routines and schedules. Low-income youth also are more likely than their peers to change residences (Wood, Halfon, Scarlata, Newacheck, & Nessim, 1993) and schools (Evans et al., 2007), disrupting children's routines, activities, and social networks. Dissolution of partner relationships and changes in family composition are also more common in these families (Evans, 2004), causing further disruption in children's lives and potentially heightening their exposure to family conflict.

In a few studies, measures of environmental chaos account for some of the associations between SES and children's outcomes. For example, adolescents living in poverty experienced more household chaos (i.e., parental reports of chaos, irregular family rituals and routines) than those being reared in more affluent families. Further, household chaos partially mediated the effects of family income on learned helplessness, psychological distress, and self-regulation deficits in these youth (Evans, 2004; Evans et al., 2005).

Despite these findings, Wachs & Evans (2010) argue that environmental chaos should not be considered a proxy for family socioeconomic risk. Although families living in poverty may face a multitude of stressors, the correlations between SES and measures of household chaos are generally modest (e.g., Dumas et al., 2005; Evans et al., 2005; Nelson, O'Brien, Blankson, Calkins, & Keane, 2009; Pike et al., 2006), and sometimes nonexistent (e.g., Coldwell et al., 2006). Moreover, SES and chaos often relate uniquely to the variance in children's outcomes (Corapci & Wachs, 2002; Dumas et al., 2005; Evans, 2006; Hart, Petrill, Deckard & Thompson, 2007; Pike et al., 2006; Vernon-Feagans, Garrett-Peters, Willoughby, & Mills-Koonce, 2011; Wachs & Chan, 1986; Wachs & Evans, 2010). Longitudinal investigations, albeit limited, have demonstrated that the introduction or reduction of aspects of environmental chaos predict changes in children's development, without corresponding adjustments in family economic circumstances (Cohen et al., 1973; Hygge et al., 2002; Maxwell & Evans, 2000).

Evans et al. (2005, p. 564) note that "levels of chaos are accelerating and pushing beyond the confines of poverty into middle- and upper-income families," and research has demonstrated variability in environmental chaos and its associations with divergent child outcomes within all income levels (Evans, Maxwell, & Hart, 1999; Gottfried &

Gottfried, 1984). The present study considered both socioeconomic status and household chaos as independent predictors of children's language development and the proposed mediating pathways. Although the families in the current sample were relatively low-risk in terms of socioeconomic characteristics, it was expected that the negative effects of environmental chaos would still be evident.

The Mediating Role of Children's Self-Regulation

A cornerstone of developmental research is the aim to not only describe developmental phenomena, but to understand the processes through which these outcomes emerge. Consistent with this line of thinking, researchers have emphasized the importance of investigating the specific pathways from risk to children's positive and negative developmental outcomes (Rutter, 2003). A main goal of the present study was to examine potential mediators of the relations between environmental chaos and the development of young children's language abilities. According to the bioecological model, repeated transactions between the child and the environment form the foundation for developmental change. If environmental chaos disrupts the types of proximal processes necessary for optimal development, children's emerging language abilities may be compromised. In fact, Bradley (1999) suggested that ambient conditions within the home affect children most notably by altering the influence of proximal processes. In this investigation it was proposed that household chaos has direct, negative effects on children's self-regulation—specifically, effortful control. In turn, it was expected that children with impaired effortful control would have difficulty consistently engaging in and benefiting from the transactions with the social and physical environment that promote learning, resulting in poorer language skills.

Effortful control (EC) is one dimension of the more encompassing construct of self-regulation. Because the development of self-regulation, broadly speaking, is fundamental for young children's optimal adjustment and functioning across a number of domains (Shonkoff & Phillips, 2000), the conceptual background regarding self-regulation will be reviewed, followed by specific discussion of effortful control and related regulatory constructs, and finally, by consideration of the relations of EC to language and chaos.

Self-Regulation

Researchers have increasingly examined the role of self-regulation in the development of children's competencies across cognitive, socioemotional, and behavioral domains. Self-regulation is a multidimensional construct, and different investigators have considered and measured aspects of self-regulation in a variety of related but conceptually-distinct ways (e.g., Cole, Martin, & Dennis, 2004; Eisenberg, Cumberland, & Spinrad, 1998; Kochanska, Murray, & Harlan, 2000). Self-regulation includes the management of attention, emotion experiences and expressions, and behavior, and reflects processes related to temperament and cognition. People who are well-regulated are able to initiate, suppress, or alter their affective, attentional, and behavioral responses flexibly, in accordance to situational demands and social norms (Eisenberg, Hofer, & Vaughan, 2007). In general, children who do not possess age-appropriate regulatory skills are at risk for social, emotional, and cognitive difficulties, including peer rejection (Ladd, Birch, & Buhs, 1999), poor psychological adjustment and behavioral problems (Keenan & Shaw, 2003; Cooper & Farran, 1988; Eisenberg, Fabes, & Spinrad, 2006; Lemery-Chalfant, Doelger, & Goldsmith, 2008), and lower levels of academic achievement (Alexander, Entwisle, & Dauber, 1993; McClelland et al., 2007; McClelland, Morrison, & Holmes, 2000).

Temperament. Temperament has been defined as "constitutionally-based individual differences in reactivity and self-regulation, in the domains of affect, activity, and attention" (Rothbart & Bates, 2006, p. 100). . Reactivity refers to features of the affective, physiological, and behavioral responses to internal and external stimuli and events, including valence, range, frequency, latency, intensity, duration, and recovery. The experience and expression of these reactions are generally reflexive and automatic, and reactivity is often indexed by emotional, attentional, and motoric behaviors (Rothbart & Derryberry, 1981). Self-regulation refers to the processes and mechanisms that modulate the quality of responses due to reactivity. Although the origins of temperament are believed to be biological (i.e., genetic, hormonal, neural), its manifestation within individuals is influenced by maturation and experience as well (Rothbart & Sheese, 2007). Individual differences in reactivity and self-regulation are thought to demonstrate consistency across contexts (Rothbart & Bates, 1998) and to be relatively stable across infancy and childhood, and even into adolescence (Rothbart & Putnam, 2002; Shoda, Mishel, & Peake, 1990).

There are two distinct forms of regulation: reactive control and voluntary control (Eisenberg, 2002; Rothbart & Bates, 2006). Reactive control does alter attentional, emotional, and behavioral responses, but reflects processes that are more involuntary and automated in nature. At the extremes, reactive control is reflected in high impulsivity and approach (i.e., undercontrol) or in low levels of impulsivity and high behavioral inhibition (i.e., overcontrol; Cole, Michel, & Teti, 1994; Eisenberg & Morris, 2002; Kagan, Snidman, & Arcus, 1992). On the other hand, voluntary control reflects deliberate (although not always conscious; Mischel & Ayduk, 2004) modulation of reactive responses that is used flexibly according to situational demands.

Effortful Control

Effortful control (EC), an aspect of voluntary self-regulation, has been defined as "the efficiency of executive attention—including the ability to inhibit a dominant response in order to perform a subdominant response, to plan, and to detect errors" (Rothbart & Bates, 2006, p. 129). Effortful control denotes the deliberate utilization of sophisticated executive abilities in order to control and adjust state changes in arousal, attention, affect, and behavior. Effortful control includes the abilities to voluntary shift and focus attention and to inhibit or activate behavior, which also contribute to the regulation of emotion (Eisenberg, Hofer, & Vaughan, 2007). Whereas reactivity initiates automatic responses, EC allows the individual to utilize attentional and behavioral strategies to modulate these responses. Reactivity and effortful control are closely linked, in that individuals with stronger reactive responses in given situations will require higher levels of effortful control in order to effectively regulate these responses (Rothbart & Sheese, 2007). In addition to regulating reactive responses (including suppressing action tendencies), EC can activate behavior that is not otherwise probable or self-desired (e.g., prosocial behavior, persistence at uninteresting tasks, rule-based actions), in the service of individual goals (Rothbart & Sheese, 2007).

Neural bases. Scientists have determined three distinct executive attentional networks in the brain that function differently in the deployment and modulation of attention (Rothbart & Bates, 2006; Rueda, Posner, & Rothbart, 2004). The first network involves alerting reponses (i.e., the state of engagement), and the second relates to orienting responses (i.e., the selection of information from sensory input). These systems originate in the posterior regions of the brain, are present from birth, and reflect more automatic processes, although even by 4 months infants exhibit increased control over their orienting responses (Johnson, Posner, & Rothbart, 1991) .

The third executive attentional network, involving the anterior cingulate cortex and the lateral prefrontal cortex, is involved in the regulation of attentional resources, thought, and emotion and provides the biological substrates for effortful control (Rueda, Posner, & Rothbart, 2004). One hypothesized mechanism is that executive attention, and these regions in particular, are involved in monitoring and regulating conflict between potentially competing neural systems in the brain (Botwinick, Braver, Barch, Carter, & Cohen, 2001). Higher levels of EC reflect greater efficiency and flexibility of this executive attentional network (Rothbart & Bates, 2006). Effortful control and its underlying neural bases develop significantly over early childhood, particularly during the toddler and preschool years, but individual differences are relatively stable from ages 7-8 through adulthood (Kochanska et al., 2000; Mezzacappa, 2004; Rueda, Fan, et al., 2004), although regulatory capacities, overall, continue to increase throughout childhood (Brocki & Bohlin, 2004; Murphy, Eisenberg, Fabes, Shepart, & Guthrie, 1999; Williams, Ponesse, Schachar, Logan, & Tannock, 1999).

Experience and socialization. Although the origins of effortful control are biologically-based, the development of efficiency and flexibility in EC is also influenced by experience. For example, in research conducted by Aksan & Kochanska (2004), children exhibiting more fearfulness and inhibition at 33 months had more voluntary inhibitory control at 45 months. The authors suggest that when children have early temperamental tendencies reflecting highly reactive inhibition, they also have more opportunities over time than their relatively fearless peers to practice and develop self-regulation skills, as they approach novel situations with slow caution. Moreover, as children repeatedly encounter situations that necessitate (or at least invite) self-regulation, they begin to learn which strategies are more or less effective under various circumstances (Eisenberg & Morris, 2002). Thus, experience (i.e., practice in situations requiring self-regulation), and not simply the maturation of related skills that support regulation (e.g., advances in cognitive, motor, and language development), can contribute to the growth of EC across early childhood.

Another line of research provides evidence that the development of effortful control is influenced by children's socialization experiences. Although children transition from more externally-regulated (e.g., caregiver-regulated) behavior to more autonomous self-regulation during the first years of life (Kopp, 1982), adult socialization continues to play an important role in the development of these capacities. In general, positive, supportive parenting is thought to foster children's regulatory capabilities, whereas negative parenting and a lack of supportive parent-child interactions are related to difficulties in self-regulation (Eisenberg et al., 1998; Rothbart & Bates, 2006). For example, mothers' unsupportive parenting (i.e., low levels of sensitivity and warmth, high levels of negative reactions and low levels of positive reactions to children's distress) with their toddlers at 18 months negatively predicted children's EC a year later, after controlling for the stability in these constructs across time (Eisenberg, Spinrad, et al., 2010; Spinrad et al., 2007).

Socio-emotional outcomes. A growing body of research indicates that self-regulation, and particularly effortful control, is important for healthy and adaptive functioning. Across childhood, measures of EC relate, often longitudinally, to increased compliance and positive moral development (Kochanska & Aksan, 2006; Kochanska, Coy, & Murray, 2001; Kochanska et al., 2000), increased social competence and prosocial behavior (Eisenberg et al., 1995; Mishel & Ayduk, 2004; Raver, Blackburn, Bancroft, & Torp, 1999; Spinrad et al., 2007), and decreased aggression, maladjustment, and problem behaviors (Eisenberg, Fabes, Nyman, Bernzweig, & Pinulas, 1994; Eisenberg et al., 2010; Spinrad et al., 2007; Krueger, Caspi, Moffitt, White, & Stouthamer-Loeber, 1996; Lemery, Essex, & Smider, 2002; Lemery-Chalfant, Doelger, & Smith, 2008; White et al., 1994). The relation between early EC and children's language outcomes was examined in the present investigation.

Self-Regulation and Language Development

Theoretical and empirical research supports the idea that self-regulation promotes learning and academic outcomes (see Blair, 2002 for a review; Eisenberg, Valiente, & Eggum, 2010), and this has become a focus of intervention efforts to foster school readiness and achievement (e.g., Bierman, Nix, Greenberg, Blair, Domitrovich, 2008; Diamond, Barnett, Thomas, & Munro, 2007). Within the bioecological framework, children's immediate transactions with the environment—recurring regularly across time—provide the foundation for developmental growth. Thus, it is of interest to consider how self-regulation, including effortful control, might facilitate or hinder the occurrence, duration, or intensity of these transactions in order to influence learning. Moreover, the relations between self-regulation and cognitive outcomes early in life are particularly important to understand, given that kindergarten teachers perceive regulatory skills to be critical for school success (Bodrova & Leong, 2006), and one recent large-scale study discovered that 46% of public school teachers reported that "more than half" of the kindergarteners typically entering their class had great difficulty with regulatory-based classroom skills (Rimm-Kaufman, Pianta, & Cox, 2000).

There is mounting evidence that effortful control and other measures tapping self-regulation are concurrently and longitudinally associated with the development of children's cognitive and language skills and academic achievement. For example, EC, particularly the attention regulation component, has been positively related to various cognitive abilities in preschool and elementary children (Allan & Lonigan, 2011; Coplan, Barber, Lagace-Seguin, 1999; Fabes et al., 2003; Graziano, Reavis, Keane, & Calkins, 2007; Liew, McTigue, Barrois, & Hughes, 2008; NICHD ECCRN, 2003; Valiente, Lemery-Chalfant, & Swanson, 2010; Valiente, Lemery-Chalfant, Swanson, & Reiser, 2008; Willoughby, Kupersmidt, Voegler-Lee, & Bryant, 2011). Teacher ratings of young children's distractibility and persistence related (negatively and positively, respectively) to their reading performance (but not vocabulary; Martin & Holbrook, 1985), school readiness (Schoen & Nagle, 1994), and later achievement test scores (Martin, Drew, Gaddis, & Mosely, 1988). A recent review of longitudinal research on children's school readiness and later achievement determined that attentional skills at school entry are an important predictor of later academic performance, irrespective of gender and socioeconomic status (Dunican, et al., 2007).

On the other hand, one study found that only preschoolers' inhibitory control, but not attentional control, predicted their math and literacy skills in kindergarten (Blair & Razza, 2007). Researchers also have found that performance on a behavioral regulation task (i.e., tapping inhibitory control, as well as attention and working memory) to positively predict later literacy, vocabulary, and math skills in preschoolers and kindergarteners (McClelland et al., 2007; Ponitz, McClelland, Matthews, & Morrison, 2009), and that improvement in regulation across the school year was related to simultaneous growth in these academic competencies for preschoolers (McClelland et al., 2007). Other work suggests that self-regulation skills mediate the relations of early behavior problems (Normandeau & Guay, 1998), emotional regulation (Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003), and preschool educational intervention efforts

(Raver, Jones, Li-Grining, Zhai, Bub, & Pressler, 2011) to academic skills such as vocabulary knowledge and problem-solving skills.

Interestingly, one study examined self-regulation and achievement, along with a number of school-related attitudes, in at-risk (i.e., low income) and not-at-risk kindergarten and second-graders. In both socioeconomic groups, liking of school, child- and teacher-reported motivation toward school tasks, and self-perceived competence were similarly high. However, the younger (but not older) at-risk children performed more poorly than their more affluent peers on a behavioral task of attentional regulation, and this predicted their lowered achievement scores (Howse, Lange, Farran, & Boyles, 2003). This finding suggests that even with similar school engagement and attitudes toward learning tasks, children with deficits in self-regulation have correspondingly heightened risk for poor learning outcomes.

Studies are limited that have examined self-regulation and, specifically, early language abilities. Some research has failed to find significant associations between aspects of self-regulation and vocabulary knowledge (e.g., Coplan et al., 1999; Martin & Holbrook, 1985), but other work has demonstrated links of self-regulation with language, pre-literacy, and reading skills. However, it should be noted that measures of expressive or receptive vocabulary are often simply used as control variables in predicting other aspects of academic performance (to which they are generally positively related) from self-regulation, and are often not considered as outcome variables themselves. Given the associations of early oral language skills (including vocabulary size) with later literacy and achievement outcomes (Dickinson et al., 2010), the current study focuses on receptive and expressive language in early childhood.

Effortful control and other aspects of self-regulation may foster learning and academic achievement by supporting children's ability to transact successfully in the social and physical environments of school. At school, children must pay attention, follow rules and directions, take turns, inhibit improper behaviors, and cooperate with peers. In fact, during the first years of formal schooling, children who have difficulty in work-related skills (WRS) requiring self-regulation (e.g., sitting still, following directions, working independently without distraction) have lower levels of academic performance and are more likely to be retained and to be referred to special educational services (Cooper & Speece, 1988; McClelland et al., 2000).

However, effortful control also may have a more immediate influence on learning, whether in the home or school context. The ability to volitionally and flexibly regulate one's attention, emotions, and behavior is intuitively necessary in order to capitalize upon the learning opportunities afforded by the environment. Children must selectively orient toward a stimulus (physical or social), event, or task, sustain attention, and inhibit attention to distractions. Along with attentional regulation, appropriate behavioral regulation also is necessary in order to initiate actions with stimuli or tasks, to inhibit potentially competing action tendencies (e.g., wandering off to play with something else), and to modulate emotions (e.g., during a challenging task). In addition to the obvious need to orient toward developmentally-facilitative stimuli in the first place, maintaining focus and engagement with a stimulus or task increases a child's time spent potentially learning. Further, it is during periods of focused attention (maintained, in part, by self-regulatory capacities) that cognitive information processing (i.e., learning) occurs (Ruff, 1986; Ruff & Rothbart, 1996).

It should also be noted that bidirectional relations may exist between self-regulation and language. Verbal skills can support children's ability to understand their emotions and provide them with a way to communicate these emotions and needs, which can increase their capacity to modulate their emotions and behavior (Kopp, 1989; Cole, Armstrong, & Pemberton, 2010). In fact, researchers have found that the range of vocabulary children possess is more important for the growth of self-regulation than merely how much they speak, or their talkativeness (Vallotton & Ayoub, 2011), suggesting that advanced communication indeed aids in the management of emotions and behavior.

Environmental Chaos and Self-Regulation

Although research is limited and measures are often inconsistent across studies, there is evidence that children exposed to chronic environmental stress have deficits in self-regulation. For example, maternal reports of household chaos were negatively related to elementary-aged children's behavioral regulation on a delay of gratification task and, a year later, to teachers' reports of children's self-control (Evans, 2005). In fact, chaos partially mediated the links between low income and self-regulation deficits in these children. In childcare settings, preschoolers in classrooms reported to be more chaotic by their teachers were also observed (by independent raters) to be less compliant at school (Wachs et al., 2004). Other researchers have found links between environmental chaos and deficits in younger and older children's attention focusing and persistence (Dumas et al., 2005; Evans et al., 2005; Evans, Lepore, et al., 1998; Wachs & Gruen, 1982). Relatedly, even newborns have been found to have difficulty maintaining basic behavioral state organization in more intensely stimulating (i.e., chaotic) neonatal intensive care units (Als, 1992).

In line with research on elevated physiological stress responses in adults and children exposed to environmental stress, theorists have emphasized "cognitive overload" as a key mechanism in the effects of chaos on learning (Saegert, 1981). Excessive attentional demands result from "intense, unpredictable, uncontrollable, or simply extremely numerous environmental events" (Saegert, 1981, p. 374). In fact, a main hypothesis in explaining the numerous relations between noise exposure and cognitive and language deficits has been that children cope with excessive auditory stimulation by filtering out unwanted stimuli (Cohen et al., 1980; Evans & Lepore, 1993). With chronic exposure to noise and other stimuli (i.e., social, visual, temporal movement) in the environment, children may begin to overgeneralize and apply this strategy indiscriminately, screening out developmentally-facilitative information and cues along with that which is irrelevant or excessive (Evans, Kliewer, & Martin, 1991; Maxwell & Evans, 2000). Thus, self-regulatory development may be compromised under conditions of persistent overstimulation, as children may become less able or willing to flexibly deploy, allocate, and shift their attentional resources to appropriate sources of learning.

In concordance with the idea that chaos-exposed children begin to "tune out" environmental stimuli, several studies have demonstrated that children in noisier homes and schools have poorer performance on tasks that require them to perceive and discriminate auditory stimuli (Cohen et al., 1973; Evans et al., 1995). Moreover, preschoolers were tested on a speech perception task (i.e., listening to a storybook reading), and those who were chronically exposed to high levels of community noise were less distracted by the presentation of background noise during the reading, indicating that they were well-practiced in tuning out ambient auditory stimulation (Evans, Hygge, et al., 1995). Similarly, young children from noisy homes or childcare centers performed better on visual attention and discrimination tasks when there was background noise during the task, whereas this was a hindrance for children from quieter contexts (Hambrick-Dixon, 1986; Heft, 1979). This research supports the idea that children chronically exposed to environmental chaos may adapt to these ambient conditions by developing rigid strategies to block out excessive stimuli (Evans &

Maxwell, 1997). Two studies examining how attentional "tuning out" might mediate the links between environmental chaos and literacy skills were inconclusive, with one investigation finding that auditory perception mediated the negative relations between noise exposure and reading abilities (Cohen et al., 1973), and another failing to find such evidence (Hygge et al., 2002).

It is important to note that children do not simply "adapt" to chaotic home environments and in turn become able to better tolerate these and other stressful environments. For example, Maxwell's (1996) research with children from high- and low-density homes and childcare settings illustrated that children who experienced crowded conditions across both settings exhibited the most emotional and behavioral problems, suggesting that they did not merely become "used to" such conditions. Moreover, children who are exposed to high levels of community noise report being more bothered by acute noise (i.e., presented in the laboratory) than children in low-noise schools (Haines et al., 2001). Thus, even if children adopt strategies to "tune out" auditory stimuli, they still perceive it as a stressor.

In addition to posing challenges for children's perceptual attention and discrimination, ambient conditions within the home can disrupt the quality of children's play in other ways (Hart et al., 2007; Petrill et al., 2004). A recent experiment examined the impact of background television (i.e., with content directed at older children or adults) on young children's object play. Children of ages 1, 2, and 3 years were observed playing in the presence or absence of background television noise. Although the children appeared to give scant attention to the television, they spent less of their time playing with toys, had shorter bouts of play, and had decreased duration of focused attention to the toys when the television was on as compared to when it was off, although complexity of play was not strongly affected (Schmidt, Pempek, Kirkorian, Lund, & Anderson, 2008).

Taken together, these studies indicate the likelihood that chaotic home environments, which often include high levels of ambient noise, foot traffic, and unpredictability in routines and schedules, undermine the development of children's self-regulation by disrupting important proximal transactions between children and the social and physical stimuli in the environment that support the development of learning. Chaos may have direct effects on children by bombarding them with unwanted and unrelentless stimulation, creating chronically high levels of arousal that place excessive demands on self-regulatory processes (Evans et al., 2005; Wachs & Evans, 2010). Given that early language skills, including vocabulary size, speech perception, and phoneme recognition, predict later reading ability even years later (Brady, Shankweiler, & Mann, 1983; Mann & Brady, 1988), the inability to flexibly regulate attentional resources may prove extremely detrimental for cognitive and language outcomes if children begin to "tune out" social interactions and speech. Moreover, decreased quality of object play will provide fewer opportunities for children to learn about the labels, properties, and usages of physical stimuli and events.

In addition to interfering with the development of attentional regulation, it is difficult for children to develop appropriate self-regulatory skills when experiences are unpredictable and non-contingent, and there is little understanding of the links between their behaviors and the outcomes of those actions (Grolnick & Farkas, 2002; Wahler & Dumas, 1989). These kinds of experiences are likely in households that are disorganized and lacking in structure and routines (Hardaway, Wilson, Shaw, & Dishion, 2011). Thus, children in chaotic environments may have fewer opportunities to engage in the kinds of supportive, reciprocal processes that provide feedback to help them organize and structure their own behavior and responses in appropriate ways.

In summary, conceptual theories and empirical research suggest that environmental chaos is related to deficits in regulatory abilities such as effortful control (most notably, attention and behavioral regulation), and that these skills are important for language and learning. Therefore, in this study it was hypothesized that effortful control will mediate the negative relations between chaos and language during early childhood. In a recent longitudinal study with low-income families, household chaos negatively predicted children's inhibitory control, which in turn related to greater externalizing problems (Hardaway et al., 2011). Similarly, Valiente and colleagues (2007) also demonstrated relations between household chaos and externalizing behaviors, mediated through a pathway of negative parenting behaviors that in turn predicted poor EC in children and subsequent behavioral problems. Although these findings indicate that self-regulation mediates the relations between chaos and children's behavioral outcomes, only one study has investigated the possibility that aspects of regulation mediate the effects of environmental chaos on cognitive or language outcomes in children. In this study, elementary-aged children exposed to prior and current environmental noise at school (i.e., aircraft noise) performed more poorly on tests of sustained attention as well as reading comprehension than children at low-noise schools (Haines, Stansfeld, Job, Berglund, Head, 2011). However, attentional skills did not mediate the relations between noise and reading ability. The current study was intended to shed additional light on these processes.

The Mediating Role of Parenting

An extensive literature exists on the role of the family in children's learning and well-being. The family environment is a primary microsystem, and it is within this context that children engage in the proximal processes that underlie growth and development. Consistent with the bioecological model, forces occurring within higher-order contexts indirectly impact children through the ways in which they shape the immediate microsystems, such as that within the family (Bronfenbrenner, 1999).

The family home environment is comprised of social and physical elements (Casey, Bradley, Nelson, & Whaley, 1988; Wachs & Gruen, 1982; Wohlwill, 1983). The *social environment* includes the transactions between children and caregivers and other household members, which are influenced by person characteristics such as the attitudes, beliefs, and behaviors of those individuals. The *physical environment* consists of the inanimate setting within which child-environment transactions occur. More recently, this latter definition has been expanded to include ambient conditions created by individuals and by their social exchanges (Wachs, 1989). The quality of the physical environment can also impact the nature of transactions occurring within the social environment (e.g., parent-child interactions), although Wachs (1986) has cautioned that it also can have unique, direct effects on children and is not just mediated by social interactions.

Of relevance for the current study, a large body of research has demonstrated the importance of microsystem parenting behaviors and parent-child interactions for children's psychological adjustment, problem behaviors, socio-emotional competence, and academic success (see Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Wachs, 2000, for reviews). In particular, this study examined the importance of parenting for children's learning outcomes, and how it might mediate the relations between environmental chaos and children's language.

Parenting and Language Development

There is a growing interest in understanding the relations between family and parenting factors and children's cognitive development, including language skills. Infants primarily depend on associative cues such as perceptual salience and temporal contiguity in word learning, but by the end of the second year, children rely more on references to eye gaze and social context (Hollich et al., 2000). Thus, social input becomes increasingly important in the development of language across early childhood. As will be reviewed, numerous studies have consistently related the quality of parenting to children's language skills and other measures of school readiness and academic achievement.

Linguistic input. The acquisition of vocabulary and language skills is promoted when caregivers consistently talk to their children, help them understand the symbolic meaning of words, and are responsive to their vocalizations (Arterberry, Midgett, Putnick, & Bornstein, 2007; Tamis-LeMonda, Bornstein, Kahana-Kalman, Baumwell, & Cyphers, 1998; Watt, Wetherby, & Shumway, 2006). In particular, the quality of maternal speech (e.g., quantity, complexity, and mean length of utterances) with their children has been positively linked with vocabulary size and grammar skills in toddlers and preschoolers (Beebe, Jaffee & Lachman, 1992; Evans et al., 1999; Hoff, 2003; Naigles & Hoff-Ginsberg, 1998; Smolak & Weinraub, 1983), although one study found that only diversity, rather than quantity, of speech predicted growth in toddlers' expressive vocabulary across two years (Pan, Rowe, Singer, & Snow, 2005). When children are spoken to more frequently and with more diverse vocabulary, their own rate of vocabulary growth also increases across time (Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Moreover, in a study of low-income, Spanish-speaking toddlers, it was found that greater levels of linguistic input by mothers at 18 months predicted children's vocabulary 6 months later, as well as their lexical processing efficiency (i.e., speed of word recognition), controlling for early vocabulary levels (Hurtado, Marchman, & Fernald, 2008).

Although there is evidence that early language skills have some heritability and could be responsible for some of the associations between parents and their children in terms of cognitive and language ability, the environment also plays a role (Dale, Dionne, Eley, & Plomin, 2000; Dionne, Dale, Boivin, & Plomin, 2003). To illustrate, an intervention study promoting more elaborate speech in mothers (e.g., increased narrative conversation and open-ended questions) resulted in immediate gains in preschoolers' vocabulary and improvements in narrative skill (another component of oral language) a year later (Peterson, Jesso, & McCabe, 1999). Moreover, studies have also found relations between the quality of preschool teachers' language in the classroom and children's syntactic growth during the preschool year (Huttenlocher, Vasilyeva, Cymerman, & Levine, 2002), kindergarten language skills and vocabulary, and even fourth grade reading comprehension, word recognition, and vocabulary (Dickinson & Porche, 2011). Thus, genetically-based similarities in language or cognitive abilities only partially explain the relation between parental and child language. Relatedly, longitudinal studies of child-directed speech and children's vocabulary provide support that language exposure has direct effects on their acquisition of language, rather than the alternative explanation that children who are naturally more verbal may elicit more linguistic input from their social environment (Huttenlocher et al., 1991).

Parenting quality. Global qualities of parenting behaviors—both positive and negative—are also important for children's learning, and are often observed during parent-child interaction and play or reported by parents. Common measures of supportive parenting include sensitivity, displays of affection and warmth, and support for children's management of negative affect. Parental sensitivity refers to behaviors that are appropriately attentive, contingent, and responsive to a child's focus of attention or action (Baumwell, Tamis-LeMonda, & Bornstein, 1997; Bornstein, 1989). Aspects of supportive parenting are related to more optimal outcomes in children, including social competence, self-regulation, and cognitive skills (Estrada, Arsenio, Hess, & Holloway, 1987; Halberstadt, Crisp, & Eaton, 1999; Spinrad et al., 2007; Spinrad, Eisenberg, Silva, et al., 2011).

Supportive parenting, such as sensitivity, is also positively associated with preschoolers' language comprehension, vocabulary, and measures of school readiness (Leigh, Nievar, & Nathans, 2011; NICHD ECCRN, 1999; Raviv, Kessenich, & Morrison, 2004) and with growth in their receptive and expressive vocabulary over time (Pungello, Iruka, Dotterer, Mills-Koonce, & Reznick, 2009). In a sample of Early Head Start families, observations of fathers' and mothers' positive, supportive parenting (i.e., combined ratings of sensitivity, positive regard, and cognitive stimulation) predicted cognitive development and language skills from age 2 to 3 years, controlling for sociodemographic factors and earlier skills (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Sensitive maternal behaviors such as maintaining (rather than redirecting) infants' attentional interest was related to increases in cognitive language skills through 40 months (Landry, Smith, Miller-Loncar, & Swank, 1997), and mothers who responded to their toddlers' verbalizations by maintaining (rather than changing) the child's topic of conversation had children with advanced language skills, including greater levels of expressed vocabulary and use of word combinations (Rocissano & Yatchmink, 1983). Finally, observed maternal warmth during interactions was positively related to their three-year-olds' language abilities (Lengua, Honorado, & Bush, 2007).

In contrast, unsupportive parenting behaviors include negative affect, harshness or punitiveness, and controlling or intrusive behaviors, and have been associated with deficits in young children's language development. Parental intrusiveness is defined as behaviors that overstimulate, inappropriately control or interfere with the child's actions or focus of attention, and are insensitive to the child cues, often in efforts to impose a parental agenda (Baumwell et al., 1997; Egeland, Pianta & O'Brien, 1993). Negative and unsupportive parenting predicts a host of poor cognitive, socioemotional, and behavioral outcomes in children (e.g., Dodge, Pettit, & Bates, 1994; Olson, Bates, & Kaskie, 1992; Nolen-Hoeksema, Wolfson, Mumme, & Guskin, 1995; Webster-Stratton & Hammond, 1999).

Although the relations of language development and unsupportive parenting are less commonly investigated than those with positive aspects of parenting, these behaviors can undermine children's developing sense of autonomy, hindering play and learning. For example, mothers' negative intrusiveness predicted slower growth in children's receptive vocabulary from 18 to 36 months, and yielded similar findings for growth in expressive language, but only for European American rather than African American children, after controlling for SES (Pungello et al., 2009). Similarly, observed intrusiveness by mothers was concurrently related to poorer language comprehension in preschoolers, and was associated with deficits in expressive language only for children of teenage mothers (Keown, Woodward, & Field, 2001). Maternal restrictiveness (i.e., physical or verbal attempts to stop the child's behavior) during infancy predicted smaller increases and slower rates of growth in cognitive-language development through age three (Landry et al., 1997). In addition, mothers' negative affect during play was concurrently associated with poorer language skills in children (Lengua et al., 2007).

Often, both positive and negative parenting behaviors are subsumed under one composite of parenting quality, but some researchers consider them separately. For example, mothers' and fathers' supportive behaviors observed during play interactions with their two-year-olds positively predicted children's cognitive and language skills concurrently and one year later, whereas findings for negative parenting were nonsignificant (Tamis-LeMonda et al., 2004). Other research provides evidence that sensitive parenting and negative intrusiveness uniquely relate to children's language outcomes (Keown et al., 2011). Moreover, different associations have been found between negative intrusive parenting and language abilities for children of different races (Pungello et al., 2009) and family risk (Keown et al., 2011). Thus, the present study examined the unique associations of supportive and unsupportive parenting separately, given evidence that their relations with language development may differ.

Environmental Chaos and Parenting

The stresses associated with risk-laden environments may compromise parents' ability to care for their children in a sensitive and nurturant manner, with implications for their developmental outcomes (McLoyd, 1998). In a relevant line of research, Conger and colleagues (Conger, Rueter, & Conger, 2000; Conger et al., 2002) have theorized and tested a family stress model of economic hardship. In this model, the economic pressures resulting from financial hardship negatively impact parental relationships, psychological health, and parenting behaviors, which in turn affect children's outcomes. Other studies provide support that disruptions in parenting or the family home environment mediate the associations between risk and children's cognitive development and behavioral adjustment (e.g., Barocas et al., 1991; Brody & Flor, 1998 ; Linver, et al., 2002; Lugo-Gil & Tamis-LeMonda, 2008).

Similarly, environmental chaos may create conditions within the microsystem of the family that may hinder parents' ability to provide sensitive, positive care to their children or may increase the likelihood of negative parenting behaviors or parent-child relationships (Matheny et al., 1995; Wachs, 1989; Wachs & Camli, 1991). Aspects of chaos, particularly crowding, have been correlated with social withdrawal in adults, in an attempt to cope with the stimulation from unwanted or uncontrollable social interaction and traffic (Cohen, 1978; Evans, 2001; Evans & Lepore, 1993). Other researchers, as noted previously, have suggested that individuals may adopt a strategy of "tuning out" excessive environmental stimuli. These tendencies are likely to lead to a lack of attention or response to social cues and overtures (Evans, Rhee, Forbes, Allen, & Lepore, 2000). In support of this idea, parents of infants, toddlers, and children in chaotic, noisy, and crowded homes are less responsive to their children's vocalizations and bids for attention, use fewer child-directed vocalizations and less complex speech, and label, show, and demonstrate objects at a lower rate (Bradley & Caldwell, 1984; Corapci & Wachs, 2002; Evans et al., 1999; Gottfried & Gottfried, 1984; Matheny et al., 1995; Wachs, 1989, 1993; Wachs & Camli, 1991). Even when acutely exposed to experimentally-induced ambient noise (i.e., background television), parents become less verbal, less responsive to their young children's bids for attention, and less attentive and involved in their children's play (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009).

In addition, environmental chaos may have a number of deleterious effects on parents' psychosocial adjustment, with consequences for their parenting behaviors. Chronic exposure to unwanted stimulation derived from noise and crowding, as well as the difficulties associated with dealing with an unorganized environment, may tax parents' coping resources and result in fatigue, irritability, and tension (Evans et al., 1999; Wachs, 1992). Parents in chaotic households generally report experiencing greater parenting stress as well as depressive symptoms (Corapci & Wachs, 2002; Nelson et al., 2009; Pike et al., 2006; Wachs & Camli, 2001), although some research has not found associations with negative mood (Corapci & Wachs, 2002). Moreover, they are particularly sensitive to minor daily hassles and stress (Lepore, Evans, and Palasane, 1991) and perceive their social support systems to be diminished (Lepore, Evans, & Schneider, 1991). Conversely, mothers feel more competent and satisfied in their parenting role when regular household routines exist (Brody & Flor, 1997; Sprunger, Boyce, & Gaines, 1985). In general, parenting stress is associated with increases in negative mood, more punitive parenting practices, and more negative perceptions of their children (Webster-Stratton, 1990; Bendell, Stone, & Field, 1989).

Parent-child relationships are more negative and conflictual and less cooperative when homes are more crowded and chaotic (Dumas et al., 2005; Evans et al., 1990; Evans, Lepore, et al., 1998). A recent study examined the relations between household chaos and parent-child relationships in a sample of families with two children, using parent surveys and a puppet interview method for children (Coldwell et al., 2006). Younger siblings (ages 4-6 years) in chaotic homes reported that relationships with their mothers were characterized by less warmth and enjoyment, and their older siblings (all were younger than 8 years) gave similar reports about both parents, and also described these relationships as reflecting more anger and hostility. Parents also rated their relationship with these older siblings as containing more negativity, and fathers characterized their relationships with both children as including less positivity when the family had a chaotic home environment. In addition, parents reporting that their homes are chaotic also state that they are less likely to use supportive strategies and more likely to use negative strategies when their children exhibit distress (Nelson, et al., 2009; Valiente et al., 2007), use harsher discipline (Dumas et al., 2005; Pike et al., 2006), and report having feelings of negativity toward their children (Pike et al., 2006). They are also more verbally intrusive and are more likely to disrupt their children's play exploration (Matheny et al., 1995).

The current study examined aspects of parenting, including maternal speech and supportive and unsupportive parenting, as mediators of the relations between chaos and language. In related research, diminished maternal responsiveness mediated the relation between residential crowding and cognitive development in 3 year old children in the U. S. and the U. K. (Evans et al., 2010). However, only one study has specifically investigated parenting as a mediator between household chaos and children's language. In a sample of low-income, rural 3 -year-olds, a number of objective indicators of chaos were assessed across infancy and toddlerhood and composited into two factors reflecting cumulative *household instability* (i.e., changes in caregivers and residences, number and changes in household) and *household disorganization* (i.e., household density and cleanliness, preparation for home visits, ambient and neighborhood noise) across the first 3 years of life. Parenting behaviors were observed during a series of free play interactions between parents and children in their homes. After covarying a number of sociodemographic variables, household disorganization was negatively related to children's expressive and receptive language assessed at age 3, and positive and negative parenting were found to partially mediate these effects (Vernon-Feagans, et al., 2011). One of the aims of the current study was to provide further evidence that parent-child interactions are key proximal processes that may be impacted by chaos and consequently affect language development. It was expected that household chaos would be associated with poorer quality of maternal speech and less supportive and more unsupportive parenting behaviors, which in turn would predict deficits in children's language. Each of these aspects of parenting (i.e., child-directed speech, supportive parenting, unsupportive parenting) were examined separately in order to determine if unique relations exist with chaos and language.

Parenting and Children's Self-Regulation

Young children make dramatic strides in the development of self-regulation across the first years of life. Precursors of effortful control (i.e., attention regulation) emerge late in the first year, followed by rapid advances in more sophisticated forms of EC across the toddler and preschool years. Although self-regulation is thought to derive from constitutional bases, environmental experiences impact the development of these competencies as well (Rothbart & Bates, 2006). In fact, a substantial body of literature attests to the importance of parenting for self-regulation (including effortful control) in children (e.g., Eisenberg et al., 1998; Rothbart & Bates, 2006; Thompson & Meyer, 2007). Early in life, infants have very limited regulatory capacities and rely a great deal upon others to detect their cues and respond in appropriate ways that modulate their arousal, attention, and emotion (Kopp, 1982, 1989). However, even as young children become capable of more autonomous and effortful self-regulation, parents continue to play a fundamental role in fostering the development of an adaptive and flexible repertoire of regulatory skills (Kopp, 1987, 1989). In particular, sensitive and affectively-positive parenting that is supportive of children's emotional experiences is expected to promote the development of optimal self-regulation and EC.

Various parenting practices support the socialization of self-regulation and effortful control. Parents may directly intervene to manage their children's emotions (both positive and negative), attention, and behavior (Thompson & Meyer, 2007). For example, parents might use strategies such as soothing, distracting or re-orienting, providing distal social cues, evaluating or modeling emotions and behaviors, conveying expectations, suggesting solutions or problem-solving, or using physical interventions. These types of behaviors may be automatic or intentional, and may serve to modulate children's emotions, attention, or behavior in the immediate situation. Moreover, when parents directly intervene this may provide children with immediate, scaffolded practice with regulation (Kopp, 1989), foster their understanding of emotions (Thompson, Flood, & Goodvin, 2006), promote internalization of what is socially appropriate (Kochanska & Knaack, 2003), help them recognize when regulation is necessary (Olson, Bates, & Bayles, 1990), and identify effective (or less effective) ways of accomplishing regulation-related goals (Eisenberg & Morris, 2002).

Specific ways in which parents manage their children's emotions, attention, and behaviors may be more or less facilitative of the development of optimal regulatory skills, or may even promote maladaptive forms of regulation. The ability to choose and implement appropriate interventions depends, in part, on parental sensitivity—prompt and appropriate responding to children's cues and needs, which incorporates knowledge of the child's characteristics and capacities. Sensitive behaviors may help children remain focused and avoid over-arousal, allowing them an opportunity to engage in adaptive regulatory behaviors (Hoffman, 2000; Sroufe, 1996). On the other hand, less sensitive parenting practices such as negative control (i.e., intrusive, excessive, power-assertive, or harsh control; Grusec & Kuczynski, 1980) may exacerbate dysregulation and are thought to undermine children's internalization of parental values, which is important in guiding children's regulated behavior (Kochanska & Knaack, 2003). Maternal sensitivity and responsiveness (i.e., to children's cues, direct signals, distress, or needs) have been related with higher levels of effortful control and attention regulation in early childhood (Belsky, Pasco Fearon, & Bell, 2007; Kochanska et al., 2000; Spinrad et al., 2007; Spinrad, Stifter, Donelan-McCall, & Turner, 2004). When mothers display little sensitivity, children are more likely to be affectively dysregulated (i.e., high levels of negative affect and defiance) during mother-child interactions (NICHD ECCRN, 2004). On the other hand, intrusiveness and negative control are generally associated with impaired EC and regulation (Karreman, van Tuijl, van Aken, & Dekovic, 2006; Kochanska & Knaack, 2003) and the use of less adaptive regulatory skills in children (Calkins, Smith, Gill, & Johnson, 1998; Stansbury & Zimmerman, 1999).

The emotional quality of parenting is also important in facilitating the development of children's self-regulation. Warm, supportive, affectively-positive parenting can benefit the parent-child attachment relationship (Ainsworth, Blehar, Waters, & Wall, 1978). Within this relationship, the infant develops a consolidated representation of the repeated experiences of parent-assisted modulation of arousal and distress, which contributes to the infants' emerging capacities for self-regulation and, eventually, is thought to generalize to other contexts and relationships as children age (Sroufe, 2000; Thompson, 2006). Consistent with this notion, maternal displays of affective warmth during teaching interactions positively predicted toddlers' observed effortful control the next year (Jennings, Sandberg, Kelley, Valdes, Yaggi, Abrews, et al., 2008), and maternal warmth and support in the second year predicted children's attentional regulation two years later (Gilliom, Shaw, Beck, Schonberg, & Lukon, 2002). Moreover, observations of positive, supportive parenting predicted faster growth in children's inhibitory control from ages 2 to 4 years, as rated by mothers, whereas harsh (e.g., critical, negative, rejecting) mothers had toddlers with low inhibitory control at 2 years (Moilanen, Shaw, Dishion, Gardner & Wilson, 2009).

In addition to the emotional quality of the parent-child relationship, specific parental emotional behaviors also affect the development of children's self-regulation and effortful control. Parental emotional expressiveness—or the manner, frequency, and context in which parents display and communicate emotions—provides a model to children for what emotions are appropriate in a given situation and how to display them, as well as the likely reactions from others (Halberstadt, Crisp, & Eaton, 1999; Eisenberg et al., 1998), which can guide children in developing regulatory strategies for managing their own emotions. High levels of positive expressivity and low levels of negative expressivity, particularly those emotions directed at children, likely benefit the parent-child relationship but also model effective emotion regulation. In fact, children are more well-regulated when their mothers convey greater levels of positive affect (Eisenberg, Gershoff, Fabes, Shepard et al., 2001; Eisenberg, Valiente, Morris, Fabes et al., 2003; Valiente, Fabes, Eisenberg, & Spinrad, 2004), whereas maternal expression of negative emotions (i.e., anger, hostility) relates negatively to children's use of constructive coping strategies (Valiente et al., 2004).

Self-regulation and effortful control are also influenced by the way that parents respond (or fail to respond) to children's expression of emotions, particularly negative affect (Eisenberg et al., 1998). Parental responses can serve to modulate emotions in the immediate context. Supportive responses may reduce stress and arousal so that children can engage in regulatory behaviors, whereas nonsupportive responses, such as punishing the child or minimizing their emotional experience, may amplify negative affect and prevent effective regulation or promote further dysregulation (Hoffman, 2000; Sroufe, 1996). Moreover, the specific ways that parents react when their children are in distress can validate and help them understand emotions, support them in identifying ways to cope with their emotions, and help them internalize parental values for behavior. Supportive responses to children's distress have been related to greater regulation and effortful control, whereas nonsupportive responses have been related to lower levels of these competencies in toddlers (Spinrad et al., 2007; Eisenberg, Spinrad, Eggum, Silva, Reiser et al., 2010; Spinrad et al., in press), preschoolers (Eisenberg & Fabes, 1994), and children (Davidov & Grusec, 2006; Eisenberg, Fabes, Shepard, Guthrie, Murphy, et al., 1999; Valiente et al., 2007).

In summary, the development of effortful control in children appears to be fostered by parenting that is sensitive, affectively-positive, and supportive of children's regulation when experiencing distress. Given the negative effects of environmental chaos on the quality of parenting, it is possible that chaos impacts children's EC not only directly, but also through decrements in parents' ability to provide positive, supportive care to their children, or increases in negative parenting. This would be consistent with other research indicating that parenting mediates the relations between contextual risk and EC (Lengua et al., 2007). In the most relevant investigation, Valiente and colleagues (2007) demonstrated that household chaos related to externalizing behaviors in school-aged children, through a pathway of negative parenting behaviors (reactions to their children's negative emotions) that then predicted poor EC in children and subsequent behavioral problems. To this author's knowledge, no research exists that has investigated the possibility that parenting and EC mediate the effects of chaos on cognitive or language outcomes in children. To this end, the current study also examined a multiple mediation model in which it was expected that higher levels of household chaos would predict less positive and more negative parenting, which, consequently, would lead to deficits in children's effortful control and language.

Sex Differences in the Relations among Chaos, Parenting, and Child Development

There is reason to explore the possibility that the relation between chaos and language development might differ for boys and girls, as gender differences may exist in individuals' responses to environmental stressors. Specifically, some researchers have suggested that physiological, physical, and cognitive development may be more adversely affected in males, whereas females may exhibit more affective-motivational deficits. Some research has found that boys in crowded homes have smaller physical stature and delayed motoric development, but similar findings are not apparent for girls (Goduka, Poole, & Aotaki-Phenice, 1992; Shapiro, 1974). There is also some evidence that school-aged boys, but not girls, respond to crowding with elevated physiological stress markers, both in experimental laboratory settings (Aiello, Nicosia, & Thompson, 1979) and within naturalistic conditions of crowding within the home (Evans, Lepore, et al., 1998), whereas findings for females are attenuated or nonsignificant. Male infants have exhibited greater intellectual deficits when reared in noisier homes, whereas females were not adversely affected (Wachs, 1978).

Environmental stress also has been linked with motivational deficits, but one study conducted with children in India found this relation only for girls (Evans, Lepore, et al., 1998). Research with adults has yielded parallel findings when examining the effects of crowding (Aiello et al., 1979; Mackintosh & West, & Saegert, 1975). On the other hand, male, but not female, infants exposed to household noise have displayed diminished mastery motivation (Wachs, 1987). Moreover, low-income rural (but not urban) school-aged boys in crowded homes were rated by their mothers as exhibiting more symptoms of poor psychological health than were girls (Evans, Saegert, & Harris, 2001). Sex differences may only exist for particular developmental domains. For example, although mean-level differences may be found across the sexes in behavior problems, many investigators have found the impact of chaos to be the same, indicating that this risk factor operates in a similar manner for this outcome (Pike et al., 2006).

In general, it is possible that the pathways linking chaos and developmental outcomes differ across the sexes, particularly given sex differences in baseline levels of these constructs. For example, girls tend to score higher on measures of self-regulation such as attentional and inhibitory control (Else-Quest et al., 2006; Moilanan et al., 2010; Raikes, Robinson, Bradley, Raikes, & Ayoub, 2007). In terms of language development, there is some research to suggest that girls have greater vocabulary growth (i.e., comprehension and production) during infancy and early toddlerhood (Fenson et al., 1994), despite similarity in parental speech towards boys and girls (Huttenlocher et al., 1991). However, the few differences in language abilities found in preschoolers or elementary-aged children are often mixed as regard to a particular sex advantage, and, across all ages (i.e., infancy through childhood), generally account for only 1-3% of the variation in these language outcomes (Ardila, Rosselli, Matute, & Inosemtzeva, 2011; Dale, Harlaar, Hayiou-Thomas, & Plomin, 2010; Fenson et al., 1994).

Moreover, it may be that girls and boys have sex-specific characteristics that render them more vulnerable or protected from environmental chaos through direct or mediated pathways. Some research has found that girls receive more positive, supportive parenting than boys (e.g., Halberstadt et al., 1993), whereas boys may be exposed to harsher, more intrusive, and less sensitive parenting (Berlin, Brady-Smith, & Brooks-Gunn, 2002; Lytton & Romney, 1991; Tamis-Lemonda, Briggs, McClowry, & Snow, 2009). It also may be the case that parenting is more likely to suffer towards sons rather than daughters when parents experience stress (i.e., marital conflict; Jenkins, Rasbash, & O'Connor, 2003), or it is possible that boys themselves are more simply more vulnerable to the effects of negative or unresponsive parenting or challenging home environments.

The present study explored whether the hypothesized pathways (i.e., parenting, EC) mediating chaos and language development were different for girls versus boys. Although somewhat exploratory, it was expected that the negative effects of chaos on language development might be stronger for boys, and that this might be mediated by larger deficits in EC, parenting, or both over time.

Study Summary

In summary, this investigation addressed important gaps in understanding the effects of environmental chaos on young children's language development. Despite consistent relations between various aspects of chaos and poor outcomes in children, the majority of existing studies have been correlational and few have investigated mediational pathways. Longitudinal designs such as this study are essential in determining causal relations across time. Moreover, meditational research is particularly critical in the area of environmental chaos given that some of the sources of chaos are less easily amenable to change. Therefore, a better understanding of the specific proximal processes through which chaos impacts children's development may suggest more specific areas on which to focus intervention efforts. Moderation by sex was also examined in order to determine if there were differential pathways between chaos and language across time for boys versus girls. Finally, the proposed study employed a multi-method, multi-reporter approach to model contextual, parenting, and child variables across time, and because key constructs were measured across multiple time points, allowed for stronger tests of mediation.

STUDY GOALS, HYPOTHESES, AND PROPOSED MODELS

The primary purpose of this investigation was to examine, longitudinally, the relation between environmental chaos and children's language across early childhood (i.e., ages 30, 42, and 54 months). Moreover, two potentially mediating processes were tested in order to assess the roles of children's effortful control and parenting in explaining these relations. Finally, moderation of these relations by children's gender was explored. All models included baseline (T1) measures of socioeconomic status and children's vocabulary in order to establish the unique relations among the constructs of interest.

Research Question 1: Does Environmental Chaos Predict Children's Language?

The first goal of this investigation was to examine the longitudinal relation between household chaos and preschoolers' expressive and receptive language. Based on existing research documenting language and literacy deficits in children exposed to chronic environmental stressors (e.g., Johnson et al., 2008; Pike et al., 2006), it was expected that high levels of chaos in the home would predict poorer language abilities in children.

Research Question 2: Does Children's Effortful Control Mediate the Relations between Chaos and Language?

The second study goal was to examine children's effortful control as a possible mediator of the relation between chaos in the home and children's language abilities. Although supporting research is limited, the heightened allostatic load associated with exposure to chronic environmental stress may tax children's coping resources. Evans and colleagues (1991) suggest that children's efforts to adapt to excessive environmental stimulation may compromise the development of flexible self-regulatory strategies, and this deficit may lead to an impaired ability to perceive and attend to the developmentally-facilitative stimuli that support the growth of language skills. Therefore, it was hypothesized that greater household chaos would be associated concurrently and longitudinally with decreased levels of EC, which would in turn predict deficits in language.

Research Question 3: Does Parenting Mediate the Relations between Chaos and Language?

The third goal was to assess the potentially mediating role of dimensions of parenting in the relation between household chaos and children's language. Several studies have indicated that adults experiencing environmental stressors such as high-density or disorganized living conditions are less responsive, more intrusive, and less verbally- and cognitively- stimulating with their children (Bradley & Caldwell, 1984; Coldwell et al., 2006; Corapci & Wachs, 2002; Valiente et al., 2007)—all of which may impair learning opportunities for children. Moreover, some research has demonstrated that poorer quality of parenting partially explains the relations between environmental chaos and deficits in children's language and cognitive skills (Evans et al., 1999; Evans et al., 2010; Vernon-Feagans, et al., 2011). Therefore, it was hypothesized that mothers in more chaotic homes would demonstrate lower levels of speech, and less positive and more negative parenting with their children. In turn, these parenting behaviors were expected to be associated with deficits in preschoolers' language, concurrently and across time.

Research Question 4: Do the Associations between Parenting and EC Mediate the Relations between Chaos and Language

The relation between maternal supportiveness and children's EC has been established in the current sample (Eisenberg et al., 2010; Spinrad et al., 2007, in press). Thus, a multiple mediation model was examined in which household chaos was expected to be associated with less positive and more negative parenting (it was not expected that parental speech would be a relevant construct in this model) that would predict deficits in children's EC over time, and, in turn, would be associated with poorer language skills in children.

Research Question 5: What Is the Role of Child Sex in the Relations among Chaos, Parenting, Effortful Control, and Language?

A final goal of the proposed study was to explore whether the relations among household chaos, parenting, children's effortful control, and language in early childhood differ for boys versus girls. Mean-level gender differences favoring girls were expected in parenting constructs, effortful control, and language. Further, there is evidence, albeit limited, that physiological stress is more elevated (Evans, Lepore, et al., 1998) and cognitive skills are more impaired (Wachs, 1978) in boys rather than girls who are exposed to environmental chaos, although much other research has not discovered divergent outcomes for boys versus girls (e.g., Pike, 2006). Finally, there is research to suggest that, in general, boys may experience less positive and more negative parenting than girls (e.g., Berlin et al., 2002; Halberstadt et al., 1993; Lytton & Romney, 1991), and that this parenting difference may be heightened in families experiencing stressful home environments (Jenkins et al., 2003). Thus, the possibility was explored that the negative effects of chaos on language development would be stronger for boys, and that this might be mediated by larger deficits in EC or parenting over time.

Finally, post-hoc analyses were conducted to explore whether SES moderated the effects of household chaos on children's language or EC or on parenting. Additional analyses explored whether the prediction of children's language from chaos differed for children with varying levels of effortful control.

RESEARCH DESIGN AND METHOD

Participants

Participants were part of a 6-year longitudinal study of children's socioemotional development across infancy and early childhood (Eisenberg et al., 2010; Spinrad et al., 2007). Children and their families participated in multiple assessments throughout this period, including questionnaire surveys and observational data collected at laboratory visits. In addition, non-parental caregivers filled out questionnaire surveys. For this study, questionnaire and observational data were collected when children were approximately 30, 42, and 54 months of age (Times 1, 2, and 3 for this study, respectively).

Initially, 352 families were recruited from three local hospitals following the birth of their infants. Families interested in receiving more information about the project were subsequently contacted by a research assistant who explained the research study, answered questions, and obtained basic demographic information and consent to participate. At the first data collection point of the overall research study (i.e., questionnaire data collected at 6 months of age), the original sample consisted of 276 families and their infants. The first laboratory visit was conducted at 18 months of age with 256 families (141 boys, 115 girls). For the purposes of the current investigation, only children whose families participated in data collection during at least one of the relevant time points in this study (i.e., at 30, 42, or 54 months of age) were included in the analyses. The final sample for the current study was comprised of 236 families (132 boys, 104 girls) with data from T1 (N = 230, 128 boys, 102 girls), T2 (N = 210, 117 boys, 93 girls), and/or T3 (N = 192, 108 boys, 84 girls), with 183 families consistent across all three time points, and a few families who rejoined the larger study at T2 or later, after earlier participation in the overall study.

The following participant characteristics were obtained from families at the time of initial recruitment. Participant parents were adults (i.e., at least 18 years of age) with full-term (i.e., at least 36 weeks gestational age) children with no birth complications residing in a large, southwestern metropolitan area. Mothers were between the ages of 18 and 44 years (M = 29.38 years, SD = 5.56) at the time of their child's birth. The majority of children and mothers who participated were non-Hispanic Caucasian (children = 67%; mothers = 74%) or Hispanic Caucasian (children = 16%; mothers = 13%). Participants also identified as non-Hispanic African American (children = 4%; mothers = 4%), Hispanic African American (children = 2%), Asian (children = 3%; mothers = 3%; all non-Hispanic), non-Hispanic Native American (children = 2%; mothers = 2%), and Hispanic Native American (children = 3%; mothers = 1%). Less than 2% of children and mothers were identified as non-Hispanic and either an "other" race or a mix of two minority races, and less than 1% of children were identified as Hispanic and a mix of races. Finally, a small number of participants did not report race, but reported a Hispanic ethnicity (children = 1%; mothers = 3%).

Additional demographic information was collected at each time point, and the following participant characteristics reflect information obtained at 30 months of age. Annual family income was reported on a 7-point scale and ranged from less than $15,000 to over $100,000, with the median income level $45,000-60,000. Parents' education ranged from 8th grade to the graduate level; median years of formal education completed by both mothers and fathers was approximately 14 years (2 years of college). Over half (61%) of all mothers were employed (61% of these greater than 30 hours per week) as were most (95%) fathers (93% of these greater than 30 hours per week). The majority (83%) of parents were married, and had been married from less than one year to 26 years (M = 6.9, years, SD = 3.9). Seven percent of parents were cohabitating, 4% were single, and 6% were divorced or separated. Approximately half (48%) of the children had siblings, and 42% of all children were firstborns. See Table 1 for demographic information about the families participating at each time point.

At each laboratory visit, mothers were asked to provide contact information for another adult who knew their child well (e.g., a non-parental caregiver). Caregivers were sent questionnaires that they returned via mail (*N* = 152 at T1, *N* = 151 at T2, *N* = 146 at T3). Caregivers for a given child were often not the same adult across time points. Caregivers who chose to return questionnaires described the type of care they provided for the child as a relative providing care in their own home (T1= 45%; T2 = 49%; T3= 34%) or the child's home (T1= 23%; T2 = 19%; T3= 14%); a nonrelative providing care in their own home (T1= 19%; T2 = 16%; T3= 14%) or the child's home (T1= 7%; T2 = 6%; T3= 7%); or a childcare provider at a day care center or preschool setting (T1= 7%; T2 = 9%; T3= 30%).

Overview of Study Design and Procedures

As part of the larger study, parents completed a series of mailed questionnaires at T1, T2, and T3 that evaluated a range of child characteristics as well as various parenting practices. Non-parental caregivers also completed similar mailed questionnaires about children's characteristics shortly after each of the lab visits at these time points. Mothers and caregivers received a modest payment after return of the questionnaires. Relevant for this study were maternal reports of family demographics, household chaos, children's vocabulary, and their own responses to their children's negative emotions, as well as maternal and caregiver ratings of children's effortful control.

In addition, mothers and children visited the laboratory for a battery of assessments conducted by trained, female research assistants when they were approximately 30 months (T1; *M* =29.77 months, *SD*=.65), 42 months (T2; *M* =41.75 months, *SD*=.65), and 54 months (T3; *M* =53.89 months, *SD*=.80) of age. The laboratory procedure at each time point included a series of structured tasks that evaluated children's effortful control, and, at T3, children's language was assessed. At each age, mothers and children also participated together in an unstructured free play session and a teaching paradigm. Upon completion of each laboratory visit, four trained research staff rated various dimensions of the child's behavior based on their observations of the child throughout the session. Mothers also completed an additional parenting questionnaire during this visit. Mothers received a modest payment after the lab visit and children received a small toy.

Laboratory sessions lasted approximately 1 ½ hours, and were videotaped in their entirety. The behavioral data from these videotapes was later coded by multiple teams of research assistants. For each observational task, a team of two research assistant coders was trained to use the behavioral coding systems until they reached acceptable levels of agreement. Subsequently, all videotaped segments for each task were coded by the main coder, and the second coder independently recoded a random sample of approximately 25% of the cases to establish reliability (intraclass correlation, ICC). For observational data, a mean composite score was computed from scores during codeable epochs.

Measures

Unless otherwise noted, measures were identical at each time point. Refer to Appendices A-B for details about all measures.

Environmental Chaos

At each time point, environmental chaos was assessed via a maternal report measure.

Household chaos. At each assessment, the degree of household chaos was reported by mothers using the Confusion, Hubbub, and Order Scale (CHAOS; Matheny, Wachs, Ludwig, & Phillips, 1995). The CHAOS consists of 15 items (e.g., "You can't hear yourself think in our home," and "No matter how hard we try, we always seem to be running late"). Observations of various indices of environmental chaos within the home environment have been found to correlate with the CHAOS scale (Matheny et al., 1995), and mothers' and fathers' reports on this measure have been moderately correlated (i.e., *r*

= .52; Atzaba-Poria & Pike, 2008). CHAOS items were rated on a true/false scale (1= *true; 2=false*) and averaged (with appropriate items reversed) to create a total score, with higher scores indicated more household chaos. Cronbach's alphas for this scale were .83, .80, and .79 at T1, T2, and T3, respectively.

Children's Language

Mothers reported on their children's vocabulary at T1. At T3, children's expressive and receptive language was assessed in the laboratory.

Adult-reported vocabulary. At T1, children's expressive vocabulary (i.e., spoken words) was reported by mothers using the short form of the MacArthur Communicative Development Inventory (CDI-Short Form; Fenson, Pethick, Renda, Cox, Dale, & Reznick, 2000). Mothers indicated the words spoken by their child (in English and/or Spanish) on a checklist of 100 words. Because of the ethnic makeup of the sample and to account for bilingualism (14% of children spoke at least one checklist word in Spanish; 7% spoke 12 or more checklist words in Spanish), raw scores were used rather than normed scores (which are based on child age and gender but for words spoken in English; Fenson et al., 2000).

Language assessment. At T3, children's receptive and expressive language were assessed by a trained research assistant, using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI-III ; Sattler & Dumont, 2004). The expressive scale included 25 items, and children were asked to define a given word (e.g., "What is a dog?"). Open-ended responses were scored according to a standard checklist. The receptive scale included 38 items, and children were asked to identify the picture (four pictures were presented per item) that corresponded with a given word (e.g., "Show me the easel."). At the beginning of each scale, children had to provide two correct responses in order to proceed with the remaining words, and testing for each scale was discontinued after five consecutive incorrect responses. In accordance with the WPPSI-III manual, the total raw scores on the expressive and receptive scales (0 – 43 and 0 – 38, respectively) were each converted into scaled scores (0 – 19) based on chronological age. *Children's Effortful Control*

At each time point, children's effortful control was reported by mothers and non-parental caregivers, and was also observed and rated globally during the laboratory assessments. In addition, children participated in a number of standard laboratory tasks designed to tap behavioral indices of effortful control. Behavioral tasks differed somewhat across T1, T2, and T3 in order to ensure that they were developmentally-appropriate. These tasks have proven to be valid measures of children's effortful regulation at these ages, correlating well with one another and with adult ratings and other measures of effortful control (Spinrad, Eisenberg, & Gaertner, 2007; Eisenberg et al., in preparation).

Adult-reported effortful control. Mothers and caregivers completed three subscales from the Early Childhood Behavior Questionnaire (ECBQ; Rothbart, 2000) at T1, and from the Childhood Behavior Questionnaire (CBQ, Rothbart, Ahadi, Hershey, & Fisher, 2001) at T2 and T3. These subscales included 1) attentional focusing (12 items at T1 and 14 items at T2 and T3; e.g., "My/this child has difficulty leaving a project s/he has begun"), 2) attentional shifting (12 items; e.g., "My/this child can easily shift from one activity to another") and 3) inhibitory control (12 items at T1 and 13 items at T2 and T3; e.g., "My/this child can easily stop an activity when s/he is told no"). For both the ECBQ and CBQ, items were rated on a 7-point scale (1= *never* to 7=*always*) and averaged (with appropriate items reversed) to create a total score. Cronbach's alphas for attentional focusing were .81, .77, and .77 for mothers and .85, .74, and .72 for caregivers, at T1, T2, and T3, respectively. Alphas for attentional shifting were .73, .67, and .73 for mothers and .71, .80, and .72 for caregivers, at each age. For inhibitory control, alphas were .88, .77, and .80 for mothers and .88, .82, and .83 for caregivers, at each age.

Observer-reported effortful control. Children's attention and persistence was rated by four research staff who observed the child throughout each laboratory session, using the Infant Behavior Record (IBR; Bayley, 1969). The IBR was originally developed for use during administration of the Bayley Exam, but also has been used as a global rating (Stifter & Corey, 2001). Upon completion of the laboratory assessment, the four observers rated various dimensions of the child's temperament and behavior, including attention and persistence. *Attention to tasks* referred to the degree to which the child focused on and sustained interest in the tasks presented, and was rated on a 5-point scale (1=*constantly off-task, does not attend* to 5=*long continued absorption in task materials/activities*). The four observer scores for attention to tasks were averaged to create a total score, with Cronbach's alphas for these four ratings of .84, .84, and .74 at T1, T2, and T3, respectively. *Persistence at tasks* referred to the degree to which the child persisted at attempting to complete the tasks presented, and was rated on a 5-point scale (1=*consistently lacks persistence* to 5=*consistently persistent*). Again, the four observer scores were averaged into a composite score, with alphas of .81, .73, and .73 at T1, T2, and T3, respectively.

Observed effortful control. Three behavioral tasks were used to assess children's effortful control at each time point. Initial measurement models included all of these observed measures; however, some were not retained in the final models.

O*bservational task: Dinky toys.* At the end of each laboratory visit at T1, T2, and T3, children were seated at a table and asked to place their hands in their lap. They were then shown a clear, open box containing a variety of small toys. The research assistant instructed children to keep their hands in their lap and to verbally indicate which prize they would like so that she could hand it to them. After the first prize choice, the procedure was repeated with the same instructions, allowing children to choose a second prize. Measuring children's effortful control, responses to these instructions were rated on a 7-point scale (0 = *Child grabs toy out of container immediately*; 1 = *Child waits less than 2 seconds before taking toy out of container*; 2 = *Child touches toy in container, but does not take out*; 3 = *Child points to toys*; 4 = *Child removes hands from lap*; 5 = *Child twitches or moves hands, but hands do not leave lap*; 6 = *Child does not remove hands from lap*), with higher scores reflecting greater levels of effortful control. Scores for each of the two episodes were averaged to create an overall score (*ICC*s = .91, .92, 1.0 at T1, T2, and T3).

Observational task: Gift delay. At T1, T2, and T3, children participated in another delay paradigm reflecting effortful control (Kochanska et al., 2000).

The research assistant presented children with a gift bag containing a surprise for them, placing it on the table directly in front of the child. She then stated that she had "forgotten the bow" for the gift, and asked children not to touch the bag in front of them until she returned with the bow (3 minute delay at T1; 2 minute delay at T2 and T3). Children were left alone in the room, and level of restraint in delaying was coded on a 5-point scale (1 = *child pulls box from bag*, 2 = *child puts hand into bag*, 3 = *child peeks in bag*, 4 = *child touches bag but does not peek*, 5 = *child does not touch bag*; *ICCs* = .96, .95, and .98 at T1, T2, and T3).

Observational task: Rabbit and turtle. During the laboratory visits at T1, T2, and T3, children participated in an assessment designed to tap effortful control (Kochanska et al., 2000). A large mat was placed upon a table, which depicted a path (with 6 curves) leading through an outdoor setting. A toy barn was placed at the end of the mat, with the doors open. Using a toy figure of a same-gender child, the research assistant demonstrated how to move the figure down the path to reach the barn. During demonstration, the research assistant explained that the child figure "wanted to go home" and showed children how to move it along the path to the barn, instructing children (while pointing to the corresponding pictures on the mat), "We try not to step on these flowers; we are careful not to fall in the pond; we try to stay on the path and off of the grass." The research assistant modeled this procedure up to 3-4 times, using a hand-over-hand strategy with the child at times, until the child understood the task.

The behavioral assessment included 6 trials at T1 and T2, and 5 trials at T3. In the first two trials (at T1 and T2, and the first trial at T3), the child was instructed to take the figure and "help the boy/girl go home." For the next two trials, a toy bunny figure was introduced and described as being "very fast," and the child was instructed to "help the bunny go home very fast." For the final two trials, a toy turtle figure was introduced and described as being "very slow," and the child was instructed to "help the turtle go home very slowly." Each curve (i.e., curves 1-6) of the path was scored during each trial according to the child's ability to successfully negotiate the path on a 3-point scale (0 = *Child ignores this curve*; 1 = *Child has the figure above the mat or follows general curvature of the path*; 2 = *Child keeps the figure on the mat and stays within the lines of the path*), added to a baseline score of 1. Scores for each of the 5-6 trials were summed and added to a baseline score of 1 to create an overall score for the assessment, with higher scores reflecting greater levels of control (*ICC*s = .96, .96, and .93 at T1, T2, and T3).

Parental Speech

Observational task: Parental speech. Maternal speech was observed during free play session (three minutes) with their children at the laboratory assessments at T1 and

T2. During each 60-second interval, the extent (i.e., frequency, duration, intensity) of maternal vocalizations was rated on a 4-point scale (1 = *mother does not focalize during the episode* to 4 = *mother's vocalizations are frequent, lengthy, and/or somewhat intense*; *ICC*s = .81 and .85 at T1 and T2) and averaged across intervals. Maternal speech also was observed during free play at T3 but was dropped due to low inter-rater reliability.

Positive Parenting

Mothers reported their parenting practices, and maternal behaviors were observed during free play and teaching interactions (three minutes each) with their children during the laboratory assessments at T1, T2, and T3. During the free play session, mothers and children were given a basket of toys and encouraged to play "as they would at home." In the teaching task at T1, mothers were asked to teach their child how to put together a challenging wooden puzzle. At T2, mothers were given a picture of a Lego model and were asked to help their child build a copy. At T3, children and mothers were seated on opposite sides of a box containing a wooden puzzle. Children could not see the puzzle and placed their arms through sleeves to reach the puzzle. Mothers could see the puzzle and were instructed to "teach their child to complete the puzzle" (mothers were unable to touch the puzzle).

Adult-reported parenting practices. At T1 and T2, mothers completed three subscales from the Coping with Toddlers' Negative Emotions Scale (CTNES, Spinrad et al., 2007), and at T3, completed three analogous subscales from the Coping with Children's Negative Emotions Scale (CCNES, Eisenberg & Fabes, 1994). These measures assess parents' reported reactions to children's negative emotions during distressful situations, and parents report how likely they are to respond in each of a variety of ways to 12 hypothetical situations expected to elicit negative affect in toddlers (e.g., having a desired object taken away; getting an injection).

The three relevant subscales from each of these measures indicate positive, emotionally-supportive parental coping reactions to young children's negative affect. The expressive encouragement subscale consists of 12 items reflecting parental responses that validate children's emotions or encourage them to express their affect, such as "Tell my child it's okay to be upset." The emotion-focused subscale consists of 12 items reflecting parental strategies intended to help the child reduce their negative affect and feel better, such as "Soothe my child with a hug or a kiss." The problem-focused subscale consists of 12 items reflecting parental attempts to help the child solve the problem or cope with the stressor, such as "Help my child think of things to do that will make it less stressful." For each item (i.e., hypothetical situation), mothers rated the likelihood that they would respond in that way to the given situation on a 7-point scale (1= *very unlikely* to 7= *very likely*). Within each subscale, item responses were averaged to create a total subscale score. Cronbach's alphas for the expressive encouragement subscale were .93, .92, and .88; for the emotion-focused subscale were .76, .78, and .77; and for the problem-focused subscale were .82, .84, and .69, at T1, T2, and T3, respectively.

Observational tasks: Sensitivity. Maternal sensitivity was observed during the free play and teaching sessions at T1, T2, and T3. Sensitivity reflected maternal verbal and physical behaviors that were appropriately attentive and contingently responsive to the child's behaviors, emotions, and level of arousal. It included behaviors such as providing an appropriate level of stimulation and noticing and responding to the child's interests, needs, or bids for attention.

A lack of sensitivity was indicated when mothers were under-responsive to their children, missed their cues and signals, or failed to provide a developmentally-appropriate level and pace of stimulation. Sensitivity was assessed in 15-second intervals throughout the free play session and in 30-second intervals throughout the teaching task on a 4-point scale (1 = *no evidence of sensitivity,* 2 = *minimal sensitivity,* 3 = *moderate sensitivity—more than one instance or one prolonged instance, clear evidence that mother is more than minimally tuned into child,* 4 = *high sensitivity—mother is extremely aware of the child, contingently responsive to the child's interests and affect and had an appropriate level of response/stimulation*), and was averaged across all intervals (free play *ICC*s = .81, .86, and .68 and teaching task *ICC*s = .71, .83, and .61 at T1, T2, and T3, respectively).

Observational tasks: Warmth. Maternal warmth was observed during the free play and teaching sessions at T1, T2, and T3. Warmth reflected maternal verbal and physical behaviors and included displays of closeness or physical affection, friendliness, encouragement, and positive affect. The quality or tone of conversation also was considered. Warmth was assessed in 30-second intervals throughout the teaching task on a 5-point scale (1=*no evidence of warmth—the parent ignores the child, is not friendly or positive,* 2 = *minimal warmth—the parent displays little positive affect, does not initiate contact, and is not friendly or close to the child,* 3 = *moderate warmth—a little positive affect and slight display of friendliness,* 4 = *engaged with the child for much of the time and touched the child in a positive way,* 5 = *very engaged with the child, positive affect was predominant, and the mother was physically affectionate*), and was averaged across all intervals (*ICC*s = .66, .88, and .79 at T1, T2, and T3, respectively).

Observational tasks: Positive affect. Mothers' positive affect was rated during each 15-second interval of the free play session and during each 10-second interval of the teaching task. Positive affect was assessed according to facial affective displays and verbal emotional tone. Mothers' positive affect was rated on a 4-point scale (1 = *no positive affect,* 2 = *low intensity positive affect—slight or brief smile or uses positive* *tone,* 3 = *moderate intensity positive affect—clear or prolonged smiles or prolonged positive tone,* to 4 = *intense or prolonged positive affect—intense, prolonged smile or laughter*), and averaged across all intervals in the segment segment (free play *ICC*s = .90, .88, and .80 and teaching task *ICC*s = .73, .87, .83 at T1, T2, and T3).

Negative Parenting

Mothers reported their parenting practices, and maternal behaviors were observed during the three-minute free play and teaching interactions (described above) with their children during the laboratory assessments at T1, T2, and T3.

Adult-reported parenting practices. At T1 and T2, mothers completed two subscales from the Coping with Toddlers' Negative Emotions Scale (CTNES, Spinrad et al., 2007), and at T3, completed two analogous subscales from the Coping with Children's Negative Emotions Scale (CCNES, Eisenberg & Fabes, 1994), reporting their reactions to children's negative emotions during distressful situations.

The two relevant subscales from each of these measures indicate negative, punitive parental coping reactions to young children's negative affect. The minimizing reactions subscale consists of 12 items reflecting parental responses that minimize the situation or devalue children's distress, such as "Tell my child that s/he is making a big deal out of nothing." The punitive reactions subscale consists of 12 items reflecting parental strategies that are intended to penalize children or reduce parents' need to deal with their children's negative affect, such as "Tell my child that if s/he starts crying then we'll have to go home right away." For each item (i.e., hypothetical situation), mothers rated the likelihood that they would respond in that way to the given situation on a 7-point scale (1= *very unlikely* to 7= *very likely*). Within each subscale, item responses were averaged to create a total subscale score. Cronbach's alphas for the minimizing reactions subscale were .85, .85, and .77 and for the punitive reactions subscale were .81, .75, and .75, at T1, T2, and T3, respectively.

Observational tasks: Intrusiveness. Maternal intrusive control was observed during the free play and teaching sessions at T1, T2, and T3. Intrusive control reflected maternal verbal and physical behaviors that attempted to control children's actions or activities or imposed a maternal agenda rather than following the child's goals. It included behaviors such as physically manipulating the child or the child's actions on an object and failing to alter behavior that was clearly aversive to the child, such as interfering with the child's activity or focus or attention or interacting with an inappropriate (e.g., overstimulating) pace. Intrusiveness was assessed in 15-second intervals throughout the free play session and in 30-second intervals throughout the teaching task on a 4-point scale (1=*no intrusiveness,* 2 = *low intrusiveness—one instance,* 3 = *moderate intrusiveness—more than one instance of intrusive behavior or prolonged or intense intrusiveness,* 4=*high intrusiveness—mother is extremely intrusive or over-controlling*), and was averaged across all intervals (free play *ICC*s = .81, .83, and .69, and teaching task *ICC*s = .71, .83, and .62 at T1, T2, and T3, respectively).

Observational tasks: Negative affect. Mothers' negative affect was rated during each 15-second interval of the free play session. Negative affect was assessed according to facial affective displays and verbal emotional tone. Mothers' negative affect was rated on a 4-point scale (1 = *no evidence of negative affect*, 2 = *low intensity negative affect—mild, vague, or brief facial expression or tone,* 3 = *moderate intensity negative affect--prolonged facial expression or tone,* 4 = *intense negative affect—intense or prolonged facial expression or tone*), and averaged across all intervals in the segment (*ICC*s = .81, .83, and .69).

Socioeconomic Status (SES)

At T1, mothers reported on mothers' and fathers' educational levels and family income. The highest level of each parent's education was rated on a 7-point scale (1 = *grade school*; 2 = *some high* school; 3 = *high school graduate*; 4 = *some college or 2-year college*; 5 = *college graduate*; 6 = *Masters degree*; 7 = *Ph.D. or M. D.*). Annual family income also was reported on a 7-point scale (1 = <*$15,000*; 2 = *$15-30,000*; 3 = *$30-45,000*; 4 = *$45-60,000*; 5 = *$60-75,000*; 6 = *$75-100,000*; 7 = >*$100,000*). Mothers' and fathers' highest educational levels and annual family income level were significantly correlated, *r*s(215-219) = .52 to .62, *p*s < .001. These three variables were each standardized and then averaged to create an index of socioeconomic status (SES).

RESULTS

A series of statistical analyses was conducted to assess the relations among socioeconomic status (SES) and children's expressive vocabulary at 30 months of age, household chaos, children's effortful control (EC; adult-reported and observed), and parenting (self-reported and observed) at 30, 42, and 54 months, and children's language (assessed) at 54 months, both within and across time. The main study hypotheses predicted that household chaos would be negatively related to children's EC, parental speech, and supportive parenting, positively related to unsupportive parenting, and negatively related to children's language. Moreover, EC and dimensions of parenting were hypothesized to mediate the longitudinal relations between chaos and language. Additional hypotheses aimed to explore whether children's sex moderated the predicted relations, with the expectation that the pattern of relations may be stronger for boys than for girls.

Preliminary analyses were conducted prior to testing the main study hypotheses to examine the relations of the study variables to children's sex, children's race and ethnicity, family demographic characteristics, and the covariates (i.e., T1 SES and vocabulary). Next, within- and across-time correlations among the study variables were computed. Finally, the main study hypotheses were tested using structural equation modeling (SEM), path analyses, and regression analyses.

Data Reduction

In order to reduce the number of indicators for use in the models, composites were created from several of the reported and observed variables. In terms of reported measures, maternal reports of children's attentional shifting, attentional focusing, and inhibitory control were significantly correlated within time, *r*s(220; 205; 189) = .21 to .56, *p*s < .01, at T1, T2, and T3, respectively. Caregiver reports of these measures also were significantly correlated, *r*s(143; 149; 145) = .39 to .68, *p*s < .001, at T1, T2, and T3, respectively. Thus, scores for attentional shifting, attentional focusing, and inhibitory control were averaged within reporter at each time to create composites of effortful control. Moreover, mother- and caregiver-reported composites were significantly correlated, *r*s(148; 147; 145) = .18, .25, and .31, *p*s < .05, at T1, T2, and T3, respectively. Thus, these were averaged at each time to create composites of *adult-reported effortful control*.

In addition, composites were created for mothers' reports of parenting. Mothers' reports of their emotionally-supportive reactions to their children's negative emotions (i.e., expressive encouragement, emotion-focused reactions, and problem-focused reactions) were significantly correlated within time, *r*s(219; 192; 168) = .27 to .68, *p*s < .001, at T1, T2, and T3, respectively. Scores for these three scales were averaged at each time to create a composite of *maternal supportive reactions*. Mothers' reports of their unsupportive reactions (i.e., punitive reactions and minimizing reactions) also were significantly correlated, *r*s(219; 192; 168) = .52, .57, and .70, *p*s < .001, at T1, T2, and

T3, respectively. Scores on these two scales were averaged within time to form composites of *maternal unsupportive reactions.*

For the observed measures, the scores for observer-reported attention to tasks and persistence at tasks (on the Infant Behavior Record) were highly positively correlated within time, *rs*(216; 192; 168) = .91, .86, and .77, *ps* < .001, at T1, T2, and T3, respectively. Attention and persistence scores were averaged at each time into composites of *observer-rated effortful control*. Maternal sensitivity during free play and puzzle tasks was significantly correlated, *rs*(216; 192; 167) = .27, .29, and .31, *ps* < .001, at T1, T2, and T3, respectively, and averaged composites of *observed sensitivity* were created from these measures at each time point. Similarly, maternal positive affect was significantly correlated across these tasks, *rs*(216; 192; 168) = .39, .34, and .17, *ps* < .05, at T1, T2, and T3, respectively. Thus, composite scores of *observed positive affect* were computed by averaging these two measures within time.

Additionally, based on prior work (i.e., Johnson et al., 2008), two separate scales were computed for the CHAOS (dropping two items) that reflected 1) noise/confusion (7 items), and 2) disorganization (6 items). The two subscales were correlated with one another at each time (*r*s = .49, .35, and .48 at T1, T2, and T3, respectively). The noise subscale had adequate internal consistency at each age (Cronbach's alphas = .79, .81, and .77 at T1, T2, and T3), but the disorganization subscale did not (alphas = .71, .58, and .60 at T1, T2, and T3). Correlations between the noise subscale and the other study variables did not differ from those between the full CHAOS and study variables at any time point. Therefore, all analyses were conducted using the original (i.e., 15 item) CHAOS measure.

Attrition Analyses

A total of 183 families participated in all three data collection points. A series of analyses were conducted to compare families lost to attrition from the 18 month visit (not included in the following analyses) to T1 (*N* = 33), T1 to T2 (*N* = 25) and from T2 to T3 (*N* = 23) to those remaining in the study across those periods in order to determine any significant differences between these groups. These analyses compared families who remained to those lost to attrition on the demographic variables as well as the child and maternal variables used in this investigation.

Families who did not remain in the study from the 18 month laboratory visit to T1 of this study (i.e., at 30 months of age) differed from continuing families on several demographic measures. Families lost due to attrition were lower on family income (*M* = 3.44; 3 = between 30 and 45K; 4 = 45 to 60K), maternal education (*M* = 3.68; 3 = high school graduate; 4 = some college), and maternal and paternal age (*M*s = 26.6 and 28.7 years) than those who remained in the study (*M*s = 4.16, 4.36, 29.5, and 31.5), *t*s(226 - 245) = 1.98, 3.25, 2.80, and 2.68, *p*s < .05 for income, maternal education, maternal age, and paternal age, respectively. Attrited families also were more likely than remaining families to have more than one child, $\chi^2(1) = 4.78$, $p < .05$. No significant differences were found in any family demographic variables between families who did or did not remain in the study across the other time periods.

In terms of the specific variables examined in this investigation, there were several significant differences between families who discontinued participation from T2 to T3 (but not between families who attritted from T1 to T2). In attrited families, mothers were observed to be less sensitive, more intrusive during the free play task, and reported using fewer positive reactions to their children's negative emotions (*M*s = 2.90, 1.50, and 5.36) at the T2 assessment than mothers in remaining families (*M*s =3.11, 1.33, and 5.67), *t*s(190) = 2.27, -2.44, and 2.05, *p*s < .05, respectively. Moreover, observer ratings of children's effortful control and scores on the gift bag task during the laboratory visit at T2 were lower for children in families who subsequently attritted (*M* s= 3.04 and 2.38) than for those in families who remained at T3 (*M*s = 3.52 and 2.91), *t*s(190, 188) = 2.57 and 2.21, *p*s < .05. No other significant differences were found between mothers or children in attrited families and those in families who continued participation in the demographic, child, or maternal variables used in this investigation.

Preliminary Analyses

The means and standard deviations for the study variables and composites at each time point are presented in Table 2, for the full sample and for boys and girls separately. Because the maximum likelihood estimation method utilized in the CFA and SEM analyses assumes that variables are normally distributed (Enders, 2005; Olsson, Foss, & Trove, 2000), measures were examined with the criteria that skewness less than the absolute value of 2.00 and kurtosis less than the absolute value of 7.00 indicates normal distribution (Curran, West, & Finch, 1996). Maternal intrusiveness during the puzzle task was non-normal at T1 and T3, and maternal negative affect during both the free play and puzzle tasks demonstrated non-normality at all time points. According to the guidelines suggested by Tabachnick and Fidell (2007), logarithmic transformations were applied to these variables at all three time points in order to ensure equivalent variables for the longitudinal models, and initial and final skewness and kurtosis statistics are presented in Table 3. All variables that were initially non-normal remained skewed and kurtotic. Additionally, linear transformations (i.e., division of the original variable by 10) were applied to the child vocabulary and language (i.e., expressive and receptive) measures in order to ensure similar dispersion (i.e., variances less than 10) across variables for use within SEM (Muthén and Muthén, 2001). *Relations with Child Sex*

At each time point, at least three MANOVAs and two ANOVAs were conducted to examine mean-level sex differences in the major study variables. At T1, T2, and T2, three separate MANOVAs were computed for the following sets of variables: 1) children's EC (i.e., adult-reported EC, observed EC ratings, gift task scores, dinky toys scores, rabbit and turtle scores), 2) supportive parenting (i.e., sensitivity, positive affect, supportive reactions), and 3) unsupportive parenting (i.e., free play intrusiveness, puzzle intrusiveness, free play negative affect, puzzle negative affect, unsupportive reactions), and two ANOVAs were computed for CHAOS and maternal speech. At T3, a MANOVA also was computed for children's language (i.e., expressive and receptive language scores), and at T1 two additional ANOVAs were conducted for SES and children's vocabulary.

At T1, sex differences were found at the multivariate level for children's EC, $F(5, 193) = 2.57$, $p < .05$, supportive parenting, $F(3, 211) = 2.86$, $p < .05$, and unsupportive parenting, $F(5, 209) = 2.27$, $p < .05$. Univariate tests indicated that observers rated girls higher on effortful control, $F(1, 216) = 5.18$, $p < .05$, and that girls also had higher scores on the gift delay task, $F(1, 213) = 5.75$, $p < .05$. Mothers were observed to be more sensitive across parent-child tasks, $F(1, 215) = 5.99$, $p < .05$, and less intrusive during the free play task, $F(1, 215) = 7.41$, $p < .01$, with daughters versus sons. Additionally, girls scored higher on measures of vocabulary at T1, $F(1, 218) = 6.94$, $p < .01$. At T3, the MANOVA for children's language indicated sex differences, $F(1, 165) = 2.26$, $p < .05$, with univariate tests indicating higher scores for girls on expressive language, $F(1, 165) = 5.11$, $p < .05$.

Relations with Child Race and Ethnicity

A series of MANCOVAs and ANCOVAs was conducted to examine the relations between children's race and ethnicity and the study variables, with SES as a covariate. Because 83% of children were Caucasian, children's race was collapsed into a dichotomous variable of Caucasian versus all minority races. In terms of ethnicity, 23% of children were of Hispanic ethnicity and the remaining children were non-Hispanic. In examining the relations with children's race and ethnicity, the study variables were grouped in the same way as in the MANOVAs and ANOVAs for child sex. Families with non-Caucasian children had lower SES (M = -.57) than those with Caucasian children (M = .10), $F(1, 221) = 9.70$, $p < .01$. Additionally, families with Hispanic children had lower SES (M = -.37) than those with non-Hispanic children (M = .10), $F(1, 221) = 4.20$, $p < .05$.

Caucasian children had higher T1 vocabulary scores (M = 75.27) than children of other races (M = 58.68), $F(1, 210) = 11.75$, $p < .01$. Additionally, the MANCOVA for children's ethnicity and unsupportive parenting was significant at T1, $F(5, 202) = 3.97$, $p < .01$. Univariate tests indicated that Hispanic mothers reported using greater levels of unsupportive reactions to their children's negative emotions (M = 3.27) than did non-Hispanic mothers (M = 2.71), $F(1, 210) = 10.67$, $p < .01$. The MANCOVA for ethnicity and children's EC was marginally significant at T3, $F(5, 155) = 2.27$, $p = .05$. Hispanic children were rated higher on EC by observers (M = 3.99) than were non-Hispanic children (M = 3.82), $F(1, 161) = 3.96$, $p < .05$. Because racial and ethnic differences were few across the study variables did not differ for the main outcome of interest (i.e., children's language), these characteristics were not included in subsequent analyses.

Relations with Family Demographic Characteristics

Another set of analyses was conducted to examine the relations between the study variables and family demographic characteristics (i.e., maternal work status, parental marital status, and number of siblings). Maternal work status was reported by mothers at each time as working or not working. Maternal employment was unrelated to

SES, and a series of MANOVAs and ANOVAs (with the same variable groupings as for the analyses examining relations with child sex) did not reveal differences in any study variables that were related to whether mothers were working or not at each assessment point.

The majority (i.e., 83% at T1 and 80% at T2; not reported at T3) of parents were married, so at each time point parental marital status was collapsed into a dichotomous variable reflecting mothers who were married or cohabitating with a partner (i.e., *two-parent homes*) versus being single, divorced, separated, or widowed (i.e., *single-parent homes*). At T1, single-parent families had lower SES (M = -.87) than two-parent families (M = .09), $F(1, 221) = 27.79$, $p < .001$, and findings were similar at T2. Thus, a series of MANCOVAs and ANCOVAs (with the same variable groupings described above) with SES as a covariate were conducted to examine potential differences in the study variables for children from two- versus single-parent homes (for T3 study variables, relations were examined with the T2 two- versus single-parent home variable). No differences were found for any variables examined in this study.

Mothers also reported the number of siblings living in the home with their participating child at T1 (M = 1.01, SD = 1.19, range = 0 – 8), and relations with the study variables were examined with Pearson product moment correlations. Number of siblings was positively related to maternal reports of household chaos at T1 and T2, rs(218, 191) = .26 and .20, ps < .01, at T1 and T2, respectively, and negatively related to scores on the rabbit and turtle task at T2, $r(190) = -.16$, $p < .05$, and to observer ratings of EC at T3, $r(168) = -.16$, $p < .05$.

Because family demographic characteristics had few relations with the study variables, including the outcome variables (i.e., children's expressive and receptive language), they were not included in further analyses.

Relations with Covariates

Pearson product moment correlations were conducted within each time point to examine the relations of the hypothesized covariates (i.e., SES and children's vocabulary at T1) with the rest of the study variables and composites, and are presented in Table 4. The two covariates, SES and children's vocabulary at T1, were positively related to one another, $r(213) = .16$, $p < .05$.

SES was negatively related to mothers' reports of household chaos at T1 and T2. All measures of children's EC across all time points were positively related to SES, with the exception of adult reports at T1, scores on the dinky toys task at T1 and T3, and scores on the rabbit and turtle task at T3. SES was positively related to maternal sensitivity and warmth at all time points and to positive affect at T3, and was negatively related intrusiveness across tasks and times. SES also was negatively related to maternal reports of unsupportive reactions to their children's negative emotions at T1 and T2, but unrelated to reports of positive reactions and maternal speech. Maternal negative affect during free play and the puzzle tasks was negatively related to SES at T1 only. Finally, children from higher-SES families had greater expressive and receptive language at T3. All non-significant correlations were in the expected direction.

Children's T1 vocabulary had positive relations with adult reports and observer ratings of children's EC at all time points and to scores on the gift delay task at T1. At each time, T1 vocabulary was positively related to maternal sensitivity and also was positively related to maternal reports of supportive reactions and to maternal warmth at T3. A negative relation existed between vocabulary and maternal negative affect during the free play task at T2. As expected, there were positive relations between children's vocabulary and their expressive and receptive language scores at T3. Vocabulary was not significantly related to household chaos or to any of the other EC or parenting variables.

Relations among the Study Variables

In the following sections, the correlations among the study variables are reported and the relations within and among the constructs, both within and across time (i.e., from T1 to T2, from T1 to T3, and from T2 to T3), are summarized. Some variables were not retained for further analyses (i.e., structural equation models and regressions); however, relations among all of the examined study variables are reported in the tables and discussed below. In the first section, the relations of measures within each construct are summarized and the continuity (mean differences) and stability of these variables across time are reported. The next section summarizes the relations among measures of the major study constructs both within and across time. The within-time correlations are presented in Tables 5, 6, and 7, and the across-time correlations may be found in Tables 8, 9, and 10.

Relations within Constructs

Relations among the various indicators of each construct, as well as their stability and continuity, were examined within and across time. In the following sections, statistical testing for continuity in means is reported from T1 to T2 and then from T2 to T3, respectively.

Household Chaos

Mothers' reports represented the only indicator of household chaos. Reports of chaos were highly correlated across time (rs > .73) and demonstrated continuity, Fs(1, 187 and 1,165) = .55 and 2.29, ps = *ns.*

Children's Effortful Control

At T1, adult reports of EC were positively related to children's gift delay score, and at T2 were again related to these scores as well as to observer ratings of EC. At T3, adult reports were positively related to all measures of EC. Observer ratings, scores on the gift delay, and scores on the dinky toys task were all positively correlated with one another at each age. Scores on the rabbit and turtle task were only marginally (but positively) related to all other measures of EC at T1, but were positively related to all other EC measures at the later ages (with the exception of T3 gift delay scores). All EC measures exhibited stability across time. Children's EC generally increased across time, and particularly from T2 to T3. Levels of adult-reported EC, were similar from T1 to T2, $F(1, 201) = 2.97$, $p = ns$, but increased from T2 to T3, $F(1, 183) = 3.44$, $p < .001$. Similarly, differences were not found in observer ratings of EC from T1 to T2, $F(1, 188) = 1.10$, $p = ns$, but they also increased from T2 to T3, $F(1, 165) = 34.14$, $p < .001$. Scores on the gift delay increased across both periods, Fs(1, 185 and 1,162) = 9.23 and 54.55, ps $< .01$, whereas scores for the dinky toys tasks were similar from T1 to T2, $F(1, 186) = 3.65$, $p = ns$, but increased from T2 to T3, $F(1, 165) = 156.62$, $p < .001$. Finally, scores on the rabbit and turtle task increased from T1 to T2, $F(1, 179) = 676.41$, $p < .001$, but were similar across the next period, $F(1, 164) = 3.56$, $p = ns$.

Maternal Speech

Level of maternal speech was observed during free play sessions with their children at each time. Maternal speech was positively correlated across time, increased from T1 to T2, but then decreased across the next period, F(1, 188 and 1, 165) = 50.51 and 72.13, ps $< .001$.

Supportive and Unsupportive Parenting

Maternal sensitivity, warmth, and positive affect were positively correlated within each age. However, maternal reports of supportive reactions to their children's negative emotions were not significantly related to any of the other measures of supportive parenting, with the exception of positive affect at T3 (a positive relation). Measures of supportive parenting were stable over time. All of the observed supportive parenting measures exhibited a pattern in which there was a decline from T1 to T2, followed by an increase from T2 to T3. This pattern held true for maternal sensitivity, *F*s(1, 188 and 1, 165) = 53.86 and 246.88, *p*s < .001, maternal warmth, *F*s(1, 188 and 1, 164) = 218.62 and 66.60, *p*s < .001, and maternal positive affect, *F*s(1, 188 and 1, 165) = 20.79 and 42.18, *p*s < .001. Maternal reports of supportive reactions decreased from T1 to T2, $F(1, 188) = 15.86$, $p < .001$, and then remained similar, $F(1, 165) = .33$, *p* = *ns*.

Relations among the measures of unsupportive parenting (i.e., intrusiveness during free play and puzzle tasks, negative affect during free play and puzzle tasks, and maternal reports of unsupportive reactions to their children's negative emotions) were positive, but were less frequently significant than relations among measures of supportive parenting. Maternal intrusiveness was significantly related across the tasks at T1 only, and relations between negative affect across the tasks were significant only at T2 and T3. Intrusiveness and negative affect were positively related to one another only within tasks at T1, but generally within and across tasks at T2 and T3. Reports of unsupportive reactions were positively related to maternal intrusiveness during free play at T1 and T2, and to maternal negative affect during free play at T1 and during the puzzle task at T3. All measures were stable over time, with the exception of negative affect during the puzzle task from T2 to T3, and intrusiveness during this task from T2 to T3. In terms of continuity across time, maternal intrusiveness demonstrated a similar, but opposite, pattern as the observed measures of supportive parenting. There were increases in intrusiveness from T1 to T2, followed by decreases from T2 to T3, during both free play, *F*s(1, 188 and 1, 165) = 17.14 and 5.18, *p*s < .05, and the puzzle task, *F*s(1, 188 and 1, 164) = 9.18 and 30.23, *p*s < .001. Maternal negative affect during free play was not significantly different across the first two assessments, $F(1, 188) = .28$, $p = ns$, but declined at T3, $F(1, 165) = 11.73$, $p < .01$. During the puzzle task, levels of negative affect increased from T1 to T2, $F(1, 188) = 8.35$, $p < .01$, and then remained similar across the next period, $F(1, 164) = .01$, $p = ns$. It should be noted that mean levels for negative affect during both tasks were extremely low at all time points. Maternal reports of unsupportive reactions first increased and then decreased across time, Fs(1, 188 and 1, 165) = 25.29 and 121.96, ps < .001.

Because prior investigators often have combined measures of supportive and unsupportive parenting into one overall construct, within-time relations across these two types of measures also were examined. Maternal sensitivity and warmth were negatively related to every measure of unsupportive parenting at each age, with the exception of warmth during the puzzle task and intrusiveness during free play at T1. Maternal positive affect was negatively related to intrusiveness during the puzzle task at T2 and T3, but was unrelated to all other unsupportive parting measures. Maternal reports of supportive reactions were negatively related to reports of their supportive reactions at each age (although only marginal at T2), to negative affect during free play at T2, and to intrusiveness during free play at T3.

Children's Language

The main outcome measure of the study is children's language, which was assessed at T3. Children's scaled scores on expressive and receptive measures of language were significantly and positively correlated.

Summary of Relations within Constructs

To summarize, there was evidence of some consistency within the study constructs, particularly children's effortful control (with the exception of rabbit and turtle scores at T1). The majority of parenting measures also were related in the expected ways within construct, and there were many negative relations across measures of supportive versus unsupportive parenting. Although maternal reports of supportive and unsupportive reactions to children's negative emotions were negatively related to one another, they were generally unrelated to other measures of parenting within the same (i.e., supportive or unsupportive) construct.

Relations among Constructs

The correlations among measures across the constructs were examined both within and across time and are summarized according to the relations that were hypothesized for this study.

Chaos and Children's Language

Reports of household chaos at each age were negatively related to children's receptive language at T3. Although relations also were negative between chaos at each time and expressive language, they were they were of marginal significance (and non-significant within-time).

Chaos and Children's Effortful Control

At each age, reports of household chaos were negatively related to the adult-reported composite of children's EC. Chaos also had negative relations with gift delay scores at T2, but was unrelated to other observed measures of EC at any time. Across time, chaos and adult-reported EC maintained negative associations, but chaos was not related to any later observed measures of children's EC.

Children's Effortful Control and Language

Adult-reported EC and scores on the rabbit and turtle task at T1 were positively related to children's receptive language at T3. Observer ratings of EC and children's gift delay scores at the first time point also were positively related to their later expressive and receptive language. Significant positive relations were found between all measures of EC at T2 and T3 and both language assessments at T3 (although the within-time relation between rabbit and turtle scores and receptive language was only marginal).

Chaos and Maternal Speech

No significant (or even marginally significant) relations were found between household chaos and maternal speech, either within or across time.

Maternal Speech and Children's Language

Maternal speech observed at any age was unrelated to children's expressive or receptive language at T3.

Chaos and Supportive/Unsupportive Parenting

Within T1 and T2, maternal reports of household chaos and their supportive reactions to children's negative emotions were negatively associated, whereas positive relations were found between chaos and unsupportive reactions within each time point. Supportive and unsupportive reactions at T1 had similar relations to chaos at T2 and, for unsupportive reactions, at T3. Unsupportive reactions at T2 also were negatively related to chaos the following year. Within each age, household chaos was unrelated to observed measures of supportive parenting (i.e., maternal sensitivity, warmth, and positive affect). However, T1 and T2 chaos each were negatively related to maternal sensitivity and warmth at T3, and a similar association was found between T1 chaos and maternal positive affect at T3. Maternal negative affect during the puzzle task at T1 was positively related to chaos at that time and a year later, but no other significant relations were evident between observed measures of unsupportive parenting at T1 or T2 and reports of chaos at any age. At T3, maternal intrusiveness and negative affect during the puzzle task were generally positively related to prior and concurrent reports of chaos. However, these maternal variables were both positively skewed and kurtotic. Unexpectedly, maternal positive affect at T2 was positively related to chaos the next year.

Supportive/Unsupportive Parenting and Children's Language

Maternal sensitivity at all ages and maternal warmth at T1 and T2 were generally positively related to children's expressive and receptive language at T3. Maternal reports of supportive reactions and their observed positive affect were unrelated to children's language, with the exception of a positive within-time association between positive affect and receptive language. Maternal intrusiveness during free play and the puzzle task at T1 and T2 and during the latter task at T3 was negatively related to children's scores on the expressive and receptive language assessments. Earlier (i.e., T1 and T2) maternal reports of unsupportive reactions and observed negative affect during both tasks were negatively related to children's receptive language, whereas associations with expressive language were non-significant. Maternal negative affect during the puzzle task at T3 also had a negative relation with children's receptive language scores.

Supportive/Unsupportive Parenting and Children's Effortful Control

As reported in other published work examining this data, there were many expected relations between parenting and children's effortful control (Eisenberg et al., 2010; Spinrad et al., 2007). At T1, observed measures of maternal sensitivity, warmth, and intrusiveness were concurrently related in the expected directions (i.e., positive relations for sensitivity and warmth, negative relations for intrusiveness) to almost all measures of children's EC, with the exception of scores on the dinky toys task. A similar pattern was evident at T2, but these measures were now also related to dinky toys scores, although findings for relations with maternal behaviors during the puzzle task (i.e., warmth and intrusiveness) were less consistent than at T1. At T3, maternal sensitivity was positively related to concurrent adult-reported EC, observer-rated EC, and gift delay scores, and maternal intrusiveness during the puzzle task was negatively related to all measures of EC, whereas no relations were found for free play intrusiveness. Maternal positive affect was only related concurrently to dinky toys scores at T1 and T2. Negative affect during the puzzle tasks was negatively related within-time to observer ratings of EC and gift delay scores at T1 and to almost all measures of EC at T2 and T3. Similar findings were evident for negative affect during free play, but these relations were less consistent at each time point. Maternal reports of supportive reactions and adult-reported EC were positively related at T1, and reports of unsupportive reactions and adult-reported EC had negative associations at both T1 and T3. At T2, unsupportive reactions were negatively related to all measures of EC except dinky toys scores.

From T1 to T2, many relations were evident in the expected directions between maternal sensitivity and intrusiveness and later measures of EC. This pattern was found from T1 to T3 and from T2 to T3 as well, but fewer relations were significant (but all in the expected direction). Across all periods (i.e., T1 to T2, T1 to T3, and T2 to T3), there also were many significant relations between measures of EC and later maternal sensitivity and intrusiveness. Some bidirectional, negative relations were also found across time between maternal negative affect and measures of children's EC. Few significant relations existed between maternal positive affect or reports of supportive reactions and measures of children's EC across time (from maternal to child variables or vice versa). Unsupportive reactions at T1 were negatively related to most measures of EC at T2, but T2 unsupportive reactions only had a negative relation with adult-reported EC at T3, and this relation was bidirectional across these latter two time points.

Summary of Relations among Constructs

To summarize, some of the hypothesized relations among the constructs were evidenced by the pattern of correlations among the study variables, either within or across time. The majority of significant relations supported the EC mediational model rather than the parenting mediational model. Household chaos and children's language were, as expected, negatively related, but this held true only for receptive, but not expressive, language scores. Although children's language was related to measures of EC assessed concurrently and the year prior (and to two EC measures at T1), household chaos was only consistently related to adult-reported EC within or across time.

There was no evidence that household chaos and maternal speech were significantly related, within or across time. Moreover, maternal reports of chaos were generally related as expected within each time point to their reports of supportive and unsupportive reactions, but were not related to observed measures of supportive parenting. A few positive associations were evident between household chaos and maternal negative affect and T3 intrusiveness, but these variables are not normally distributed. On the other hand, mother-reported chaos at T1 and T2 were negatively related to several observed measures of supportive parenting at T3. Supportive and unsupportive measures of parenting were generally related in the expected directions to measures of children's EC, within and across time, although some bidirectional relations were indicated between EC and aspects of supportive parenting. Finally, across ages many positive associations were found between observations of maternal sensitivity and warmth and children's language, and negative relations were found between observed intrusiveness and language. Mother-reported unsupportive reactions were negatively related to later receptive (but not expressive) language scores.

Evaluation of Study Hypotheses

Each of the study hypotheses was initially tested using structural equation models. Because the results of these SEM analyses did not always fully support the study hypotheses, single-indicator models and hierarchical regression analyses were used to further explore the relations among the study constructs. Lack of fit in some of the hypothesized models was likely due to a combination of factors, including the modest sample size relative to the complexity of the models, the small (or single) number of indicators for some constructs, and the high stability in several of the constructs or indicators across time. In the following sections, results are presented according to hypothesis, with each section including all analyses (i.e., latent construct models, single-indicator models, regressions) conducted for the various models attempted for the given hypothesis.

Structural Equation Modeling

Structural equation modeling (SEM) and path analyses were used to test the unique longitudinal relations among SES, children's vocabulary, household chaos, children's effortful control, parenting, and children's language in a number of hypothesized models. Because maternal speech was not significantly related to the predictor or outcome of interest (i.e., household chaos and children's language) at any age, this variable was not included in the following analyses. Moreover, due to extremely low frequency and variability in this sample, three additional parenting variables (i.e., negative affect during free play, negative affect during the puzzle task, and intrusiveness during the puzzle task) were not retained for analyses.

Model-testing. Mplus 6.11 (Muthén and Muthén, 1998-2011) was used for model-testing because it uses a maximum likelihood estimation procedure to account for missing data. Model-testing was conducted in several steps. For each hypothesized model, both *unconstrained* and *constrained* measurement models were examined initially. In the unconstrained models, all loadings were estimated and free to vary (i.e., within measure) across time points. In the constrained models, loadings for the same measures were constrained to be equal across time, in order to assess longitudinal invariance in the factors (Bijleveld & van der Kamp, 1998; Bollen, 1989). Some loadings were then freed for estimation if this resulted in significant fit improvement. A χ^2-difference test was used to compare the fit of each set of unconstrained and constrained (or partially-constrained) measurement models, and when significant, the model with the lower χ^2 value was retained for use in the SEMs (Bijleveld & van der Kamp, 1998). When the fit was not significantly different, the more parsimonious model (i.e., with more constraints on the parameters estimated) was retained.

As described in later sections, when SEM analyses resulted in poor fit (likely due to our relatively small sample size), composites were created from the indicators for the latent factors and path analyses were conducted to test the study hypotheses. In all SEM and path models, only the within-time correlations among the constructs and the hypothesized structural paths among the constructs were estimated initially. Next, the autoregressive paths (i.e., paths from a construct to the corresponding construct at the subsequent time point) between the measures across time were added and the model was re-estimated in order to account for stability in the measurements. Because the pattern of results generally did not differ depending on whether autoregressive paths were included or not, the results reported below reflect the full model with all paths specified (i.e., structural and autoregressive paths) unless otherwise noted.

For all of the CFAs, SEM, and path analyses, model fit was assessed with the chi-square statistic (χ^2), comparative fit index (CFI), root mean square of approximation (RMSEA), and standardized root mean square residual (SRMR). Nonsignificant chi-square statistics, CFIs greater than .95, RMSEAs less than .06, and SRMRs less than .05 indicate adequate model fit; however, the chi-square statistic was not considered a primary fit indicator due to its sensitivity to sample size (Byrne, 2012; Hu & Bentler, 1999). If model fit was inadequate and modification indices suggested fit improvement according to the χ^2-difference test, measurement errors of the study variables were allowed to covary within reporter (within time) and across time (within measure), and were added to the initial models individually (see Sörbom, 1979). Additionally, measurement errors for the single indicators (i.e., chaos, SES, vocabulary, and language scores) were fixed initially. The measurement error for chaos was fixed as (1-alpha)*(variance), where alpha was the reliability for the measure at each age (Jöreskog & Sörbom, 1982). Because SES, vocabulary, and language scores did not have reliability estimates, measurement error for these manifest variables was assumed to be zero and was fixed at this value in initial models.

Missing data. Data are considered missing completely at random (MCAR) when the likelihood of missing data for a variable is not related to the values of that variable or to other measured variables in the data set—data is missing in a "purely haphazard" pattern (see Enders, 2010). More commonly, data for a variable may be missing at random (MAR) when the pattern of missingness is systematically related to other measured variables, but not to values of the variable itself (e.g., outcome data on a variable is missing for those initially "screened out" on the basis of another variable). Data that are missing not at random (MNAR) refers to a pattern in which values of the given variable relate to the probability of missingness, after controlling for other variables (e.g., outcome data on a variable is missing for those who would have scored in a particular range for this variable), and Allison (2002) notes that this is a rare situation. The default procedure for estimating missing data in Mplus is the full estimation maximum likelihood (FIML) procedure, which is appropriate when data are assumed to be MCAR or MAR (Schafer & Graham, 2002).

Mediation. Some hypothesized models included mediational factors (i.e., EC and/or parenting) thought to explain or partially explain the longitudinal effects of household chaos on children's language. Bootstrap methods are recommended for testing mediation (i.e., the strength of the indirect effect) in samples less than 400 (McCartney, Burchinal, & Bub, 2006). In this approach, a bias-corrected bootstrap procedure is run with at least 1000 draws (i.e., sampling with replacement from the original data). For each draw, the product of 1) the effect of the predictor on the mediator (i.e., the unstandardized path coefficient), and 2) the effect of the mediator on the outcome is calculated. A confidence interval (i.e., 95%) is estimated from the distribution of these product terms, and if this CI does not include the value zero, this supports that there is significant mediation.

Moderation. For each final model, a series of Box's *M* analyses were conducted to examine whether the hypothesized relations among the constructs differed for boys versus girls. Box's *M* assesses whether there is equivalence in the variance-covariance matrices of different groups (Winer, 1971). For models in which significant differences were found, moderation was assessed using multiple-group modeling in SEM. Fully constrained models (i.e., correlations, autoregressive paths, and structural paths constrained equal for boys and girls) were estimated initially. Next, models with separately estimated structural paths for boys and girls (but correlations and autoregressive paths constrained equal) were specified. The fit of the fully- and partially-constrained models were compared with a χ^2-difference test, with a significant χ^2 indicating sex differences in the overall model.

Research Question 1: Does Environmental Chaos Predict Children's Language?

Model 1

Measurement model. An unconstrained CFA was estimated that included five single indicators (SES and children's vocabulary at T1 and reports of household chaos at T1, T2, and T3) and one latent construct (children's language at T3; indicators: expressive language score and receptive language score). Measurement errors for SES, vocabulary, expressive language, and receptive language were set to zero, and measurement errors for chaos were set to the adjusted reliability at each time point [(1-alpha)*variance]. The model would not converge, so the measurement errors for SES, vocabulary, and language were released to be freely estimated. In the subsequent model, the standard errors for the model parameters could not be estimated. Measurement errors for the chaos variables were also released, but standard errors still could not be estimated for this model.

Because this model contained only one, two-indicator latent construct and five single indicators (three of which were highly correlated), it was not surprising that the model could not be estimated. In general, two indicators with uncorrelated errors per latent construct are required in order to ensure measurement model identification (Kline, 2011). It is likely that measurement errors were correlated for expressive and receptive language due to shared method variance. Thus, a path model approach was taken.

Path analysis. A composite of children's language (i.e., expressive and receptive) was created for use in path models. Because measurement models that contain only one latent construct (and no other variables) require three indicators with uncorrelated errors (Kline, 2011), a CFA could not be estimated with language as the latent construct. Thus, a weighted-score composite (i.e., based on factor loadings of the indicators) could not be computed. Instead, a composite was created by averaging children's expressive and receptive language scores, which were positively correlated (r = .46). Using this composite, a path analysis was conducted with six single indicators (i.e., T1 SES, T1 vocabulary, T1, T2, and T3 chaos, and T3 language). The model included autoregressive paths for chaos and structural paths from a) T1 SES to chaos at T2, b) T1 vocabulary to T3 language, and 3) T2 chaos to T3 language.

Based on the pattern of results of the prior CFA and SEM analyses, no measurement errors (i.e., for SES, vocabulary, or chaos) were fixed in this model. The initial model did not fit the data, so residual variances among chaos measures were allowed to covary (i.e., T1 with T2; T1 with T3), based on modification indices. Model fit was still poor, and further inspection of the modification indices suggested a direct path from SES to language. With the addition of this path, the model fit the data: $\chi^2(3) = .94$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .07); SRMR = .01. All hypothesized paths were significant and in the expected direction, with the exception of the path from SES to T2 chaos, although these constructs were positively correlated within T1. This path had been significant and negative in the model that did not include autoregressive paths, but was no longer significant after controlling for stability in chaos. T2 chaos negatively predicted language a year later, even after controlling for earlier vocabulary. SES and vocabulary at T1 were positive predictors of later language. The model is presented in Figure 10 and a summary of results can be found in Table 12.

Research Question 2: Does Children's Effortful Control Mediate the Relations between Chaos and Language?

Model 2a: Combined Reported and Multiple Observed Indicators of EC

Measurement model. An unconstrained CFA was estimated that included six single variables (SES and children's vocabulary at T1, reports of household chaos at T1, T2, and T3, and the composite score for children's language at T3) and three latent constructs (children's effortful control at T1, T2, and T3; indicators: adult-reported EC, observer-rated EC, gift delay score, dinky toys score, and rabbit and turtle task score). Similar to the previously-estimated measurement model, this model would not converge when the measurement errors for SES, vocabulary, and chaos were fixed. With these measurement errors released for estimation, the model converged without errors but the fit was poor. Based on modification indices, the residual variances for chaos were allowed to covary (i.e., T1 with T2; T1 with T3; T2 with T3), as were those for adult-reported EC (i.e., T1 with T2; T1 with T3; T2 with T3). Residual variances also were allowed to covary for observer-rated EC (i.e., T1 with T2; T2 with T3) and gift delay scores (i.e., T2 with T3). Although all loadings were positive and significant (*p*s < .01), model fit remained inadequate: $\chi^2(183) = 374.89$, $p < .001$; CFI = .84; RMSEA = .07 (90% CI = .06 - .08); SRMR = 0.13.

In an attempt to improve model fit, another CFA was estimated that constrained the loadings across time within each measure. After adding measurement error covariances suggested by the modification indices (i.e., the same as in the unconstrained model), the fit was worse than in the previous measurement model. Individual constraints on factor loadings were released successively, based on inspection of the loadings across time in the unconstrained model. The resulting partially-constrained model (i.e., constraining equal the loadings of T1 and T2 adult-reported EC and the loadings of T1 and T2 gift delay scores, within measure) did not differ significantly in fit from the unconstrained model [$\Delta\chi^2(2) = 2.54$, $p = ns$]; however, despite positive and significant factor loadings for all indicators, model fit was still poor, $\chi^2(185) = 377.43$, $p < .001$; CFI = .84; RMSEA = .07 (90% CI = .06 - .08); SRMR = 0.13.

Because of the number of single indicators in the full model (three of which were highly correlated) and resulting problems in achieving adequate fit, an unconstrained CFA was next estimated that included only the three latent constructs (i.e., EC at T1, T2, and T3; indicators: adult-reported EC, observer-rated EC, gift delay score, dinky toys score, rabbit and turtle score). The initial model did not fit, and residual variances were allowed to covary between measures of adult-reported EC, observer-rated EC, and gift delay scores, across the same time points noted in the prior measurement model. The final model fit the data: $\chi^2(81) = 84.21$, p = *ns*; CFI = 1.00; RMSEA = .01 (90% CI = .00 - .03); SRMR = 0.07. All loadings were positive and significant (ps < .01), with the exception of the loading for rabbit and turtle score at T3, which was positive and non-significant. A fully-constrained CFA was then estimated, and after adding the residual covariances suggested by the modification indices (i.e., the same as in the unconstrained model) the model did not fit the data well. Factor loading constraints were released individually based on the loadings obtained in the unconstrained model. After freeing the loading constraints for rabbit and turtle scores at T2 and adult-reported EC and gift delay scores at T3, the resulting partially-constrained model did not differ significantly in fit from the unconstrained model [$\Delta\chi^2(6) = 5.33$, p = *ns*] and fit the data: $\chi^2(87) = 89.54$, p = *ns*; CFI = 1.00; RMSEA = .01 (90% CI = .00 - .04); SRMR = 0.06. All loadings were positive and significant (ps < .001); the unstandardized and standardized loadings and R^2 statistics are presented in Table 12.

Structural equation model. A structural equation model was estimated next with six single indicators (i.e., T1 SES, T1 vocabulary, T1, T2, and T3 chaos, and T3 language) and three latent constructs (i.e., EC at T1, T2, and T3; indicators: adult-reported EC, observer-rated EC, gift delay score, dinky toys score, rabbit and turtle score). The model included autoregressive paths for chaos and EC and structural paths from a) T1 SES to chaos and EC at T2, b) T1 chaos to T2 EC, c) T1 vocabulary to T2 EC and T3 language, d) T2 chaos to EC and language at T3, and e) T2 EC to T3 language. Within-time correlations between the constructs were specified, and loadings for EC indicators were constrained across time based on the partially-constrained measurement model. The initial model did not fit the data and residual variances were allowed to covary based on modification indices. Specifications included covarying adult-reported EC (i.e., T1 with T2; T2 with T3; T1 with T3), chaos (i.e., T1 with T3), observer-rated EC (i.e., T2 with T3), and gift delay (i.e., T2 with T3). Model fit continued to be inadequate, and modification indices suggested a direct path from SES to language, which was added. The model fit the data: $\chi^2(171) = 223.87$, $p < .01$; CFI = .95; RMSEA = .04 (90% CI = .02 - .05); SRMR = .08. All loadings and autoregressive paths were positive and significant. Within T1, SES, EC, and vocabulary were all positively correlated with one another. SES had a negative correlation with chaos at T2. At T2, there was a negative correlation between chaos and EC. Language was negatively predicted by T2 chaos and positively predicted by T1 vocabulary and SES and T2 EC. However, all other hypothesized paths in the model were non-significant. Therefore, although greater language was additively predicted by lower chaos and higher EC at T2 (as well as being predicted by T1 SES and vocabulary), there was no evidence of mediation over time.

Path analysis. Relatively small sample size and a high degree of stability in constructs across time (i.e., chaos, EC) can be problematic for model estimation. In order to further test the hypothesized relations among the constructs, composite scores were created as a single indicator of EC at each age to be used in path analysis. In this and all of the following path analyses, the procedure for creating these composite scores was as follows. Linear transformations were applied to the EC indicators (at each time) to ensure that equivalent scales existed across all measures. A weighted score for each indicator was created by multiplying the score by the unstandardized weight from the measurement model (i.e., the CFAs including only the three latent EC constructs), including the factor loading constraints determined by the final CFA. Composite scores of effortful control were then computed by summing the weighted indicator scores and dividing by the sum of the weights. If data were missing, the composite was created by summing the weighted scores of valid data and dividing this by the sum of the valid weights.

For this path model, the unstandardized loadings from the partially-constrained measurement model were used in computing the weighted scores to create a composite score for EC, according to the procedure described above. A path analysis was conducted with nine single indicators (T1 SES, T1 vocabulary, chaos and EC at T1, T2, and T3, and T3 language). Within-time correlations between the constructs were specified and the model included autoregressive paths for chaos and EC and structural paths from a) T1 SES to chaos and EC at T2, b) T1 chaos to T2 EC, c) T1 vocabulary to T2 EC and T3 language, d) T2 chaos to EC and language at T3, and e) T2 EC to T3 language. The model did not fit the data, and residual variances were allowed to covary for chaos (i.e., T1 with T3). A direct path was indicated from SES to language, and this was added to the model. The model had acceptable fit: $\chi^2(12) = 10.34$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .06); SRMR = 0.02. All autoregressive paths were significant and positive. SES was not related to chaos at T2, although there was a negative correlation between these constructs within T1. Chaos did not predict EC across time at either age. However, SES positively predicted EC at T2, which in turn had a positive path to later language. Vocabulary at T1 positively predicted the language outcome, whereas language was negatively predicted by chaos at T2. Additionally, SES was positively correlated with EC and vocabulary within T1, chaos and EC had a negative relation within T2, and EC and language were positively correlated at T3 (see Figure 11). Similar to the SEM, the path model demonstrated prediction of children's language from lower chaos and higher EC at the prior time point. Moreover, in this model SES positively predicted children's EC from T1 to T2. The model is presented in Figure 11 and a summary of results can be found in Table 13.

Summary

Chaos and SES had additive effects on later language, even when controlling for earlier levels of vocabulary in children. SES also predicted EC at T2, controlling for stability in EC.

Model 2b: Reported EC and Gift Delay

Although the previous path model fit the data, chaos failed to predict EC across time. This was not surprising as there was only one significant within- or across-time correlation between chaos and any of the observed measures of EC (i.e., negative relation with gift delay at T1). An alternative model was attempted that included only adult-reported EC and gift delay as indicators of effortful control, in accordance with prior research with this sample at these ages (i.e., 30, 42, and 54 months; Spinrad et al., 2011).

Measurement model. An unconstrained CFA was estimated with the six single indicators from earlier models and three latent constructs (i.e., EC at T1, T2, and T3; indicators: adult-reported EC, gift delay score). The model converged but yielded an error warning regarding the EC latent construct at T2. Examination of the output revealed correlations greater than one between the EC constructs at T1 and T2 as well as between EC constructs at T1 and T3. Based on modification indices, residual variances were allowed to covary between chaos measures and between gift delay measures (i.e., T1 with T2; T1 with T3; T2 with T3, for each measure). These specifications resulted in estimation of the model with no errors; however, the model did not fit the data: $\chi^2(51) = 209.50$, $p < .001$; CFI = .80; RMSEA = .12 (90% CI = .10 - .13); SRMR = 0.16. A fully-constrained model resulted in a negative residual variance for adult-reported EC at

T2. Similar to prior models, releasing the loading for T3 gift delay was necessary and resolved this problem. However, although loadings were positive and significant (*p*s < .001), the model still did not fit the data: $\chi^2(53) = 215.99$, $p < .001$; CFI = .79; RMSEA = .11 (90% CI = .10 - .13); SRMR = 0.17.

Next, an unconstrained CFA was estimated with only three latent EC constructs (i.e., EC at T1, T2, and T3; indicators: adult-reported EC, gift delay score). The initial model did not fit the data. Residual variances for gift delay were allowed to covary (i.e., T1 with T2; and T2 with T3). This model fit the data: $\chi^2(4) = 7.32$, $p = ns$; CFI = .99; RMSEA = .06 (90% CI = .00 - .13); SRMR = 0.04. A second model was estimated that included constrained factor loadings across time. After freeing the loading for T3 gift delay, the partially-constrained model did not significantly decrease fit relative to the unconstrained model [$\chi^2(1) = 1.01$, $p = ns$], so the partially-constrained model was retained; model fit: $\chi^2(5) = 8.31$, $p = ns$; CFI = .99; RMSEA = .05 (90% CI = .00 - .12); SRMR = 0.05. Loadings were positive and significant (*p*s < .01); unstandardized and standardized loadings and R^2-statistics are presented in Table 14.

Structural equation model. A structural equation model was estimated with six single indicators (i.e., T1 SES, T1 vocabulary, T1, T2, and T3 chaos, and T3 language) and three latent constructs (i.e., EC at T1, T2, and T3; indicators: adult-reported EC, gift delay score). The model included autoregressive paths for chaos and EC and structural paths from a) T1 SES to chaos and EC at T2, b) T1 chaos to T2 EC, c) T1 vocabulary to T2 EC and T3 language, d) T2 chaos to EC and language at T3, and e) T2 EC to T3 language. Within-time correlations between the constructs were specified, and loadings for EC indicators were constrained across time based on the partially-constrained measurement model. The initial model did not fit the data and the residual variances for chaos (i.e., T1 with T2) and adult-reported EC (i.e., T1 with T2; T2 with T3; T1 with T3) were allowed to covary based on modification indices. Additional covariances were suggested by the modification indices, but each addition resulted in an error warning that the latent covariance matrix was not positive definite, and this error could not be resolved. Prior to obtaining this error, model fit was poor: $\chi^2(39) = 143.52$, $p < .001$; CFI = .86; RMSEA = .11 (90% CI = .09 - .13); SRMR = .08. Inspection of the output revealed correlations greater than one between T1 EC and the other EC constructs.

Path analysis: Because latent constructs with only two indicators can also pose problems for model estimation, a composite score was created for EC using the process described earlier. A path analysis was conducted with nine single indicators (T1 SES, T1 vocabulary, chaos and EC at T1, T2, and T3, and T3 language). The initial model specified within-time correlations and included the autoregressive and structural paths described above. Based on modification indices, one covariance was added for chaos (i.e., T1 with T3). The model fit the data: $\chi^2(12) = 11.66$, $p < .001$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .07); SRMR = 0.03.

The model results indicated that the path from T1 SES to T2 chaos was negative but non-significant, although SES positively predicted EC at T2. T1 chaos did not predict EC a year later after controlling for stability in the constructs (but was negative), but unlike the prior path model in which all observed measures of EC were included, there was a significant negative path from T2 chaos to T3 EC. Chaos at T2 also negatively predicted later language. T1 vocabulary and SES and T2 EC also predicted later language. In terms of concurrent relations among the constructs, chaos and EC were negatively related within T1 and (controlling for stability in the constructs) T2. SES was negatively related to chaos and positively related to EC within T1; moreover, EC and vocabulary were positively correlated within this time as well. Similarly, EC and language were positively related at T3. The model is presented in Figure 12 and a summary of results can be found in Table 15.

Summary

Chaos and EC (along with vocabulary and SES) had additive effects on children's language across the last year. Because chaos did not significantly predict EC from T1 to T2, after controlling for stability in EC, the hypothesis that EC mediated the effects of chaos on language across the three time points was not supported. However, the pattern of relations from T2 to T3 (i.e., chaos predicting EC and EC predicting language across this time) supports the possibility that mediational processes may be present at later ages.

Research Question 3: Does Parenting Mediate the Relations between Chaos and Language?

As noted earlier, maternal speech was not including in any of the CFA or SEM models because at all ages it was uncorrelated with either household chaos or children's language. Moreover, maternal negative affect during free play and the puzzle task, and maternal intrusiveness during the puzzle task were excluded from analyses due to non-normality.

Model 3

Measurement model. Because attempts to estimate a measurement model using the full set of constructs were unsuccessful in the previous model, a CFA was estimated that included only six latent constructs, including supportive parenting (i.e., at T1, T2, and T3; indicators: maternal sensitivity, maternal warmth, maternal positive affect, and supportive reactions), and unsupportive parenting (i.e., at T1, T2, and T3; indicators: maternal free play intrusiveness and unsupportive reactions). The initial model did not fit, and an error warning was obtained regarding unsupportive parenting at T2.

Examination of the output revealed that correlations greater than 1.0 existed between all unsupportive parenting constructs. Residual variances between a number of measures were allowed to covary, based on the modification indices. Specifically, covariances were estimated for supportive and unsupportive reactions and maternal positive affect (i.e., T1 with T2; T2 with T3; T1 with T2, within each measure). Model fit was inadequate: $\chi^2(111) = 233.46$, $p < .001$; CFI = .91; RMSEA = .07 (90% CI = .06 - .08); SRMR = 0.09. Problematic (> 1.0) correlations remained among the unsupportive parenting constructs, and there was a negative residual variance for maternal sensitivity at T1. Additionally, several factor loadings were non-significant, including supportive reactions at all time points and unsupportive reactions at T3.

In order to reduce the number of parameters in the measurement model, separate CFAs were estimated for supportive and unsupportive parenting. The initial measurement model for supportive parenting did not fit the data well. Residual variances were allowed to covary for supportive reactions, maternal positive affect, and maternal sensitivity (i.e., T1 with T2; T2 with T3; T1 with T2, within each measure). The model fit the data: $\chi^2(42) = 51.72$, $p = ns$; CFI = .99; RMSEA = .03 (90% CI = .00 - .06); SRMR = 0.07. However, the measure of supportive reactions failed to load significantly at T1 or T3 (although all loadings were positive). Thus, the CFA was re-estimated again without this measure, and covariances were added, based on modification indices, for maternal positive affect and sensitivity (i.e., T1 with T2; T2 with T3; T1 with T2, within each measure). The model fit the data: $\chi^2(18) = 29.53$, $p = ns$; CFI = .98; RMSEA = .05 (90% CI = .01 - .09); SRMR = 0.06.

A fully-constrained CFA was then estimated, which did not fit the data. The same covariances as in the previous model were suggested by the modification indices. After these covariances were specified, model fit was significantly worse than that of the unconstrained model, [$\chi^2(4) = 22.46$, $p < .001$]. After examining the pattern of loadings from the unconstrained model, the constraint on the loading for maternal sensitivity at T2 was released. Subsequently, the partially-constrained measurement model did not differ significantly from the unconstrained model, [$\chi^2(3) = 5.75$, $p = ns$], and the former was retained for further analyses. All loadings were positive and significant (*p*s < .001); unstandardized and standardized loadings and R^2-statistics are presented in Table 16.

The measurement model for unsupportive parenting did not fit the data well, and correlations greater than 1.0 among the three unsupportive parenting constructs across time were evident. Residual variances among maternal intrusiveness across all time points were allowed to covary, based on modification indices. All loadings were positive and significant, and the model fit the data: $\chi^2(3) = 5.42$, $p = ns$; CFI = .99; RMSEA = .06 (90% CI = .01 - .14); SRMR = 0.03. However, correlations among all three of the unsupportive parenting constructs remained greater than 1.0, which may have been due to the high stability in the measure of unsupportive reactions across time. Thus, the unsupportive parenting construct was dropped from further analyses.

Structural equation model. Because an adequate measurement model could not be estimated for unsupportive parenting, a structural equation model was estimated with only supportive parenting. The model included six single indicators (i.e., T1 SES, T1 vocabulary, T1, T2, and T3 chaos, and T3 language) and three latent constructs (i.e., supportive parenting at T1, T2, and T3; indicators: maternal sensitivity, maternal warmth, maternal positive affect). The model included autoregressive paths and structural paths from a) T1 SES to chaos and parenting at T2, b) T1 chaos to T2 parenting, c) T1 vocabulary to T3 language, d) T2 chaos to parenting and language at T3, and e) T2 parenting to T3 language. Within-time correlations between the constructs were specified, and loadings for parenting indicators were constrained across time based on the partially-constrained measurement model.

The initial model did not fit the data and, based on modification indices, the residual variances for chaos (i.e., T1 with T2; T1 with T3), and for maternal sensitivity and maternal positive affect (i.e., T1 with T2; T2 with T3; T1 with T3, within each measure) were allowed to covary based on modification indices. Additionally, a direct path was added from SES to language. The model fit the data: $\chi^2(70) = 107.46$, $p < .001$; CFI = .96; RMSEA = .05 (90% CI = .03 - .07); SRMR = .07. All autoregressive paths were positive and significant. The model results indicated that the path from T1 SES to T2 chaos was negative but non-significant, although SES positively predicted supportive parenting at T2. T1 chaos did not predict parenting a year later after controlling for stability in the constructs, but there was a significant negative path from T2 chaos to T3 parenting. Chaos at T2 also negatively predicted later language, and T1 vocabulary positively predicted language. There was no relation between supportive parenting at T2 and language the next year. In terms of concurrent relations among the constructs, SES was negatively related to chaos and positively related to parenting and vocabulary within T1; no other within-time correlations were significant. The model is presented in Figure 13 and a summary of results can be found in Table 17.

Path analysis. In order to further test the hypothesized relations among the constructs, a path analysis was conducted. Composites for supportive parenting were created by using the unstandardized indicator loadings from the partially-constrained measurement model to compute weighted scores, as described previously. A path model was estimated with nine single indicators (T1 SES, T1 vocabulary, chaos and parenting at T1, T2, and T3, and T3 language). The initial model contained within-time correlations, autoregressive paths, and structural paths from a) T1 SES to chaos and parenting at T2, b)

T1 chaos to T2 parenting, c) T2 chaos to parenting and language at T3, and d) T2 parenting to T3 language. Based on modification indices, the residual covariances for chaos were allowed to covary (i.e., T1 with T3) and a direct path was added from SES to language. The model fit the data: $\chi^2(13) = 27.32$, $p < .001$; CFI = .97; RMSEA = .07 (90% CI = .03 - .11); SRMR = 0.05.

The path model results reflected those obtained with the SEM analysis. SES positively predicted supportive parenting at T2, but did not predict chaos. T1 chaos did not predict parenting a year later after controlling for stability in the constructs, but at T2, negatively predicted T3 parenting as well as language. T1 vocabulary positively predicted language, but parenting did not. As in the SEM, SES was negatively related to chaos and positively related to parenting and vocabulary within T1; no other within-time correlations were significant. The model is presented in Figure 14 and Table 18 provides a summary of the results.

Summary

Both the SEM and path analyses for supportive parenting demonstrated that chaos predicted parenting from T2 to T3, after controlling for stability in the constructs, although it did not predict from T1 to the next year. However, chaos had a direct and negative effect on language but parenting was not a significant predictor. Thus, mediation of the effects of chaos on language by supportive parenting was not supported across either time period.

Research Question 4: Do the Associations between Parenting and EC Mediate the Relations between Chaos and Language?

Although the prior analyses did not provide direct evidence that either parenting or EC mediated the effects of chaos on language, it was of interest to test these constructs together in the same model to examine the unique relations of chaos, parenting and EC to children's language. Given the limited sample size and because similar findings emerged for both the SEM and path analyses for the parenting model, a path model approach (rather than SEM) was taken in order to reduce the complexity of the model.

Path analysis. Using the EC and supportive parenting composites created for earlier analyses, a path model was estimated with twelve single indicators (T1 SES, T1 vocabulary, chaos, parenting, and EC at T1, T2, and T3, and T3 language). Based on modification indices, a covariance was added for chaos (i.e., T1 with T3) and a direct path was added from SES to language. The model fit the data: $\chi^2(25) = 41.21$, $p < .001$; CFI = .98; RMSEA = .05 (90% CI = .02 - .08); SRMR = 0.05.

As in prior models, SES positively predicted supportive parenting, EC, and language. T1 chaos did not predict either parenting or EC a year later, after controlling for stability in the constructs. However, chaos at T2 negatively predicted parenting, EC, and language at T3. As in the separate EC and parenting models, T2 EC positively predicted later language but parenting had no association with language. Within T1, positive correlations were found between parenting and EC, EC and vocabulary, and SES and parenting, EC, and vocabulary. There was a negative correlation between SES and T1 language. At T2, EC was positively correlated with parenting and negatively correlated with chaos, and at T3, EC and language had a positive correlation. The model is presented in Figure 15 and a summary of results can be found in Table 19.

Summary

This model maintained the path results from previous analyses and failed to find support that parenting or EC mediate the effects of chaos on language from T1 to T3. The model did suggest, as in prior analyses, that EC, but not parenting, may be a mediating factor at later ages.

Research Question 5: What Is the Role of Child Sex in the Relations among Chaos, Parenting, Effortful Control, and Language?

Another goal of this study was to assess the role of child sex in the relations among the study constructs. Mean-level sex differences were found in several variables and it was of interest to determine whether including sex in the prior models would impact the pattern of relations among the main constructs. Moreover, based on trends in prior research, it also was hypothesized that the negative effects of chaos on language and EC may be stronger for boys and that parenting may be more adversely affected in mothers with sons rather than daughters.

Sex as a Covariate

All SEM and path models were estimated with and without children's sex as a covariate (i.e., when sex was included in the model as a covariate, paths were specified from sex to each of the model constructs; non-significant paths were then trimmed individually). There were no significant differences in the pattern of relations among the study constructs for any model depending on whether or not sex was a covariate in the model. Thus, the results presented above reflect those for the more parsimonious models (i.e, without sex as a covariate).

Sex as a Moderator

Model 1: Chaos and Language

A series of Box's *M* analyses was conducted to assess the equality of the variance-covariance matrix of the indicators in this model for boys versus girls. The Box's M for the full set of indicators in the model was significant, $M = 44.89$, $F(21, 89884) = 2.05$, $p < .01$. The covariance of children's vocabulary at T1 as well as chaos at T2 with their later language significantly differed for boys and girls, Box's *Ms* = 8.05 and 9.40, *F*s(3, 9115488), *p*s < .05. Moderation of the full model was tested using multiple group models. A fully-constrained model (i.e., correlations and all autoregressive and structural paths were constrained equal for boys and girls) was estimated first. This model fit the data: $\chi^2(18) = 20.97$, $p = ns$; CFI = .99; RMSEA = .04 (90% CI = .00 - .10); SRMR = 0.11. Next, a fully-unconstrained model was estimated (i.e., all correlations and paths were free to be estimated separately for boys and girls), which also fit the data: $\chi^2(8) = 13.86$, $p = ns$; CFI = .99; RMSEA = .08 (90% CI = .00 - .15); SRMR = 0.05. The difference between the fully- constrained and fully-unconstrained models was not significant, [$\Delta\chi^2(10) = 7.11$, $p = ns$], indicating that boys and girls did not differ in terms of this model.

Model 2a: Chaos, EC, and Language

In this model, EC was represented by six indicators (i.e., reported and observed). The Box's M analysis for the set of indicators in this model was significant, $M = 74.59$, $F(45, 78995) = 1.56$, $p < .05$. In addition to the sex differences described for Model 1, in this model the covariance of children's vocabulary at T1 and EC at T2 differed for boys and girls, $M = 8.07$, $F(3, 19028937) = 2.66$, $p < .05$. In multiple group models, the fully-constrained model fit the data: $\chi^2(47) = 38.75$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .04); SRMR = 0.09, as did the fully-unconstrained model: : $\chi^2(24) = 20.33$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .06); SRMR = 0.04. The models did not differ in fit, [$\Delta\chi^2(23) = 18.42$, $p = ns$]. Thus, moderation by sex was not supported for this model.

Model 2b: Chaos, EC, and Language

Adult-reported EC and gift delay were indicators of EC in this model. The Box's M analysis for the set of indicators in this model was significant, $M = 75.37$, $F(45, 80328) =$

1.57, $p < .01$. No sex differences in the covariation among constructs was found beyond those described above. In multiple group models, the fully-constrained model fit the data: $\chi^2(47) = 51.07$, $p = ns$; CFI = .99; RMSEA = .03 (90% CI = .00 - .07); SRMR = 0.10, as did the fully-unconstrained model: : $\chi^2(24) = 29.89$, $p = ns$; CFI = .99; RMSEA = .05 (90% CI = .00 - .09); SRMR = 0.04. The models did not differ in fit, [$\Delta\chi^2(23) = 21.18$, $p = ns$], indicating that sex was not a moderator in this model.

Model 3: Chaos, Supportive Parenting, and Language

A significant Box's M was obtained for the indicators in the SEM model (i.e., including the separate indicators for the latent parenting construct), $M = 173.35$, $F(120, 75214) = 1.30$, $p < .05$. In the fully-constrained model, paths, correlations, and factor loadings were initially constrained equal for boys and girls. The standard errors could not be estimated for this model. Attempts were made to estimate additional models with fewer constraints, without success.

Given that the SEM model included latent constructs and that sample size was necessarily split in order to examine sex differences, the less complex path model for chaos, parenting, and language was examined next. The Box's M analysis for the indicators in this model (i.e., including the parenting composite) was marginally significant, $M = 65.07$, $F(45, 79683) = 1.36$, $p < .10$. However, no sex differences were found in addition to those in Model 1. Using multiple group models, the fully-constrained model fit the data: $\chi^2(48) = 57.21$, $p = ns$; CFI = .98; RMSEA = .04 (90% CI = .00 - .08); SRMR = 0.16. The fully-unconstrained model also fit the data: $\chi^2(26) = 35.96$, $p = ns$; CFI = .98; RMSEA = .06 (90% CI = .00 - .10); SRMR = 0.05. As the difference between fully-constrained and fully-unconstrained models was non-significant, [$\Delta\chi^2(22) = 21.25$, $p = ns$], the pattern of relations among the constructs in this model did not differ for boys and girls.

Model 4: Chaos, Parenting, EC, and Language

The Box's M analysis for this model was not significant, $M = 100.83$, $F(78, 76604) = 1.19$, $p = ns$. Thus, moderation by sex was not tested.

Summary

No evidence was found that sex moderated the relations among the study constructs in any of the models tested.

Post-hoc Analyses

Post-hoc Research Question 1: Does Effortful Control Mediate the Effects of SES on Language?

Although the study hypothesis that children's effortful control would mediate the effects of household chaos on children's language failed to find support, the results of the path analysis suggested that EC may in fact mediate the effects of SES on language. In Model 2b there were significant and positive paths from SES at T1 to EC at T2, and from EC to later language (see Figure 12). Thus, it was of interest to test whether EC mediated the effect of SES on children's language. Mediation was tested in Mplus 6.11 using the bias-corrected bootstrapping method with 1000 draws. There was a significant indirect effect and the confidence interval did not include the value zero (95% CI = .004 - .06), indicating that EC played a mediating role in the prediction of children's language from SES.

Post-hoc Research Question 2: Does SES Moderate the Effects of Chaos on Children's Language, Effortful Control, or Supportive Parenting?

A series of hierarchical regression analyses was conducted to explore whether SES moderated the relations of household chaos to the mediating or outcome constructs in this study. In each regression, the control variables (described below for each model) were entered in the first step, chaos and SES were entered in the second step, and the interaction term for chaos and SES (i.e., the product of the centered variables) was entered in the final step. The composites of EC and parenting created for the path analyses were used in the following regression analyses.

Model 1. A regression analysis was conducted to examine whether SES moderated the effects of T2 chaos on language a year later. Child vocabulary was entered in the first step, chaos and SES were entered in the second step, and the interaction term was entered in the final step. The interaction term was not significant, indicating that the relation of chaos and language was similar across different levels of SES.

Model 2a. Model 2a included the EC composite created from all 6 reported and observed indicators (i.e., adult-reported EC, observer-rated EC, gift delay score, dinky toys score, rabbit & turtle score). Although chaos did not predict EC at T2 or T3 in this model, it was of interest to examine the potentially moderating role of SES across both time periods. Two sets of regression analyses were conducted, the first regressing T2 EC on T1 chaos, and the second regressing T3 EC on T2 chaos. Early EC (i.e., from the prior time point) was entered in the first step, chaos and SES were entered in the second step, and the interaction term was entered in the final step. There was no evidence of moderation by SES from T1 chaos to T2 EC, or from T2 chaos to T3 EC. Early EC was removed as a control variable in the regressions, with similar results.

Model 2b. The EC composite in Model 2b was created from adult-reported EC and the gift delay score, and in this model T2 chaos predicted later EC. The regression analyses examining moderation by SES were identical to those for Model 2a, as were the results of these analyses. SES did not moderate the relation of T1 chaos to T2 EC or the relation of T2 chaos to T3 EC, whether or not earlier levels of EC were controlled.

Model 3. As in the previous analyses, two sets of regression analyses were conducted to examine the role of SES in moderating the relation between chaos and later supportive parenting. Prior parenting was entered in the first step, chaos and SES were entered in the second step, and the interaction term was entered in the final step. The interaction term was not significant in the regression of T2 parenting on T1 chaos and SES (whether or not T1 parenting was entered as a control variable). However, a significant SES x T2 chaos interaction effect was obtained, $\beta = .22$, $p < .01$, F change (1, 157) = 1.69, $p < .001$, even when controlling for prior levels of parenting. Specifically, the negative effects of chaos on supportive parenting were evident only for mothers of low SES (slope = -.34, $p < .001$ for mothers of low SES; slopes = -.19 and .16, *p*s = *ns,* for mothers of medium and high SES, respectively; see Figure 16).

Post-hoc Research Question 3: Does Effortful Control Moderate the Effects of Chaos on Children's Language?

Model 2a. A regression analysis was conducted to examine whether children's EC (i.e., the 6-indicator composite) moderated the effects of T2 chaos on language the following year. Child vocabulary and SES were entered in the first step, T2 chaos and EC were entered in the second step, and the interaction term was entered in the final step. The interaction term was not a significant predictor, indicating that this measure of EC did not moderate the effects of chaos on language.

Model 2b. A second regression analysis was conducted to examine the moderating role of EC, as measured by the adult-reported/gift delay composite. Child vocabulary and SES were entered in the first step, T2 chaos and EC were entered in the second step, and the interaction term was entered in the final step. The T2 chaos x T2 EC interaction was significant, $\beta = .15$, $p < .05$, F change (1, 157) = 2.61, $p < .001$. Specifically, the negative effects of chaos on children's language were found only for children who also had low EC (slope = -3.42, $p < .01$ for children with low EC; slopes = -1.39 and .63, *p*s = *ns,* for children with medium and high EC, respectively; see Figure 17).

Summary of Analyses

Three types of analyses (i.e., structural equation modeling, single-indicator path modeling, and regression models) were used to evaluate the hypotheses of the current study. Overall, partial support was found for the main hypotheses. As expected, household chaos negatively predicted later language, even when taking into account a number of other relevant influences (i.e., early vocabulary, SES, effortful control). A key study goal was to assess whether children's EC or parenting mediated the relation of chaos with later language. In both SEM and single-indicator models, household chaos failed to predict either children's effortful control or supportive parenting from 30 to 42 months of age. Thus, mediation by EC or parenting across the study time period was not supported. However, significant prediction of EC and parenting was evident from 42 to 54 months of age, even when controlling for stability in these constructs. Higher levels of household chaos predicted lower EC and less supportive parenting across this latter time period. Post-hoc regression analyses indicated that the negative effect of chaos on parenting was true only for mothers of low SES, whereas parenting in mothers of medium or high SES was not significantly affected by chaos. Additionally, EC positively predicted language from 42 to 54 months of age, suggesting that it may play a mediating role at these later ages. Parenting did not predict later language, and in the multiple-mediation model, parenting was not found to predict EC across either time period. Sex differences were not evident the pattern of relations in any of the hypothesized models. In the SEM and path models, SES was determined to relate directly to children's language, and post-hoc analyses found that EC significantly mediated these effects. Other post-hoc analyses revealed that the negative effects of chaos on language from 42 to 54 months of age were moderated by effortful control, such that effects were evident only for children initially low in EC.

DISCUSSION

Only in recent decades have researchers turned their attention toward studying the relations between environmental chaos and children's outcomes. Early work in this area often focused on individual aspects of chaos, such as community-level noise or residential crowding. More recently, researchers have considered the impact of household chaos—a constellation of features including ambient noise, excessive traffic patterns, and disorganization of routines within the home—on children's development. Despite this growing interest in the effects of chaos on children and increasing emphasis on understanding factors that impact school readiness skills, rarely have investigators empirically examined the critical mechanisms that may underlie the relations between chaos and child outcomes—particularly, children's language abilities.

Drawing from a bioecological perspective and incorporating the fundamental elements of *process*, *person*, *context*, and *time*, the current investigation examined child and parenting processes hypothesized to explain the associations between chaos and children's language across early childhood, and considered the role of individual child characteristics in these relations. The elegance of the bioecological model is not only in its multi-component framework for understanding human development, but also that it can, in turn, illuminate numerous potential points for intervention. This study offers significant improvements upon prior research by utilizing multi-reporter, multi-method assessments and employing a longitudinal design to examine important mediational processes and moderating factors. The study findings extend the literature on environmental chaos and shed new light on the relations among household chaos, children's effortful control, parenting, and oral language skills across the early years of life. Specifically, the data reported in this study provide evidence that greater levels of household chaos predict not only poorer language skills, but also deficits in children's EC and less supportive parenting in low-income mothers over time, even when controlling for stability in these constructs. Importantly, findings also suggest that EC, although not parenting, may play a mediating role in the relations between household chaos, as well as SES, and children's early language abilities.

Chaos and Children's Language

Household chaos had concurrent and predictive relations with children's language. In correlational analyses, mother reports of chaos at each time point were negatively related to children's expressive (albeit marginally) and receptive language assessed in the laboratory at 54 months of age. In the longitudinal path model that accounted for other factors that had direct relations with language—including family SES and children's prior vocabulary size—chaos at 42 months had unique negative relations with later language. These findings are in concordance with the results of a number of other investigations that have demonstrated similar links between aspects of environmental chaos and poorer language, pre-literacy, and literacy skills in preschool and school-aged children (Evans & Maxwell, 1997; Haines et al., 2001; Maxwell & Evans, 2000; Pike et al., 2006).

The Mediating Role of Effortful Control

A key aim of the current study was to examine processes that might explain the fairly well-established relations, replicated in this investigation, between exposure to environmental chaos and poor language outcomes in children. One factor hypothesized to mediate these relations was children's effortful control. Effortful control (or other aspects of self-regulation) has seldom been empirically tested as a mediator between chaos and children's outcomes (see Hardaway et al., 2011, Haines et al., 2011, and Valiente et al., 2007 for exceptions), and this was the first study to examine the role of effortful control in the relations between chaos and language in young children.

In the longitudinal path models including the EC composite that reflected adult-reported EC and gift delay scores, household chaos at 42 months negatively predicted EC a year later, even when controlling for prior levels of EC. That is, children of mothers who rated the home environment as being more chaotic had lower EC than other children the following year. Multiple studies have shown that children experiencing environmental chaos have poorer attentional and regulatory skills (Dumas et al., 2005; Evans et al., 2005; Evans, Lepore et al., 1998), but this research has generally been correlational in design or has not accounted for the stability in constructs over time. Some researchers have speculated that the persistent and excessive stimulation associated with such contexts may lead individuals to adopt a coping strategy of "tuning out." Over time, this method may become overgeneralized as children develop rigidity rather than flexibility in shifting and allocating their attentional resources (Evans et al., 1991; Evans & Lepore, 1993; Evans & Maxwell, 1997). Moreover, the unpredictability that can characterize a disorganized, unstructured environment can undermine efforts at behavioral self-regulation as children experience difficulty in anticipating events and a lack of contingent and reciprocal responses to their actions (Grolnick & Farkas, 2002; Wahler & Dumas, 1989). The fact that a predictive relation was found in this study even when accounting for the influence of prior levels of EC lends further strength to the hypothesis that exposure to chaos related negatively to EC in young children.

Effortful control assessed concurrently and during the prior year was positively related to children's language abilities at 54 months, even when including other predictors of language in the models. In fact, in the correlational analyses almost every measure of EC, at every age, had positive relations with children's language scores. These findings are in concordance with a number of investigations demonstrating significant associations, often predictive, between aspects of self-regulation and young children's vocabulary, literacy, and math skills (Dunican, et al., 2007; McClelland et al., 2007; NICHD ECCRN, 2003; Ponitz et al., 2009).

Thus, across the last two waves of data, 42 month chaos negatively predicted EC at 54 months, and 42 month EC positively predicted language the following year. This pattern of relations suggests that EC may in fact play a mediating role in the relations between chaos and language across these ages. If chaotic environments impair children's capacity to flexibly and volitionally regulate their attention and behaviors, they may experience difficulty focusing and engaging with developmentally-facilitative stimuli and may miss critical opportunities for learning. Of particular relevance, if children indiscriminately "tune out" external stimuli this may also include speech, which may severely limit the amount of linguistic input they perceive and hinder their developing language skills.

It is important to note, however, that the data did not support mediation by EC across the three time points in the study. Although negative bivariate correlations existed between chaos and adult-reported EC within and across the 30 and 42 month assessments, this path did not emerge as significant in the model, even before controlling for the stability in EC. One reason for the lack of prediction across these earlier ages may be the timing of exposure to chaos. Although the measure of household chaos used in this study demonstrated high stability across time, it may be that there are particular developmental points at which its relations with effortful control are more pronounced. For example, as children enter the preschool years they often encounter more rules and greater expectations for compliant and socially-acceptable behavior, particularly if they are in an early educational environment. It may be that the difficulties in self-regulation associated with exposure to chaos become more evident to parents and caregivers across this time than during the toddler years. Alternatively, it is possible that the predictive relations between chaos and EC are apparent only at later ages due to a dosage effect. Exposure to chaos may have cumulative effects such that only with chronicity does it begin to have significant relations with children's regulatory abilities. Both of these explanations would parallel evidence that the timing and duration of exposure to poverty influences the strength of its relations with developmental outcomes (Bradley & Corwyn, 2002; Duncan & Brooks-Gunn, 1997; McLoyd, 1998).

It also should be acknowledged that chaos did not predict EC in the model using the composite created from all reported and observed indicators of EC. In the correlational analyses, chaos was consistently and negatively associated with adult-reports of children's EC but was generally unrelated to behavioral measures of EC. Although some research has failed to find consistency across reported and observed measures of temperament or cross-contextual relations among observed measures (Gaertner et al., 2008; Ruff, Lawson, Parrinello, & Weissberg, 1990), our assessments of effortful control (both reported and observed) were generally correlated with one another at 42 and 54 months, although fewer significant correlations were found (particularly between reported and observed measures) at the earliest time point. Despite this consistency, chaos may have had stronger relations with adult-reported EC because children's performance on laboratory assessments can be influenced by immediate and situational factors, whereas adult raters may have been able to provide a more cohesive assessment of children's EC by integrating patterns of their behaviors across time and situations. Moreover, the laboratory assessments of EC were conducted under relatively calm, quiet conditions. It is possible that for children exposed to chaos in the home, deficits in EC become more evident when examined in similar circumstances, and this may have been better captured by adult raters who are familiar with children's behavior in naturalistic contexts.

Mothers did report on both chaos and children's EC, which may raise concerns that shared reporter variance contributed to the links between these two constructs. However, the adult-reported EC composite was created with both mother and caregiver ratings, and caregivers were not necessarily the same individuals across time. Further, post-hoc examination of these ratings separately indicated that both mother and caregiver ratings of EC were significantly and negatively correlated with chaos within and across time, with only one exception (i.e., the correlation between T1 caregiver-reported EC and T3 chaos, which was negative but non-significant). This lends more confidence to the notion that greater levels of chaos within the home are indeed related to and predictive of lower EC (which did include both reported and observed indicators) and that this finding is not an artifact of shared reporter variance.

SES, Effortful Control, and Language

Although not initially hypothesized, results of the EC path model indicated that effortful control was a significant mediator of the relations between family SES and children's language across time, even though SES continued to have a direct relation with language. This finding emerged even when the relations among chaos, EC, and language were included in the model. SES was only modestly correlated with chaos at the first two assessments (and not correlated at T3), and both related uniquely to children's language score at 54 month. It is also interesting that SES was positively associated with EC at the first two assessments, but the relations between EC and chaos only were evident at the last two time points. Although this was not an impoverished sample, it is clear that there are factors related to financial hardship, even at relatively low levels, that relate to effortful control in very young children.

The fact that EC explained some of associations of SES with children's later language is similar to findings reported by Howse and colleagues (2003), who discovered that low-income kindergarteners (but not second graders) performed more poorly on a task requiring attentional regulation than their more affluent peers, which in turn was related to their lower achievement scores. This was true despite similar levels of school engagement and self-perceived competence across the children. With growing recognition of the importance of socioemotional competence and self-regulation for children's learning and school success (Blair, 2002; Eisenberg, Valiente, & Eggum, 2010), the findings of this study highlight the need to consider this a particularly critical focus for children who are economically disadvantaged.

Chaos and Parenting

Parenting was another factor hypothesized in this study to mediate the relations between household chaos and children's language. There is evidence that adults exposed to environmental chaos are less responsive and involved and more irritable and intrusive with their children (Corapci & Wachs, 2002; Evans et al., 1999; Matheny et al., 1995; Wachs & Camli, 1991). Moreover, a large body of literature attests to the importance of quality of parenting for young children's learning and cognitive outcomes (e.g., NICHD ECCRN, 1999; Tamis-LeMonda et al., 2004) and, specifically, language development (Keown et al., 2001; Lengua et al., 2007; Pungello et al., 2009). Thus, it was hypothesized that parents experiencing chaotic home environments may be impaired in their capacity to engage in the supportive parent-child interactions that foster learning and more likely to exhibit parenting behaviors that hinder cognitive and linguistic growth in children.

In the SEM and path models, greater levels of household chaos predicted less supportive parenting a year later, even after controlling for prior quality of parenting. Based on the findings of existing research, it is probable that exposure to chaotic conditions increases fatigue and social withdrawal and diminishes responsiveness, rendering parents less likely to exhibit displays of affection and warmth. Parents may also become less aware and attuned to their children's social cues (Evans et al., 2000) and therefore impaired in their ability to interact with them in a sensitive and contingent manner. Similar to the findings for EC, the prediction of parenting from chaos was only found from 42 to 54 months, and chaos was not significantly related to concurrent supportive parenting at any time point. Demands on parents may become greater as children begin navigate the preschool years with growing autonomy and competencies.

Exploring this finding further in post-hoc analyses, it was discovered that the relation between chaos and later parenting held true only for lower-income mothers. Thus, even in this generally low-risk sample, the financial hardships experienced by families at the lower end of the socioeconomic spectrum, when coupled with a greater level of chaos within the home, may have proven excessively burdensome and taxing for parents and compromised their parenting. Further, although the associations of psychosocial chaos (e.g., partner instability, residential changes, family trauma) and physical chaos within the home have rarely been examined (Ackerman & Brown, 2010), low-income families are more likely to experience a range of such psychosocial stressors and negative life events (Evans, 2004). Models of cumulative risk suggest that the greater the number of risk factors experienced, the greater the impact on human behavior and development (Gutman et al., 2003; Rutter, 1983; Sameroff et al., 1993). On the other hand, more affluent families are likely better able to provide material resources and enriching experiences to their children, and these types of things may offset exposure to chaos for children in these families.

It also may be the case that the nature and correlates of household chaos differ for families at varying levels of wealth. For example, it is possible that household chaos in high-SES families may be more likely characterized by the hustle and bustle of visitors or numerous “extracurricular” activities, whereas the chaotic home environments of low-income families may reflect unpredictable work schedules, variable childcare arrangements, or the distal effects of neighborhood noise or upheaval. Quite simply, it is possible that elements of “chaos” may be more self-imposed and self-controlled in higher-SES families and more externally-imposed and uncontrollable in disadvantaged families. If underlying differences such as these do exist, household chaos may be perceived as a more stressful and unmanageble experience for disadvantaged families, and this may explain why parenting in low-income mothers is particularly susceptible to chaotic conditions within the home.

It should be acknowledged that overall there were very few correlations between chaos and indicators of either supportive or unsupportive parenting, particularly the observed measures. The most consistent relations were found between chaos and mothers’ supportive and unsupportive reactions to their children’s negative emotions, but these were all assessed solely via maternal reports, which may have artificially inflated their true correlations. It is possible that other unmeasured variables, such as mothers’ perceptions of social support, may have attenuated the relations between chaos and parenting. The data for this study also did not allow for a solid assessment of the relations between chaos and unsupportive parenting behaviors, as most of our observational measures (i.e., maternal intrusiveness and negative affect) were very low in frequency. This may have been due to our predominantly middle-class, educated sample or it may reflect the nature of our laboratory tasks, which generally did not place high demands (which may have elicited more negative behaviors) on mothers in terms of interactions with their children.

Contrary to the study hypothesis, supportive parenting did not predict children's language and thus did not mediate the effects of chaos. Bivariate correlations indicated that several observed measures of parenting (both supportive and unsupportive) were related to later language in the expected ways, but in the longitudinal model parenting was not predictive after taking into account a number of other important factors relating to language (i.e., SES, chaos, and earlier vocabulary).

The Interaction of Chaos and EC in Predicting Language

Although a main research question of this study was to examine children's effortful control as a mediator of the effects of chaos on language, and this was supported by the data, it also was of interest to determine whether chaos and EC had interactive effects. From a bioecological perspective, person characteristics interact with contextual phenomena in affecting development. For example, gender, age, or temperamental predispositions may make an individual more vulnerable or better able to adapt to contextual risk. Conversely, these characteristics may render a child more or less able to take advantage of optimal environments. Researchers have found that self-regulation, and effortful control in particular, can moderate the impact of cumulative contextual risk (e.g., economic, parenting) on children's adjustment (Buckner, Mezzacappa, & Beardslee, 2003; Lengua, 2002; Lengua, Bush, Long, Kovacs, & Trancik, 2008).

Post-hoc regression analyses revealed that the prediction of language from household chaos at 42 months was moderated by children's effortful control. That is, chaos had a negative impact on later language only for children who initially (i.e., at 42 months) had the lowest levels of EC. Children who are skilled at regulating their attention, emotions, and behavior may be better able to filter the excessive stimulation often characterizing chaotic environments or to effectively manage their responses to these conditions. Put simply, high levels of effortful control may allow children to limit their own exposure to the elements of chaos deemed harmful for development and to respond flexibly and adaptively to these circumstances. At the same time, they may be better able to focus on and benefit from the learning opportunities afforded by the environment. On the other hand, chaos may exacerbate other children's poor ability to self-regulate, leaving them more vulnerable to such stressful contexts, and developmental outcomes may consequently suffer to a greater extent.

Maternal Speech

No relations were found within or across time between household chaos and maternal speech or between speech and children's language. This was surprising given prior research demonstrating that mothers experiencing sociocontextual risk (i.e., low SES) engage in less frequent and less complex speech with their young children (Evans et al., 1999; Hart & Risley, 1995) and that mothers in chaotic homes appear less verbally and physically responsive to their children (Bradley & Caldwell, 1984; Corapci & Wachs, 2002; Matheny et al., 1995; Wachs & Camli, 1991). Moreover, quantity and complexity of maternal speech has been linked with levels and growth in vocabulary and language skills in toddlers and preschoolers (Evans et al., 1999; Hoff, 2003; Hutenlocher et al., 1991; Naigles & Hoff-Ginsberg, 1998, Pan et al., 2005). Our measure of maternal speech was a 4-point rating based on a global assessment of parent vocalizations during each minute of the 3-minute free play session. More fine-grained measures of parental speech and more prolonged, cross-contextual assessments would provide a more accurate representation of children's linguistic input and may likely yield different findings.

The Role of Sex

Although based on limited research and thus somewhat exploratory, it had been hypothesized that the effects of chaos on children's EC and language and on parenting may be stronger for boys. As expected, mean level differences were found in early vocabulary, later language, and one measure of EC at 30 months, all favoring girls. However, including sex in the models as a covariate did not alter the pattern of relations among the main constructs of interest. Moreover, contrary to hypotheses, sex was not found to moderate the effects of chaos on EC, parenting, or language in any of the models tested. As noted, research demonstrating sex differences in outcomes associated with environmental chaos is limited and findings are not always consistent with regard to sex. It does not appear from the data examined in this study that boys, or parenting with sons, is more vulnerable to chaotic conditions. Alternatively, it may be that sex differences emerge at more extreme levels of exposure to chaos than were present in the current sample or captured by our measurement.

Parenting and Children's Effortful Control

It should be noted that although there were many positive correlations between measures of supportive parenting and children's EC, the path model including both of these constructs failed to provide evidence that parenting predicted EC over time, although within-time correlations were significant. This was surprising given the importance of parental socialization for children's emerging effortful control across the early childhood years (Kochanska et al., 2000). Prior research with this sample demonstrated that supportive parenting (i.e., a composite of maternal sensitivity and warmth, but not positive affect) at 30 months predicted children's EC (i.e., a composite of adult-reported EC and gift delay score, as in the current study) a year later, after controlling for stability in EC (Spinrad et al., 2011). However, other predictive factors in that model differed and this may be responsible for the lack of significant relations in the current study. In the present study, the effects of both earlier EC and SES were controlled, and these may be particularly powerful predictors of effortful control.

Language and EC

Although correlated within time, 30 month vocabulary did not predict EC a year later in any of the models. This pattern fails to support the notion that greater verbal skills may assist children in communicating and thus in regulating their emotions and behaviors. As described above, EC appears to play a causal role in the development of oral language skills, at least during the preschool years.

Study Strengths

The current study has multiple strengths that should be highlighted. Although the links between exposure to environmental chaos and deficits in children's language and other academic skills are robust, the mechanisms underlying these relations are not well understood. Little research has employed prospective longitudinal designs or multi-method data (e.g., reported and observed measures), and even fewer studies have examined mediating processes or moderating factors of chaos-outcome linkages. The current study focused on multiple processes thought to explain the relations between exposure to chaos and children's language, and considered the role of child characteristics that might impact these relations. The use of three-wave, autoregressive panel models allowed for stronger tests of mediation as well as analyses that revealed unique effects of each predictor after taking into account the stability in constructs over time.

Study Limitations

Despite considerable strengths, some limitations of the study must be acknowledged. Although multiple reporters and methods were utilized across the set of constructs, some constructs had only one measured indicator. Most notably, household chaos was assessed only by maternal report. The extent to which adult perceptions of chaos mirror children's "felt experience" of chaos is unclear. Thus, mothers' ratings on the CHAOS may not have provided a completely accurate representation of the level of environmental chaos to which children were actually exposed. Moreover, there are likely unmeasured individual differences that contributed to mothers' perceptions of the level of chaos within their homes. These maternal characteristics may have included aspects of personality, mental health, self-regulatory abilities, or tolerance for environmental stressors (e.g., noise or commotion). For example, Valiente and colleagues (2007) found that parents' ratings of their own effortful control were negatively related to their reports of chaos within the home. Combining parent ratings of chaos with more objectively-measured indices would strengthen the conclusions that can be drawn from such investigations. Additionally, the response scale for the CHAOS was dichotomous, and more fine-grained measures of household chaos may yield a greater likelihood of detecting effects.

Hardaway and colleagues (2011) suggested that the CHAOS scale assesses dimensions that may be either controllable (e.g., organization and routines) or uncontrollable (e.g., noise and crowding) by adults, and that a better understanding of the relations of chaos with parent and child outcomes may be achieved by examining these elements separately. On the other hand, combining aspects of environmental chaos into a single assessment, such as the CHAOS, may mask direct relations between particular variables (e.g., ambient noise, crowding) or types of chaos (e.g., psychosocial, physical) and specific developmental outcomes, as well the relative contributions of various variables to the experience of chaos within the home (Ackerman & Brown, 2010).

As noted, individual differences in parent characteristics were not examined in this study and these factors may have moderated the relations of chaos with aspects of parenting. There is obviously variation in the way that adults respond to stressors such as environmental chaos and how this in turn may be expressed through parenting behaviors. If chaos elicits irritability and fatigue, parents may be prompted to be more negative or punitive with their children. On the other hand, if chaos induces depressive symptoms, parents may withdraw from their children and become less sensitive and responsive. Other parents may have a higher tolerance for chaos and it may not be a particularly salient stressor for them. These differences in the ways that individuals cope with stressful environments may be responsible for the lack of significant associations between chaos and many of the parenting measures in the current study. Further, the indices of supportive parenting used in the final models were captured only during two brief tasks in a laboratory setting. Assessing a broader range of parenting behaviors and utilizing naturalistic observations may yield a different pattern of results.

The data for this study were drawn from a relatively small sample, given the complexity of the models. Thus, some hypothesized relations may not have emerged due to lack of power. The longitudinal design of the study was a considerable strength, but the number of families ($n = 38$) that attritted from the study across time reduced the already modest sample size, potentially making it even more difficult to detect significant effects. The current sample included mainly Caucasian, middle class, relatively educated families. Although cross-cultural research has demonstrated similar effects of environmental chaos on both adult and child outcomes across groups, replication of the findings in this study within more culturally and socioeconomically diverse families will increase their generalizability. Similarly, the study findings also cannot be generalized to other ages. Given the rapid development of self-regulatory skills during early childhood and the changing nature of parental socialization, the relations between EC and the other study constructs may not hold true for younger or older children.

Summary and Implications

Language development during early childhood can have far-reaching implications for children's future skills and school achievement. Across socioeconomic strata, children who develop a strong mastery of foundational language skills early in life are more likely to perform better in reading and other domains of academic achievement during the early and later schools years (NICHD ECCRN, 2002, 2005; Dickinson & Tabors, 2001; Walker et al., 1994; Whitehurst & Lonigan, 1998). Thus, the factors that influence language development prior to school entry are an important focus for researchers, educators, parents, and policymakers. Research has shown that environmental chaos is associated with negative socioemotional, behavioral, and cognitive outcomes in children. This study is the first to provide evidence that exposure to chaotic conditions within the home (as well as family economic risk) are predictive of lower effortful control and poorer oral language skills across time in preschoolers, and that the relations of chaos with language are particularly pronounced for children who already exhibit deficits in self-regulation. Although very limited research has demonstrated the mediating role of effortful control (or components of EC) in the relation between household chaos and children's behavioral problems, this is the first study to suggest that this process may also extend to language development. Moreover, this investigation demonstrated that greater levels of household chaos predict less supportive parenting—parenting that is lacking in sensitivity, warmth, and positive affect—in mothers of lower socioeconomic status. The fact that the pattern of findings in this study did not change across the models tested suggests that they are robust.

The negative relations of chaos with child characteristics and parenting were evident even in this fairly low-risk sample, and this underscores the need to address this phenomenon in the lives of all families. Of particular concern is the high stability of chaos across all of the early childhood years. Research illustrating the link between cumulative risk (including chaos) and elevated allostatic load (Evans, 2003; Evans et al., 2007) suggests that chronic exposure to household chaos may have important cumulative effects on physical, cognitive, and psychosocial functioning.

The findings of this study point to potential avenues for prevention or intervention work. First, efforts must be made to reduce the level of chaos in families' lives. Some aspects of environmental chaos, such as community-level noise or crowded home conditions, are simply not amenable to change in many situations. Thus, families should be assisted in creating less chaotic home environments. The factors that prevent parents from structuring the household effectively and the supports that they need in order to accomplish this may differ across families. Parents may benefit from education about the effects of aspects of household chaos and concrete tips and strategies for maintaining a calm and well-organized home. Other families may be more in need of economic relief, material resources, stable childcare or work schedules, or increased social support—all of which may reduce stress and allow them to manage the family home more effectively. Because chaotic conditions can emanate from multiple sources and be reflected in a range of forms, interventions should be tailored to the specific needs of each family. This of course requires that service providers and other professionals working with families and children be broadly knowledgeable about environmental chaos and its effects on individual and family functioning. It should also be recognized that families in the midst of chaos are likely less able to secure and utilize beneficial services without assistance.

Secondly, the findings from this study highlight the fact that programs aimed at improving children's school-readiness skills would benefit from a focus on self-regulation in addition to core academic proficiencies. Specifically, this study indicates that effortful control directly predicts children's oral language competencies, even when taking into account a number of other relevant factors. Thus, developing effective early interventions to promote children's regulatory abilities may be an important way to improve language skills and eventual academic achievement, particularly for children exposed to contextual risks.

Finally, mothers at lower income levels who perceived their households to be more chaotic exhibited less supportive parenting behaviors with their preschoolers. Exposure to multiple risks (e.g., financial hardships, chaos) may have particularly strong effects on parents' ability to interact with their children in a warm and sensitive manner. Alternatively, economic risk may cause parental stress or depression, which could interfere with their ability to maintain a calm, organized home as well as affecting their parenting. In either case, supports and services (such as those mentioned above) are necessary to help alleviate some of the adversities associated with economic risk and to bolster parents' coping resources and mental health.

Future Directions

A number of germane directions for future research on environmental chaos are broadly outlined below.

Measuring environmental chaos. Given the multi-faceted nature of environmental chaos, researchers should continue to develop and refine methods of assessment. There are both advantages and limitations to adult-reported and objective measures, to those that aggregate versus separate dimensions of chaos, and to those that assess chaos in naturalistic versus experimentally-induced contexts. Using a more comprehensive array of methods may establish additional validity as well as shed light on potential cumulative effects of various aspects of chaos. Moreover, careful consideration of the theoretical and empirical foundations of the specific research question under investigation should guide measurement—particularly when considering how different dimensions of chaos may relate to various outcomes—and should increase the likelihood of obtaining converging patterns of evidence across studies.

Efforts also should be made to more comprehensively assess children's actual exposure to chaos. For example, some children may experience multiple chaotic environments (e.g., at home and at childcare). Further, other situational factors may moderate children's exposure, such as whether or not they have a space to "escape" from chaotic conditions (e.g., a private bedroom; Wachs & Gruen, 1982).

Environmental and organismic specificity. The environmental specificity and organismic specificity hypotheses suggest that certain aspects of environmental experience impact various developmental outcomes differentially (Wachs, 1991), as well as that the effects of the environment are moderated by characteristics of the individual organism (Wachs, 1987). Regarding the field of environmental chaos, it is critical to better understand what aspects of chaos impact which developmental outcomes most profoundly, and which individuals are most strongly affected. Relatedly, it is unknown whether there are thresholds above which exposure to aspects of environmental chaos cannot be tolerated effectively and becomes detrimental, and if so, whether these thresholds differ across individuals. Additional investigations including multiple outcomes and examining moderating factors will help elucidate the answers to these questions. Moreover, consideration of potential moderators external to the child (e.g., quality of parenting or childcare) is also important in understanding how chaos affects children's development.

Mediating processes. Researchers should continue to examine potential mechanisms through which chaos impacts development, including additional aspects of parenting. Specific to this study, it also is possible that the links between chaos and language also are mediated by motivational factors. Several investigations have demonstrated that children exposed to environmental chaos exhibit learned helplessness and other markers of motivational deficits (Brown & Low, 2008; Evans et al., 2001; Maxwell & Evans, 2000; Wachs, 1987), and these could undermine learning and affect the development of language. Additional research is needed to examine this and other potentially mediating processes.

Correlates of chaos. Continuing efforts should be made to further examine the relations between environmental chaos and aspects of other contextual risks (e.g., poverty, community violence), family psychosocial chaos (e.g., family instability, relocation), parent characteristics (e.g., mental health, substance abuse), and child characteristics (e.g., dysregulation, medical complications). A fuller understanding is needed of which factors produce, covary with, or result from chaos in order to best inform policies and practices.

Chaos across contexts. With the expanding frequency of young children in childcare settings, the need to better consider quality of caregiving environments becomes crucial. Thus, the study of chaos should be more systematically extended to childcare contexts, as well as other institutions with which young children have regular or prolonged experience, such as hospitals and homeless shelters. Given that researchers have demonstrated a dosage effect for children exposed to multiple chaotic environments

(Maxwell, 1996), the implications of environmental chaos are staggering, considering the many microcontexts that children may experience in their daily lives.

Long-term implications. Clearly, longitudinal research is important for a number of reasons. Generally speaking, it is unknown whether the negative developmental consequences associated with environmental chaos are persistent, become amplified, or could be reversed if exposure to chaos was alleviated. It is also unclear whether more acute experiences of chaos (e.g., surrounding a relocation or birth of a new child) are less harmful to children as compared to sustained exposure to chaos throughout the early childhood years. It may be the case that some of the effects of chaos on children and parents are immediate, whereas others may develop with continued experience. Longitudinal work is necessary to address some of these issues and to allow for an examination of developmental trajectories over time.

Environmental chaos clearly is a field of study whose time has come. Overall, a more comprehensive understanding of chaos and how it is situated within the lives of individual families and children will drive more effective policymaking and methods of prevention and intervention. The present study makes a significant contribution to this growing knowledge.

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: An ecological perspective.* (pp. 35-47). Washington, DC, US: American Psychological Association. doi:10.1037/12057-003

Ackerman, B. P. B., Brown, E. D. E., D'Eramo, K. S. K., & Izard, C. E. C. (2002). Maternal relationship instability and the school behavior of children from disadvantaged families. *Developmental Psychology, 38*(5), 694-704.

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*(1), 258-268.

Aiello, J. R., Nicosia, G., & Thompson, D. E. (1979). Physiological, social, and behavioral consequences of crowding on children and adolescents. *Child Development, 50*(1), 195-202. doi:10.2307/1129056

Ainsworth, M. D. S., Blehar, M. C., Waters, E., & Wall, S. (1978). *Patterns of attachment: A psychological study of the strange situation.* Oxford, England: Lawrence Erlbaum.

Aksan, N., & Kochanska, G. (2004). Links between systems of inhibition from infancy to preschool years. *Child Development, 75*(5), 1477-1490. doi:10.1111/j.1467-8624.2004.00752.x

Alexander, K. L., & Entwisle, D. R. (1988). Achievement in the first 2 years of school: Patterns and processes. *Monographs of the Society for Research in Child Development, 53*(0037-976X, 0037-976X), i-139.

Alexander, K. L., Entwisle, D. R., & Dauber, S. L. (1993). First-grade classroom behavior: Its short- and long-term consequences for school performance. *Child Development, 64*(3), 801-814.

Allan, N. P., & Lonigan, C. J. (2011). Examining the dimensionality of effortful control in preschool children and its relation to academic and socioemotional indicators. *Developmental Psychology, 47*(4), 905-915.

Allison, P. D. (2002). *Missing data.* Thousand Oaks, CA: Sage.

Als, H. (1992). Individualized, family-focused developmental care for the very low birth weight preterm infant in the NICU. In Friedman, S.L., & Sigman, M.D. (Eds.), *Advances in applied developmental psychology. Vol 6: The psychological development of low-birthweight children.* Norwood, NJ: Ablex Publishing Co.

Ardila, A., Rosselli, M., Matute, E., & Inozemtseva, O. (2011). Gender differences in cognitive development. *Developmental Psychology, 47(4),* 984-990.

Arriaga, R. I., Fenson, L., Cronan, T., & Pethick, S. J. (1998). Scores on the MacArthur communicative development inventory of children from low- and middle-income families. *Applied Psycholinguistics, 19*(2), 209-223.

Arterberry, M. E., Midgett, C., Putnick, D. L., & Bornstein, M. H. (2007). Early attention and literacy experiences predict adaptive communication. *First Language, 27*(2), 175-189.

Asbury, K., Dunn, J. F., Pike, A., & Plomin, R. (2003). Nonshared environmental influences on individual differences in early behavioral development: A monozygotic twin differences study. *Child Development, 74*(3), 933-943. doi:10.1111/1467-8624.00577

Asbury, K., Dunn, J. F., & Plomin, R. (2006). Birthweight-discordance and differences in early parenting relate to monozygotic twin differences in behaviour problems and academic achievement at age 7. *Developmental Science, 9*(2), F22-F31. doi:10.1111/j.1467-7687.2006.00469.x

Asbury, K., Wachs, T. D., & Plomin, R. (2005). Environmental moderators of genetic influence on verbal and nonverbal abilities in early childhood. *Intelligence, 33*(6), 643-661. doi:10.1016/j.intell.2005.03.008

Attar, B. K., Guerra, N. G., & Tolan, P. H. (1994). Neighborhood disadvantage, stressful life events, and adjustment in urban elementary-school children. *Journal of Clinical Child Psychology, 23*(4), 391-400. doi:10.1207/s15374424jccp2304_5

Atzaba-Poria, N., & Pike, A. (2008). Correlates of parental differential treatment: Parental and contextual factors during middle childhood. *Child Development, 79*(1), 217-232. doi:10.1111/j.1467-8624.2007.01121.x

Barocas, R., Seifer, R., Sameroff, A. J., Andrews, T. A., Croft, R. T., & Ostrow, E. (1991). Social and interpersonal determinants of developmental risk. *Developmental Psychology, 27(3),* 479-488. doi:10.1037/0012-1649.27.3.479

Baum, A. & Paulus, P. B. (1987) Crowding. In D. Stokols & I. Altman (Eds.) *Handbook of Environmental Psychology*. New York: John Wiley & Sons.

Baumwell, L., Tamis-LeMonda, C. S., & Bornstein, M. H. (1997). Maternal verbal sensitivity and child language comprehension. *Infant Behavior and Development: An International and Interdisciplinary Journal, 20*(2), 247-258. doi:10.1016/S0163-6383(97)90026-6

Bayley, N. (1969). T*he Bayley Scales of Infant Development.* Training and Scoring Manual.

Beebe, B., Jaffe, J., & Lachmann, F. M. (1992). A dyadic systems view of communication. In N. J. Skolnick, & S. C. Warshaw (Eds.), *Relational views of psychoanalysis* (pp. 61-81). Hillsdale, NJ, England: Analytic Press, Inc.

Berko-Gleason & Ratner. (2009). ***The development of language*** (7th ed.)**.** Boston, MA: Allyn & Bacon.

Berlin, L. J., Brady-Smith, C., & Brooks-Gunn, J. (2002). Links between childbearing age and observed maternal behaviors with 14-month-olds in the early head start research and evaluation project. *Infant Mental Health Journal, 23(1-2),* 104-129. doi:10.1002/imhj.10007

Bierman, K. L., Nix, R. L., Greenberg, M. T., Blair, C., & Domitrovich, C. E. (2008). Executive functions and school readiness intervention: Impact, moderation, and mediation in the head start REDI program. *Development and Psychopathology, 20*(3), 821-843. doi:10.1017/S0954579408000394

Bijleveld, C. C., & van der Kamp, L. J. (1998). *Longitudinal data analysis: Designs, models, and methods.* London: Sage Publications.

Blair, C., & Razza, R. P. (2007). Relating effortful control, executive function, and false belief understanding to emerging math and literacy ability in kindergarten. *Child Development, 78*(2), 647-663.

Bloom, L., Lifter, K., & Broughton, J. (1985). The convergence of early cognition and language in the second year of life: Problems in conceptualization and measurement. In M. Barrett (Ed.), *Children's single-word speech* (pp. 149-180). London: John Wiley & Sons.

Bodrova, E., & Leong, D. J. (2006). Self-regulation as a key to school readiness: How early childhood teachers can promote this critical competency. In M. Zaslow, & I. Martinez-Beck (Eds.), *Critical issues in early childhood professional development* (pp. 203-224). Baltimore, MD, US: Paul H Brookes Publishing.

Bollen, K. A. (1989). *Structural equations with latent variables.* New York: Wiley.

Booth, A., & Edwards, J. N. (1976). Crowding and family relations. *American Sociological Review, 41*(2), 308-321.

Bornstein, M. H., Putnick, D. L., Heslington, M., Gini, M., Suwalsky, J. T. D., Venuti, P. et al., (2008). Mother-child emotional availability in ecological perspective: Three countries, two regions, two genders. *Developmental Psychology, 44*(3), 666-680. doi:10.1037/0012-1649.44.3.666

Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive control. *Psychological Review, 108*(3), 624-652. doi:10.1037/0033-295X.108.3.624

Bradley, R. H. (1999). The home environment. In S. L. Friedman, & T. D. Wachs (Eds.), *Measuring environment across the lifespan: Emerging methods and concepts* (pp. 31-58). Washington, DC, US: American Psychological Association. doi:10.1037/10317-002

Bradley, R. H. (2010). From home to day care: Chaos in the family/child-care mesosystem. In G. W. Evans, & T. D. Wachs (Eds.), *Chaos and its influence on* *children's development: An ecological perspective.* (pp. 135-153). Washington, DC, US: American Psychological Association. doi:10.1037/12057-009

Bradley, R. H., & Caldwell, B. M. (1984). The HOME inventory and family demographics. *Developmental Psychology, 20*(2), 315-320. doi:10.1037/0012-1649.20.2.315

Bradley, R. H., Caldwell, B. M., & Rock, S. L. (1988). Home environment and school performance: A ten-year follow-up and examination of three models of environmental action. *Child Development, 59*(4), 852-867. doi:10.2307/1130253

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology, 53*, 371-399.

Brady, S., Shankweiler, D., & Mann, V. (1983). Speech perception and memory coding in relation to reading ability. *Journal of Experimental Child Psychology, 35*(2), 345-367. doi:10.1016/0022-0965(83)90087-5

Britto, P. R., Fuligni, A. S., & Brooks-Gunn, J. (2002). Reading, rhymes, and routines: American parents and their young children. In N. Halfon, K. T. McLearn & M. A. Schuster (Eds.), *Child rearing in America: Challenges facing parents with young children* (pp. 117-145). New York, NY, US: Cambridge University Press. doi:10.1017/CBO9780511499753.005

Brocki, K. C., & Bohlin, G. (2004). Executive functions in children aged 6 to 13: A dimensional and developmental study. *Developmental Neuropsychology, 26*(2), 571-593. doi:10.1207/s15326942dn2602_3

Bronfenbrenner, U. (1999). Environments in developmental perspective: Theoretical and operational models. In S. L. Friedman, & T. D. Wachs (Eds.), *Measuring environment across the lifespan: Emerging methods and concepts* (pp. 3-28). Washington, DC, US: American Psychological Association. doi:10.1037/10317-001

Bronfenbrenner, U. (2005). Growing chaos in the lives of children, youth, and families: How can we turn it around? (2001). In U. Bronfenbrenner (Ed.), *Making human beings human: Bioecological perspectives on human development.* (pp. 185-197). Thousand Oaks, CA: Sage Publications Ltd.

Bronfenbrenner, U., & Ceci, S. J. (1994). Nature-nuture reconceptualized in developmental perspective: A bioecological model. *Psychological Review, 101*(4), 568-586. doi:10.1037/0033-295X.101.4.568

Brofenbrenner, U., & Evans, G. W. (2000). Developmental science in the 21st century: Emerging questions, theoretical models, research designs and empirical findings. *Social Development, 9*(1), 115-125. doi:10.1111/1467-9507.00114

Bronfenbrenner, U., & Morris, P. A. (1998). In Damon W., Lerner R. M. (Eds.), *The ecology of developmental processes.* Hoboken, NJ, US: John Wiley & Sons Inc.

Bronfenbrenner, U., & Morris, P. A. (1998). The ecology of developmental processes. In W. Damon, & R. M. Lerner (Eds.), *Handbook of child psychology: Volume 1: Theorectical models of human development (5th ed.).* (pp. 993-1028). Hoboken, NJ, US: John Wiley & Sons Inc.

Bronzaft, A. L. (1981). The effect of a noise abatement program on reading ability. *Journal of Environmental Psychology, 1*(3), 215-222. doi:10.1016/S0272-4944(81)80040-0

Buckner, J. C., Mezzacappa, E., & Beardslee,W. R. (2003). Characteristics of resilient youths living in poverty: The role of self-regulatory processes. Development and Psychopathology, 15, 139–162.

Burchinal, M., Roberts, J. E., Zeisel, S. A., Hennon, E. A., & Hooper, S. (2006). Social risk and protective child, parenting, and child care factors in early elementary school years. *Parenting: Science and Practice, 6*(1), 79-113. doi:10.1207/s15327922par0601_4

Byrne, B. M. (2012). *Structural equation modeling with Mplus: Basic concepts, applications, and programming.* New York: Routledge/Taylor & Francis Group.

Casey, P. H., Bradley, R. H., Nelson, J. Y., & Whaley, S. A. (1988). The clinical assessment of a child's social and physical environment during health visits. *Journal of Developmental and Behavioral Pediatrics, 9*(6), 333-338. doi:10.1097/00004703-198812000-00004

Cohen, S., Evans, G. W., Krantz, D. S., & Stokols, D. (1980). Physiological, motivational, and cognitive effects of aircraft noise on children: Moving from the laboratory to the field. *American Psychologist, 35*(3), 231-243. doi:10.1037/0003-066X.35.3.231

Cohen, S., Evans, G. W., Krantz, D. S., & Stokols, D. (1980). Physiological, motivational, and cognitive effects of aircraft noise on children: Moving from the laboratory to the field. *American Psychologist, 35*(3), 231-243. doi:10.1037/0003-066X.35.3.231

Cohen, S., Glass, D. C., & Singer, J. E. (1973). Apartment noise, auditory discrimination, and reading ability in children. *Journal of Experimental Social Psychology, 9*(5), 407-422. doi:10.1016/S0022-1031(73)80005-8

Coie, J. D., Watt, N. F., West, S. G., Hawkins, J. D., Asarnow, J. R., Markman, H. J., . . . Long, B. (1993). The science of prevention: A conceptual framework and some directions for a national research program. *American Psychologist, 48*(10), 1013-1022. doi:10.1037/0003-066X.48.10.1013

Coldwell, J., Pike, A., & Dunn, J. (2006). Household chaos--links with parenting and child behaviour. *Journal of Child Psychology and Psychiatry, 47*(11), 1116-1122. doi:10.1111/j.1469-7610.2006.01655.x

Cole, P. M. P., Michel, M. K. M., & Teti, L. O. L. (1994). The development of emotion regulation and dysregulation: A clinical perspective. *Monographs of the Society for Research in Child Development, 59*(2-3), 73-100.

Cole, P. M., Armstrong, L. M., & Pemberton, C. K. (2010). The role of language in the development of emotion regulation. In S. D. Calkins, & M. A. Bell (Eds.), (pp. 59-77). Washington, DC, US: American Psychological Association. doi:10.1037/12059-004

Collins, W. A., Maccoby, E. E., Steinberg, L., Hetherington, E. M., & Bornstein, M. H. (2000). Contemporary research on parenting. the case for nature and nurture. *American Psychologist, 55*(2), 218-232.

Compañ, E., Moreno, J., Ruiz, M. T., & Pascual, E. (2002). Doing things together: Adolescent health and family rituals. *Journal of Epidemiology & Community Health, 56*(2), 89-94. doi:10.1136/jech.56.2.89

Conger, R. D., Wallace, L. E., Sun, Y., Simons, R. L., McLoyd, V. C., & Brody, G. H. (2002). Economic pressure in african american families: A replication and extension of the family stress model. *Developmental Psychology, 38*(2), 179-193.

Cooper, D. H., & Farran, D. C. (1988). Behavioral risk factors in kindergarten. *Early Childhood Research Quarterly, 3*(1), 1-19.

Cooper, D. H., & Speece, D. L. (1988). A novel methodology for the study of children at risk for school failure. *Journal of Special Education, 22*(2), 186-198. doi:10.1177/002246698802200205

Coplan, R. J., Barber, A. M., & Lagace-Seguin, D. G. (1999). The role of child temperament as a predictor of early literacy and numeracy skills in preschoolers. *Early Childhood Research Quarterly, 14*(4), 537-553.

Corapci, F., & Wachs, T. D. (2002). Does parental mood or efficacy mediate the influence of environmental chaos upon parenting behavior? *Merrill-Palmer Quarterly, 48*(2), 182-201.

Curran, P. J., West, S. G., & Finch, J. F. (1996). The robustness of test statistics to non-normality and specification error in confirmatory factor analysis. *Psychological Methods, 1,* 16-29. doi: 10.1037/1082-989X.1.1.16

Dale, P. S., Dionne, G., Eley, T. C., & Plomin, R. (2000). Lexical and grammatical development: A behavioural genetic perspective. *Journal of Child Language, 27*(3), 619-642.

DeCasper, A. J., & Spence, M. J. (1986). Prenatal maternal speech influences newborns' perception of speech sounds. *Infant Behavior & Development, 9*(2), 133-150. doi:10.1016/0163-6383(86)90025-1

Diamond, A., Barnett, W. S., Thomas, J., & Munro, S. (2007). Preschool program improves cognitive control. *Science, 318*(5855), 1387-1388. doi:10.1126/science.1151148

Dickinson, D. K., Golinkoff, R. M., & Hirsh-Pasek, K. (2010). Speaking out for language: Why language is central to reading development. *Educational Researcher, 39*(4), 305-310. doi:10.3102/0013189X10370204

Dickinson, D. K., & Porche, M. V. (2011). Relation between language experiences in preschool classrooms and children's kindergarten and fourth-grade language and reading abilities. *Child Development, 82*(3), 870-886.

Dickinson, O.K. & Tabors, P.O. (2001). *Beginning literacy with language: Young children learning at home and school.* Baltimore: Paul H. Brookes.

Dionne, G., Dale, P. S., Boivin, M., & Plomin, R. (2003). Genetic evidence for bidirectional effects of early lexical and grammatical development. *Child Development, 74*(2), 394-412.

Dubow, E. F. E., Tisak, J. J., Causey, D. D., Hryshko, A. A., & Reid, G. G. (1991). A two-year longitudinal study of stressful life events, social support, and social problem-solving skills: Contributions to children's behavioral and academic adjustment. *Child Development, 62*(3), 583-599.

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*(1), 93-104. doi:10.1207/s15374424jccp3401_9

Duncan, G. J., & Brooks-Gunn, J. (1997). *Consequences of growing up poor.* Russell Sage Foundation, 112 East 64th Street, New York, NY 10021 ($49.95).

Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development, 65*(2), 296-318.

Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P. et al. (2007). School readiness and later achievement. *Developmental Psychology, 43*(6), 1428-1446.

Duncan, G. J., Yeung, W. J., Brooks-Gunn, J., & Smith, J. R. (1998). How much does childhood poverty affect the life chances of children? *American Sociological Review, 63*(3), 406-423.

Dunifon, R., Duncan, G. J., & Brooks-Gunn, J. (2004). The long-term impact of parental organization and efficiency. In A. Kalil, & T. DeLeire (Eds.), *Family investments in children's potential: Resources and parenting behaviors that promote success.* (pp. 85-118). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Edwards, A., Eisenberg, N., Spinrad, T. L., Sallquist, J., Eggum, N. D., Gaertner, B. M., & Kupfer, A. S. (2011, March). *The factor structure of effortful and reactive* *control: A longitudinal analysis.* Poster session presented at the biennial meeting of the Society for Research in Child Development, Montreal, Quebec, Canada.

Egeland, B., Pianta, R., & O'Brien, M. A. (1993). Maternal intrusiveness in infancy and child maladaptation in early school years. *Development and Psychopathology, 5(3),* 359-370. doi:10.1017/S0954579400004466

Eisenberg, N. (2002). Distinctions among various modes of empathy-related reactions: A matter of importance in humans. *Behavioral and Brain Sciences, 25*(1), 33-34. doi:10.1017/S0140525X02350015

Eisenberg, N., Cumberland, A., & Spinrad, T. L. (1998). Parental socialization of emotion. *Psychological Inquiry, 9*(4), 241-273. doi:10.1207/s15327965pli0904_1

Eisenberg, N., & Fabes, R. A. (1994). Mothers' reactions to children's negative emotions: Relations to children's temperament and anger behavior. *Merrill-Palmer Quarterly: Journal of Developmental Psychology, 40(1),* 138-156.

Eisenberg, N., Fabes, R. A., Nyman, M., Bernzweig, J., & Pinuelas, A. (1994). The relations of emotionality and regulation to children's anger-related reactions. *Child Development, 65*(1), 109-128.

Eisenberg, N., Fabes, R. A., Shepard, S. A., Guthrie, I. K., Murphy, B. C., & Reiser, M. (1999). Parental reactions to children's negative emotions: Longitudinal relations to quality of children's social functioning. *Child Development, 70(2),* 513-534. doi:10.1111/1467-8624.00037

Eisenberg, N., Fabes, R. A., & Spinrad, T. L. (2006). In Eisenberg N., Damon W. and Lerner R. M. (Eds.), *Prosocial development.* Hoboken, NJ, US: John Wiley & Sons Inc.

Eisenberg, N., Gershoff, E. T., Fabes, R. A., Shepard, S. A., Cumberland, A. J., et al. (2001). Mother's emotional expressivity and children's behavior problems and social competence: Mediation through children's regulation. *Developmental Psychology, 37(4),* 475-490. doi:10.1037/0012-1649.37.4.475

Eisenberg, N., Hofer, C., & Vaughan, J. (2007). Effortful control and its socioemotional consequences. In J. J. Gross (Ed.), *Handbook of emotion regulation.* New York, NY, US: Guilford Press.

Eisenberg, N. & Morris, A. S. (2002). Children's emotion-related regulation. *Advances in Child Development and Behavior, 30*, 189-229.

Eisenberg, N., Spinrad, T. L., Eggum, N. M., Silva, K. M., Reiser, M., Hofer, C. et al. (2010). Relations among maternal socialization, effortful control, and maladjustment in early childhood. *Development and Psychopathology, 22*(3), 507-525. doi:10.1017/S0954579410000246

Eisenberg, N., Valiente, C., & Eggum, N. D. (2010). Self-regulation and school readiness. *Early Education and Development, 21*(5), 681-698. doi:10.1080/10409289.2010.497451

Eisenberg, N., Valiente, C., Morris, A. S., Fabes, R. A., Cumberland, A., Reiser, M., . . . Losoya, S. (2003). Longitudinal relations among parental emotional expressivity, children's regulation, and quality of socioemotional functioning. *Developmental Psychology, 39(1), 3-19.* doi:10.1037/0012-1649.39.1.3

Else-Quest, N. M., Hyde, J. S., Goldsmith, H. H., Van Hulle, C. A. (2006). Gender differences in temperament: A meta-analysis. *Psychological Bulletin, 132(1),* 33-72.

Enders, C. K. (2005). Estimation by maximum likelihood. In B. Everitt & D.C. Howell (Eds.), *Encyclopedia of behavioral statistics* (pp. 1164-1170). West Sussex, UK: Wiley.

Entwisle, D. R., & Alexander, K. L. (1992). Summer setback: Race, poverty, school composition, and mathematics achievement in the first two years of school. *American Sociological Review, 57*(1), 72-72.

Estrada, P., Arsenio, W. F., Hess, R. D., & Holloway, S. D. (1987). Affective quality of the mother–child relationship: Longitudinal consequences for children's school-relevant cognitive functioning. *Developmental Psychology, 23(2),* 210-215. doi:10.1037/0012-1649.23.2.210

Evans, G. W. (1999). Measurement of the physical environment as a stressor. In S. L. Friedman, & T. D. Wachs (Eds.), *Measuring environment across the lifespan: Emerging methods and concepts* (pp. 249-277). Washington, DC, US: American Psychological Association. doi:10.1037/10317-009

Evans, G. W. (2000). *Crowding*. Washington, DC, US: American Psychological Association; New York, NY, US: Oxford University Press. doi:10.1037/10517-139

Evans, G. W. (2003). A multimethodological analysis of cumulative risk and allostatic load among rural children. *Developmental Psychology, 39*(5), 924-933. doi:10.1037/0012-1649.39.5.924

Evans, G. W. (2004). The environment of childhood poverty. *American Psychologist, 59*(2), 77-92. doi:10.1037/0003-066X.59.2.77

Evans, G. W. (2006). Child development and the physical environment. *Annual Review of Psychology, 57*, 423-451. doi:10.1146/annurev.psych.57.102904.190057

Evans, G. W., Bullinger, M., & Hygge, S. (1998). Chronic noise exposure and physiological response: A prospective study of children living under environmental stress. *Psychological Science, 9*(1), 75-77. doi:10.1111/1467-9280.00014

Evans, G. W., & Carrère, S. (1991). Traffic congestion, perceived control, and psychophysiological stress among urban bus drivers. *Journal of Applied Psychology, 76*(5), 658-663. doi:10.1037/0021-9010.76.5.658

Evans, G. W., & English, K. (2002). The environment of poverty: Multiple stressor exposure, psychophysiological stress, and socioemotional adjustment. *Child Development, 73*(4), 1238-1248. doi:10.1111/1467-8624.00469

Evans, G. W., Gonnella, C., Marcynyszyn, L. A., Gentile, L., & Salpekar, N. (2005). Research article: The role of chaos in poverty and children's socioemotional adjustment. *Psychological Science, 16*(7), 560-565. doi:10.1111/j.0956-7976.2005.01575.x

Evans, G. W., Hart, B., & Maxwell, L. E. (1999). Parental language and verbal responsiveness to children in crowded homes. *Developmental Psychology, 35*(4), 1020-1023.

Evans, G. W., Hygge, S., & Bullinger, M. (1995). Chronic noise and psychological stress. *Psychological Science, 6*(6), 333-338. doi:10.1111/j.1467-9280.1995.tb00522.x

Evans, G. W., Kliewer, W., & Martin, J. (1991). The role of the physical environment in the health and well-being of children. In H. E. Schroeder (Ed.), *New directions in health psychology assessment* (pp. 127-157). Washington, DC: Hemisphere Publishing Corp.

Evans, G. W., & Lepore, S. J. (1993). Household crowding and social support: A quasi-experimental analysis. *Journal of Personality and Social Psychology, 65*(2), 308-316. doi:10.1037/0022-3514.65.2.308

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*(6), 1514-1523. doi:10.2307/1132129

Evans, G. W., & Maxwell, L. (1997). Chronic noise exposure and reading deficits: The mediating effects of language acquisition. *Environment and Behavior, 29*(5), 638-656. doi:10.1177/0013916597295003

Evans, G. W., Maxwell, L. E., & Hart, B. (1999). Parental language and verbal responsiveness to children in crowded homes. *Developmental Psychology, 35*(4), 1020-1023. doi:10.1037/0012-1649.35.4.1020

Evans, G. W., Palsane, M. N., Lepore, S. J., & Martin, J. (1989). Residential density and psychological health: The mediating effects of social support. *Journal of Personality and Social Psychology, 57*(6), 994-994.

Evans, G. W., Rhee, E., Forbes, C., Allen, K. M., & Lepore, S. J. (2000). The meaning and efficacy of social withdrawal as a strategy for coping with chronic residential crowding. *Journal of Environmental Psychology, 20*(4), 335-342. doi:10.1006/jevp.1999.0174

Evans, G. W., Ricciuti, H. N., Hope, S., Schoon, I., Bradley, R. H., Corwyn, R. F., & Hazan, C. (2010). Crowding and cognitive development: The mediating role of maternal responsiveness among 36-month-old children. *Environment and Behavior, 42*(1), 135-148. doi:10.1177/0013916509333509

Evans, G. W., Saegert, S., & Harris, R. (2001). Residential density and psychological health among children in low-income families. *Environment & Behavior, 33*(2), 165-180. doi:10.1177/00139160121972936

Evans, G. W., & Stecker, R. (2004). Motivational consequences of environmental stress. *Journal of Environmental Psychology, 24*(2), 143-165. doi:10.1016/S0272-4944(03)00076-8

Evans, G. W., & Wachs, T. D. (Eds.). (2010). *Chaos and its influence on children's development: An ecological perspective*. Decade of behavior series. Washington, DC: American Psychological Association. doi:10.1037/12057-000

Farkas, G., & Beron, K. (2004). The detailed age trajectory of oral vocabulary knowledge: Differences by class and race. *Social Science Research, 33*(3), 464-497. doi:10.1016/j.ssresearch.2003.08.001

Fenson, L., Dale, P., Reznick, J., Bates, E., Thal, D., & Pethick, S. (1994). Variability in early communicative development. Monographs of the Society for Research in Child Development, Serial No. 242, Vol. 59, No. 5.

Fenson, L., Marchman, V., Thal, D., Dale, P., Resnick, J.S., & Bates, E. (2007). *MacArthur-Bates Communicative Development Inventories*. Baltimore: Brookes.

Fiese, B. H., & Winter, M. A. (2009). In J. H. Bray and M. Stanton (Eds.), *Family stories and rituals.* Wiley-Blackwell. doi:10.1002/9781444310238.ch44

Fiese, B. H., Tomcho, T. J., Douglas, M., Josephs, K., Poltrock, S., & Baker, T. (2002). A review of 50 years of research on naturally occurring family routines and rituals: Cause for celebration? *Journal of Family Psychology, 16*(4), 381-390. doi:10.1037/0893-3200.16.4.381

Fiese, B. H. & Winter, M. A. (2009). Family stories and rituals. In J. H. Bray & M. Stanton (Eds.), *Family stories and rituals.* Wiley-Blackwell. doi:10.1002/9781444310238.ch44

Fiese, B. H., & Winter, M. A. (2010). The dynamics of family chaos and its relation to children's socioemotional well-being. In G. W. Evans, & T. D. Wachs (Eds.), *Chaos and its influence on children's development: An ecological perspective.* (pp. 49-66). Washington, DC, US: American Psychological Association. doi:10.1037/12057-004

Gaertner, B. M., Spinrad, T. L., & Eisenberg, N. (2008). Focused attention in toddlers: Measurement, stability, and relations to negative emotion and parenting. *Infant and Child Development, 17(4),* 339-363. doi:10.1002/icd.580

Gilliom, M., Shaw, D. S., Beck, J. E., Schonberg, M. A., & Lukon, J. L. (2002). Anger regulation in disadvantaged preschool boys: Strategies, antecedents, and the development of self-control. *Developmental Psychology, 38(2)*, 222-235. doi:10.1037/0012-1649.38.2.222

Goduka, I. N., Poole, D. A., & Aotaki-Phenice, L. (1992). A comparative study of black South African children from three different contexts. *Child Development, 63(3),* 509-525. doi:10.2307/1131343

Gottfried, A. W., & Gottfried, A. E. (1984). Home environment and cognitive development in young children of middle-socioeconomic-status families. In A. W. Gottfried (Ed.), *Home environment and early cognitive development: Longitudinal research* (pp. 57-115). New York: Academic Press.

Grusec, J. E., & Kuczynski, L. (1980). Direction of effect in socialization: A comparison of the parent's versus the child's behavior as determinants of disciplinary techniques. *Developmental Psychology, 16*, 1-9.

Grolnick, W. S., & Farkas, M. (2002). Parenting and the development of children's self-regulation. In M. H. Bornstein (Ed.), (pp. 89-110). Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers.

Gutman, L. M., Sameroff, A. J., & Cole, R. (2003). Academic growth curve trajectories from 1st grade to 12th grade: Effects of multiple social risk factors and preschool child factors. *Developmental Psychology, 39*(4), 777-790.

Haines, M. M., Stansfeld, S. A., Job, R. F. S., Berglund, B., & Head, J. (2001). Chronic aircraft noise exposure, stress responses, mental health and cognitive performance in school children. *Psychological Medicine, 31*(2), 265-277. doi:10.1017/S0033291701003282

Halberstadt, A. G., Crisp, V. W., & Eaton, K. L. (1999). In Philippot P., Feldman R. S. and Coats E. J. (Eds.), *Family expressiveness: A retrospective and new directions for research*. New York Paris, NY, US France: Cambridge University Press Editions de la Maison des Sciences de l'Homme.

Hambrick-Dixon, P. J. (1986). Effects of experimentally imposed noise on task performance of black children attending day care centers near elevated subway trains. *Developmental Psychology, 22*(2), 259-264. doi:10.1037/0012-1649.22.2.259

Hardaway, C. R., Wilson, M. N., Shaw, D. S., & Dishion, T. J. (2011). Family functioning and externalizing behaviors among low-income children: Self-regulation as a mediator. *Infant and Child Development.* doi: 10.1002/icd.765

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*(3), 233-242. doi:10.1016/j.intell.2006.08.004

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

Heft, H. (1979). Background and focal environmental conditions of the home and attention in young children. *Journal of Applied Social Psychology, 9*(1), 47-69. doi:10.1111/j.1559-1816.1979.tb00794.x

Hoff, E. (2003). The specificity of environmental influence: Socioeconomic status affects early vocabulary development via maternal speech. *Child Development, 74*(5), 1368-1378. doi:10.1111/1467-8624.00612

Hollich, G. J., Hirsh-Pasek, K., Golinkoff, R. M., Brand, R. J., Brown, E., Chung, H. Let al. (2000). Breaking the language barrier: An emergentist coalition model for the origins of word learning. *Monographs of the Society for Research in Child Development, 65*(3), v-123. doi:10.1111/1540-5834.00090

Hoffman, M. L. (2000). *Empathy and moral development: Implications for caring and justice.* New York: Cambridge University Press.

Howse, R. B., Calkins, S. D., Anastopoulos, A. D., Keane, S. P., & Shelton, T. L. (2003). Regulatory contributors to children's kindergarten achievement. *Early Education and Development, 14*(1), 101-119.

Howse, R. R., Lange, G., Farran, D. C., & Boyles, C. D. (2003). Motivation and self-regulation as predictors of achievement in economically disadvantaged young children. *Journal of Experimental Education, 71*(2), 151-174.

Hurtado, N., Marchman, V. A., & Fernald, A. (2008). Does input influence uptake? links between maternal talk, processing speed and vocabulary size in spanish-learning children. *Developmental Science, 11*(6), 9.

Huttenlocher, J., Haight, W., Bryk, A., Seltzer, M., & Lyons, T. (1991). Early vocabulary growth: Relation to language input and gender. *Developmental Psychology, 27*(2), 236-248. doi:10.1037/0012-1649.27.2.236

Huttenlocher, J., Vasilyeva, M., Cymerman, E., & Levine, S. (2002). Language input and child syntax. *Cognitive Psychology, 45*(3), 337-374.

Hygge, S., Evans, G. W., & Bullinger, M. (2002). A prospective study of some effects of aircraft noise on cognitive performance in schoolchildren. *Psychological Science, 13*(5), 469-474. doi:10.1111/1467-9280.00483

Jenkins, J. M., Rasbash, J., & O'Connor, T.,G. (2003). The role of the shared family context in differential parenting. *Developmental Psychology, 39(1),* 99-113.

Jennings, K. D., Sandberg, I., Kelley, S. A., Valdes, L., Yaggi, K., Abrew, A., & Macey-Kalcevic, M. (2008). Understanding of self and maternal warmth predict later self-regulation in toddlers. *International Journal of Behavioral Development, 32(2),* 108-118. doi:10.1177/0165025407087209

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, 54*(4), 445-472.

Johnson, A. E., Bruce, J., Tarullo, A. R., & Gunnar, M. R. (2011). Growth delay as an index of allostatic load in young children: Predictions to disinhibited social approach and diurnal cortisol activity. *Development and Psychopathology, 23*(3), 859-871. doi:10.1017/S0954579411000356

Johnson, M. H., Posner, M. I., & Rothbart, M. K. (1991). Components of visual orienting in early infancy: Contingency learning, anticipatory looking, and disengaging. *Journal of Cognitive Neuroscience, 3*(4), 335-344. doi:10.1162/jocn.1991.3.4.335

Jöreskog, K. & Sörbom, D. (1982). Recent developments in structural equation modeling. *Journal of Marketing Research, 19,* 404-416. doi: 10.2307/3151714

Kagan, J., Snidman, N., & Arcus, D. M. (1992). Initial reactions to unfamiliarity. *Current Directions in Psychological Science, 1*(6), 171-174. doi:10.1111/1467-9566.ep10770010

Karreman, A., van Tuijl, C., van Aken, Marcel A. G., & Dekovic, M. (2006). Parenting and self-regulation in preschoolers: A meta-analysis. *Infant and Child Development, 15(6),* 561-579. doi:10.1002/icd.478

Keenan, K., & Shaw, D. S. (2003). Starting at the beginning: Exploring the etiology of antisocial behavior in the first years of life. In B. B. Lahey, T. E. Moffitt, and A. Caspi (Eds.), *Causes of conduct disorder and juvenile delinquency.* New York, NY, US: Guilford Press.

Keown, L. J., Woodward, L. J., & Field, J. (2001). Language development of pre-school children born to teenage mothers. *Infant and Child Development, 10(3),* 129-145. doi:10.1002/icd.282

Kirkorian, H. L., Pempek, T. A., Murphy, L. A., Schmidt, M. E., & Anderson, D. R. (2009). The impact of background television on parent-child interaction. *Child Development, 80*(5), 1350-1359. doi:10.1111/cdev.2009.80.issue-510.1111/j.1467-8624.2009.01337.x

Kline, R. B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). New York: Guilford Press.

Kochanska, G., & Aksan, N. (2006). Children's conscience and self-regulation. *Journal of Personality, 74*(6), 1587-1617. doi:10.1111/j.1467-6494.2006.00421.x

Kochanska, G., Coy, K. C., & Murray, K. T. (2001). The development of self-regulation in the first four years of life. *Child Development, 72*(4), 1091-1111.

Kochanska, G., & Knaack, A. (2003). Effortful control as a personality characteristic of young children: Antecedents, correlates, and consequences. *Journal of Personality, 71(6),* 1087-1112. doi:10.1111/1467-6494.7106008

Kontos, S., & Wachs, T.D., 2000. *Life in Early Childhood Programs Scale*. Unpublished manuscript. Department of Child Development and Family Studies. Purdue University. West Lafayette, IN.

Kopp, C. B. (1982). Antecedents of self-regulation: A developmental perspective. *Developmental Psychology, 18*(2), 199-214. doi:10.1037/0012-1649.18.2.199

Kopp, C. B. (1989). Regulation of distress and negative emotions: A developmental view. *Developmental Psychology, 25*(3), 343-354. doi:10.1037/0012-1649.25.3.343

Krueger, R. F., Caspi, A., Moffitt, T. E., White, J., & Stouthamer-Loeber, M. (1996). Delay of gratification, psychopathology, and personality: Is low self-control specific to externalizing problems? *Journal of Personality, 64*(1), 107-129. doi:10.1111/j.1467-6494.1996.tb00816.x

Ladd, G. W., Birch, S. H., & Buhs, E. S. (1999). Children's social and scholastic lives in kindergarten: Related spheres of influence? *Child Development, 70*(6), 1373-1400.

Landry, S. H., Miller-Loncar, C., Smith, K. E., & Swank, P. R. (2002). The role of early parenting in children's development of executive processes. *Developmental Neuropsychology, 21(1),* 15-41. doi:10.1207/S15326942DN2101_2

Landry, S. H., Smith, K. E., Miller-Loncar, C. L., & Swank, P. R. (1997). Predicting cognitive-language and social growth curves from early maternal behaviors in children at varying degrees of biological risk. *Developmental Psychology, 33*(6), 1040-1053. doi:10.1037/0012-1649.33.6.1040

Leigh, P., Nievar, M. A., & Nathans, L. (2011). Maternal sensitivity and language in early childhood: A test of the transactional model. *Perceptual and Motor Skills, 113(1),* 281-299. doi:10.2466/10.17.21.28.PMS.113.4.281-299

Lemery-Chalfant, K., Doelger, L., & Goldsmith, H. H. (2008). Genetic relations between effortful and attentional control and symptoms of psychopathology in middle childhood. *Infant and Child Development, 17*(4), 365-385.

Lengua, L. J. (2002). The contribution of emotionality and self-regulation to the understanding of childrens response to multiple risk. *Child Development, 73*(1), 144-161. doi:10.1111/1467-8624.00397

Lengua, L. J., Bush, N. R., Long, A. C., Kovacs, E. A., & Trancik, A. M. (2008). Effortful control as a moderator of the relation between contextual risk factors and growth in adjustment problems. *Development and Psychopathology, 20*(2), 509-528. doi:10.1017/S0954579408000254

Lengua, L. J., Honorado, E., & Bush, N. R. (2007). Contextual risk and parenting as predictors of effortful control and social competence in preschool children. Journal of Applied *Developmental Psychology, 28(1),* 40-55. doi:10.1016/j.appdev.2006.10.001

Lepore, S. J., & Evans, G. W. (1996). Coping with multiple stressors in the environment. In M. Zeidner, & N. S. Endler (Eds.), *Handbook of coping: Theory, research, applications.* (pp. 350-377). Oxford, England: John Wiley & Sons.

Lepore, S. J., Evans, G. W., & Palsane, M. N. (1991). Social hassles and psychological health in the context of chronic crowding. *Journal of Health and Social Behavior, 32(4),* 357-367. doi:10.2307/213710

Lepore, S. J., Evans, G. W., & Schneider, M. L. (1991). Dynamic role of social support in the link between chronic stress and psychological distress. *Journal of Personality and Social Psychology, 61*(6), 899-909. doi:10.1037/0022-3514.61.6.899

Lepore, S. J., Evans, G. W., & Schneider, M. L. (1992). Role of control and social support in explaining the stress of hassles and crowding. *Environment and Behavior, 24*(6), 795-811. doi:10.1177/0013916592246006

Lichter, D. T., & Wethington, E. (2010). Chaos and the diverging fortunes of american children: A historical perspective. In G. W. Evans, & T. D. Wachs (Eds.), *Chaos and its influence on children's development: An ecological perspective.* (pp. 15-32). Washington, DC, US: American Psychological Association. doi:10.1037/12057-002

Liew, J., McTigue, E. M., Barrois, L., & Hughes, J. N. (2008). Adaptive and effortful control and academic self-efficacy beliefs on achievement: A longitudinal study of 1st through 3rd graders. *Early Childhood Research Quarterly, 23*(4), 515-526.

Linver, M. R., Brooks-Gunn, J., & Kohen, D. E. (2002). Family processes as pathways from income to young children's development. *Developmental Psychology, 38(5),* 719-734. doi:10.1037/0012-1649.38.5.719

Lugo-Gil, J., & Tamis-LeMonda, C. (2008). Family resources and parenting quality: Links to children's cognitive development across the first 3 years. *Child Development, 79(4),* 1065-1085. doi:10.1111/j.1467-8624.2008.01176.x

Luthar, S. S. (1999). *Poverty and children's adjustment.* Thousand Oaks, CA, US: Sage Publications, Inc.

Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development, 71*(3), 543-562.

Lytton, H., & Romney, D. M. (1991). Parents' differential socialization of boys and girls: A meta-analysis. *Psychological Bulletin, 109(2),* 267-267.

Mackintosh, E., West, S., & Saegert, S. (1975). Two studies of crowding in urban public spaces. *Environment and Behavior, 7(2),* 159-184. doi:10.1177/001391657500700203

Mann, V. A., & Brady, S. (1988). Reading disability: The role of language deficiencies. *Journal of Consulting and Clinical Psychology, 56*(6), 811-816. doi:10.1037/0022-006X.56.6.811

Martin, R. P., Drew, K. D., Gaddis, L. R., & Moseley, M. (1988). Prediction of elementary school achievement from preschool temperament: Three studies. *School Psychology Review, 17*(1), 125-137.

Martin, R. P., & Holbrook, J. (1985). Relationship of temperament characteristics to the academic achievement of first-grade children. *Journal of Psychoeducational Assessment, 3*(2), 131-140. doi:10.1177/073428298500300204

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*(3), 429-444. doi:10.1016/0193-3973(95)90028-4

Maxwell, L. E. (1996). Multiple effects of home and day care crowding. *Environment and Behavior, 28*(4), 494-511. doi:10.1177/0013916596284004

Maxwell, L. E., & Evans, G. W. (2000). The effects of noise on pre-school children's pre-reading skills. *Journal of Environmental Psychology, 20*(1), 91-97. doi:10.1006/jevp.1999.0144

McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology, 43*(4), 947-959. doi:10.1037/0012-1649.43.4.947

McClelland, M. M., Morrison, F. J., & Holmes, D. L. (2000). Children at risk for early academic problems: The role of learning-related social skills. *Early Childhood Research Quarterly, 15*(3), 307-329.

McEwen, B. S. B. (2000). The neurobiology of stress: From serendipity to clinical relevance. *Brain Research, 886*(1-2), 172-189.

McEwen, B. S., & Stellar, E. (1993). Stress and the individual: Mechanisms leading to disease. *Archives of Internal Medicine, 153*(18), 2093-2101. doi:10.1001/archinte.153.18.2093

McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist, 53*(2), 185-204. doi:10.1037/0003-066X.53.2.185

Mezzacappa, E. (2004). Alerting, orienting, and executive attention: Developmental properties and sociodemographic correlates in an epidemiological sample of young, urban children. *Child Development, 75*(5), 1373-1386. doi:10.1111/j.1467-8624.2004.00746.x

Mischel, W., & Ayduk, O. (2004). *Willpower in a cognitive-affective processing system: The dynamics of delay of gratification.* New York, NY, US: Guilford Press.

Moilanen, K. L., Shaw, D. S., Dishion, T. J., Gardner, F., & Wilson, M. (2010). Predictors of longitudinal growth in inhibitory control in early childhood. *Social Development, 19(2),* 326-347. doi:10.1111/j.1467-9507.2009.00536.x

Molfese, V. J., Modglin, A., & Molfese, D. L. (2003). The role of environment in the development of readings skills: A longitudinal study of preschool and school-age measures. *Journal of Learning Disabilities, 36*(1), 59-67.

Naigles, L. R., & Hoff-Ginsberg, E. (1998). Why are some verbs learned before other verbs? effects of input frequency and structure on children's early verb use. *Journal of Child Language, 25*(1), 95-120.

Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J. et al. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*(2), 77-101. doi:10.1037/0003-066X.51.2.77

Nelson, J. A., O'Brien, M., Blankson, A. N., Calkins, S. D., & Keane, S. P. (2009). Family stress and parental responses to children's negative emotions: Tests of the spillover, crossover, and compensatory hypotheses. *Journal of Family Psychology, 23*(5), 671-679. doi:10.1037/a0015977

NICHD Early Child Care Research Network. (2003). Do children's attention processes mediate the link between family predictors and school readiness?*Developmental Psychology, 39*(3), 581-593. doi:10.1037/0012-1649.39.3.581

NICHD Early Child Care Research Network. (2005a). Pathways to reading: The role of oral language in the transition to reading. *Developmental Psychology, 41*(2), 428-442. doi:10.1037/0012-1649.41.2.428

NICHD Early Child Care Research Network. (2005b). Predicting individual differences in attention, memory, and planning in first graders from experiences at home, child care, and school. (2005). *Developmental Psychology, 41*(1), 99-114. doi:10.1037/0012-1649.41.1.99

Nolen-Hoeksema, S., Wolfson, A., Mumme, D., & Guskin, K. (1995). Helplessness in children of depressed and nondepressed mothers. *Developmental Psychology, 31(3),* 377-387. doi:10.1037/0012-1649.31.3.377

Normandeau, S., & Guay, F. (1998). Preschool behavior and first-grade school achievement: The mediational role of cognitive self-control. *Journal of Educational Psychology, 90*(1), 111-121.

Olson, S. L., Bates, J. E., & Bayles, K. (1990). Early antecedents of childhood impulsivity: The role of parent-child interaction, cognitive competence, and temperament. *Journal of Abnormal Child Psychology: An Official Publication of the International Society for Research in Child and Adolescent Psychopathology, 18(3),* 317-334. doi:10.1007/BF00916568

Olson, S. L., Bates, J. E., & Kaskie, B. (1992). Caregiver-infant interaction antecedents of children's school-age cognitive ability. *Merrill-Palmer Quarterly: Journal of Developmental Psychology, 38(3),* 309-330.

Olsson, U. H., Foss, T., Troye, S. V., & Howell, R. D. (2000). The performance of ML, GLS, and WLS estimation in structural equation modeling under conditions of misspecification and nonnormality. *Structural Equation Modeling, 7,* 557-595. doi: 10.1207/S15328007SEM0704_3

Pan, B. A., Rowe, M. L., Singer, J. D., & Snow, C. E. (2005). Maternal correlates of growth in toddler vocabulary production in low-income families. *Child Development, 76*(4), 763-782. doi:10.1111/j.1467-8624.2005.00876.x

Peterson, C., Jesso, B., & McCabe, A. (1999). Encouraging narratives in preschoolers: An intervention study. *Journal of Child Language, 26*(1), 49-67.

Pan, B. A. & Uccelli, P. (2009). Semantic development. In J. Berko-Gleason & N. B. Ratner (Eds.), *The development of language* (7th ed.). Boston: Allyn & Bacon.

Petrill, S. A., Pike, A., Price, T., & Plomin, R. (2004). Chaos in the home and socioeconomic status are associated with cognitive development in early childhood: Environmental mediators identified in a genetic design. *Intelligence, 32*(5), 445-460. doi:10.1016/j.intell.2004.06.010

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*(1), 55-66. doi:10.1177/0165025406062124

Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral self-regulation and its contribution to kindergarten outcomes. *Developmental Psychology, 45*(3), 605-619.

Presser, H. B. (2003). *Working in a 24/7 economy: Challenges for American families.* United States: Russell Sage.

Pungello, E. P., Iruka, I. U., Dotterer, A. M., Mills-Koonce, R., & Reznick, J. S. (2009). The effects of socioeconomic status, race, and parenting on language development in early childhood. *Developmental Psychology, 45(2),* 544-557. doi:10.1037/a0013917

Raikes, H. A., Robinson, J. L., Bradley, R. H., Raikes, H. H., & Ayoub, C. C. (2007). Developmental trends in self-regulation among low-income toddlers. *Social Development, 16(1),* 128-149. doi:10.1111/j.1467-9507.2007.00375.x

Raver, C. (2004). Placing emotional self-regulation in sociocultural and socioeconomic contexts. *Child Development, 75*(2), 346-353.

Raver, C. C., Blackburn, E. K., Bancroft, M., & Torp, N. (1999). Relations between effective emotional self-regulation, attentional control, and low-income preschoolers' social competence with peers. *Early Education and Development, 10*(3), 333-350.

Raver, C. C., Jones, S. M., Li-Grining, C., Zhai, F., Bub, K., & Pressler, E. (2011). CSRP's impact on low-income preschoolers' preacademic skills: Self-regulation as a mediating mechanism. *Child Development, 82*(1), 362-378.

Raviv, T., Kessenich, M., & Morrison, F. J. (2004). A mediational model of the association between socioeconomic status and three-year-old language abilities: The role of parenting factors. *Early Childhood Research Quarterly, 19(4),* 528-547. doi:10.1016/j.ecresq.2004.10.007

Regecová, V. V., & Kellerová, E. E. (1995). Effects of urban noise pollution on blood pressure and heart rate in preschool children. *Journal of Hypertension, 13*(4), 405-412.

Repetti, R. L., Taylor, S. E., & Seeman, T. E. (2002). Risky families: Family social environments and the mental and physical health of offspring. *Psychological Bulletin, 128*(2), 330-366. doi:10.1037/0033-2909.128.2.330

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*(2), 147-166.

Rocissano, L., & Yatchmink, Y. (1983). Language skill and interactive patterns in prematurely born toddlers. *Child Development, 54(5),* 1229-1241. doi:10.2307/1129678

Rothbart, M.K. (2000). The Early Childhood Behavior Questionnaire. Retrieved January 27, 2002 from University of Oregon, Mary Rothbart's Temperament Laboratory Web site: http://www.uoregon.edu/~maryroth

Rothbart, M. K., Ahadi, S. A., Hershey, K. L., & Fisher, P. (2001). Investigations of temperament at three to seven years: The children's behavior questionnaire. *Child Development, 72(5),* 1394-1408.

Rothbart, M. K., & Derryberry, D. (1981). Development of individual differences in temperament. *Advances in Developmental Psychology.,* (0275-3049, 0275-3049), 37-86.

Rothbart, M. K., & Bates, J. E. (2006). In Eisenberg N., Damon W. and Lerner R. M. (Eds.), *Temperament.* Hoboken, NJ, US: John Wiley & Sons Inc.

Rothbart, M. K., & Putnam, S. P. (2002). Temperament and socialization. In L. Pulkkinen, & A. Caspi (Eds.), (pp. 19-45). New York, NY, US: Cambridge University Press. doi:10.1017/CBO9780511489761.002

Rueda, M. R., Posner, M., & Rothbart, M. K. (2005). The development of executive attention: Contributions to the emergence of self-regulation. *Developmental Neuropsychology, 28*(2), 573-594. doi:10.1207/s15326942dn2802_2

Rueda, M. R., Fan, J., McCandliss, B. D., Halparin, J. D., Gruber, D. B., Lercari, L. P., & Posner, M. I. (2004). Development of attentional networks in childhood. *Neuropsychologia, 42*(8), 1029-1040. doi:10.1016/j.neuropsychologia.2003.12.012

Ruff, H. A. (1986). Components of attention during infants' manipulative exploration. *Child Development, 57*(1), 105-114.

Ruff, H. A., & Rothbart, M. K. (1996). *Attention in early development: Themes and variations*. New York: Oxford University Press.

Rutter, M. (1983). In Garmezy N., Rutter M. (Eds.), *Stress, coping, and development: Some issues and some questions.* Baltimore, MD, US: Johns Hopkins University Press.

Rutter, M. (1993). Resilience: Some conceptual considerations. *Journal of Adolescent Health, 14*(8), 626-631. doi:10.1016/1054-139X(93)90196-V

Rutter, M. (2003). In Lahey B. B., Moffitt T. E. and Caspi A. (Eds.), *Crucial paths from risk indicator to causal mechanism.* New York, NY, US: Guilford Press.

Sachs, J. (2009). Communication development in infancy. In J. Berko-Gleason & N. B. Ratner (Eds.), *The development of language* (7th ed.). Boston: Allyn & Bacon.

Saegert, S. (1978). The personal and social consequences of high density environments. In A. Baum & Y. Epstein (Eds.), *Human responses to crowding.* Hillside, NJ: Erlbaum Associates.

Saegert, S. (1981). Crowding and cognitive limits. In J. H. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 373-391). Hillsdale, NJ: Lawrence Erlbaum.

Sameroff, A. J., Seifer, R., Baldwin, A., & Baldwin, C. (1993). Stability of intelligence from preschool to adolescence: The influence of social and family risk factors. *Child Development, 64*(1), 80-97. doi:10.2307/1131438

Sattler, J.M., & Dumont, R. (2004). *Assessment of children: WISC-IV and WPPSI-III supplement*. San Diego: Jerome M. Sattler Publisher, Inc.

Schmidt, M. E., Pempek, T. A., Kirkorian, H. L., Lund, A. F., & Anderson, D. R. (2008). The effects of background television on the toy play behavior of very young children. *Child Development, 79*(4), 1137-1151. doi:10.1111/j.1467-8624.2008.01180.x

Schoen, M. J., & Nagle, R. J. (1994). Prediction of school readiness from kindergarten temperament scores. *Journal of School Psychology, 32*(2), 135-147.

Shamama-tus-Sabah, S., Gilani, N., & Wachs, T. D. (2011). Relation of home chaos to cognitive performance and behavioral adjustment of pakistani primary school children. *International Journal of Behavioral Development, 35*(6), 507-516. doi:10.1177/0165025411406852

Shapiro, A. H. (1974). Effects of family density and mothers’ education on preschoolers’ motor skills. *Perceptual and Motor Skills, 38*, 79-86.

Shoda, Y., Mischel, W., & Peake, P. K. (1990). Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions. *Developmental Psychology, 26*(6), 978-986. doi:10.1037/0012-1649.26.6.978

Shonkoff, J. P., & Phillips, D. A. (2000). *From neurons to neighborhoods: The science of early childhood development* National Academy Press.

Smolak, L., & Weinraub, M. (1983). Maternal speech: Strategy or response? *Journal of Child Language, 10*(2), 369-380.

Spinrad, T. L., Eisenberg, N., Silva, K. M., Eggum, N. D., Reiser, M., Edwards, A., . . . Gaertner, B. M. (2011). Longitudinal relations among maternal behaviors, effortful control and young children's committed compliance. *Developmental Psychology*, doi:10.1037/a0025898

Spinrad, T. L., Stifter, C. A., Donelan-McCall, N., & Turner, L. (2004). Mothers' regulation strategies in response to toddlers' affect: Links to later emotion self-regulation. *Social Development, 13(1),* 40-55. doi:10.1111/j.1467-9507.2004.00256.x

Sprunger, L. W., Boyce, W. T., & Gaines, J. A. (1985). Family–infant congruence: Routines and rhythmicity in family adaptations to a young infant. *Child Development, 56(3),* 564-572. doi:10.2307/1129746

Sroufe, L. A. (1996). *Emotional development: The organization of emotional life in the early years.* New York, NY, US: Cambridge University Press

Sroufe, L. A. (2000). Early relationships and the development of children. *Infant Mental Health Journal, 21(1-2),* 67-74. doi:10.1002/(SICI)1097-0355(200001/04)21:1/2<67::AID-IMHJ8>

Stansbury, K., & Zimmermann, L. K. (1999). Relations among child language skills, maternal socialization of emotion regulation, and child behavior problems. *Child Psychiatry and Human Development, 30(2)*, 121-142

Steinglass, P., Bennett, L. A., Wolin, S. J., & Reiss, D. (1987). *The alcoholic family.* New York, NY, US: Basic Books.

Stifter, C. A., & Corey, J. M. (2001). Vagal regulation and observed social behavior in infancy. *Social Development, 10(2),* 189-201.

Stipek, D. J., & Ryan, R. H. (1997). Economically disadvantaged preschoolers: Ready to learn but further to go. *Developmental Psychology, 33*(4), 711-723.

Storch, S. A., & Whitehurst, G. J. (2002). Oral language and code-related precursors to reading: Evidence from a longitudinal structural model. *Developmental Psychology, 38*(6), 934-947. doi:10.1037/0012-1649.38.6.934

Supplee, L. H., Unikel, E. B., & Shaw, D. S. (2007). Physical environmental adversity and the protective role of maternal monitoring in relation to early child conduct problems. *Journal of Applied Developmental Psychology, 28*(2), 166-183.

Tabachnick, B. G., & Fidell, L. S. (1996). *Using multivariate statistics.* New York: Harper Collins.

Tamis-LeMonda, C. S., Bornstein, M. H., Kahana-Kalman, R., Baumwell, L., & Cyphers, L. (1998). Predicting variation in the timing of language milestones in the second year: An events history approach. *Journal of Child Language, 25*(3), 675-700. doi:10.1017/S0305000998003572

Tamis-LeMonda, C., Briggs, R. D., McClowry, S. G., & Snow, D. L. (2009). Maternal control and sensitivity, child gender, and maternal education in relation to children's behavioral outcomes in African American families. *Journal of Applied Developmental Psychology, 30(3),* 321-331.

Tamis-LeMonda, C., Shannon, J. D., Cabrera, N. J., & Lamb, M. E. (2004). Fathers and mothers at play with their 2- and 3-year-olds: Contributions to language and cognitive development. *Child Development, 75(6),* 1806-1820. doi:10.1111/j.1467-8624.2004.00818.x

Thompson, R. A., Flood, M. F., & Goodvin, R. (2006). Social support and developmental psychology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology, Vol 3: Risk, disorder, and adaptation (2nd ed.)* (pp. 1-37). Hoboken, NJ, US:John Wiley & Sons.

Thompson, R. A., & Meyer, S. (2007). In Gross J. J. (Ed.), *Socialization of emotion regulation in the family.* New York, NY, US: Guilford Press.

U.S. Census Bureau (2011). *Child poverty in the United States 2009 and 2010: Selected race groups and Hispanic origin.* Retrieved from http://www.census.gov/prod/2011pubs/acsbr10-05.pdf

U.S. Census Bureau, Census of Housing (2011). *Historical census of housing tables.* Retrieved from http://www.census.gov/hhes/www/housing/census/historic/crowding.html

Valiente, C., Fabes, R. A., Eisenberg, N., & Spinrad, T. L. (2004). The relations of parental expressivity and support to children's coping with daily stress. *Journal of Family Psychology, 18(1),* 97-106. doi:10.1037/0893-3200.18.1.97

Valiente, C., Lemery-Chalfant, K., & Swanson, J. (2010). Prediction of kindergartners' academic achievement from their effortful control and emotionality: Evidence for direct and moderated relations. *Journal of Educational Psychology, 102*(3), 550-560.

Valiente, C., Lemery-Chalfant, K., Swanson, J., & Reiser, M. (2008). Prediction of children's academic competence from their effortful control, relationships, and classroom participation. *Journal of Educational Psychology, 100*(1), 67-77.

Valiente, C., Lemery-Chalfant, K., & Reiser, M. (2007). Pathways to problem behaviors: Chaotic homes, parent and child effortful control, and parenting. *Social Development, 16*(2), 249-267. doi:10.1111/j.1467-9507.2007.00383.x

Vallotton, C., & Ayoub, C. (2011). Use your words: The role of language in the development of toddlers' self-regulation. *Early Childhood Research Quarterly, 26*(2), 169-181.

Vernon-Feagans, L., Garrett-Peters, P., Willoughby, M., & Mills-Koonce, R. (2011). Chaos, poverty, and parenting: Predictors of early language development. *Early Childhood Research Quarterly,* (0885-2006, 0885-2006) doi:10.1016/j.ecresq.2011.11.001

Wachs, T. D. (1986). Noise in the nursery: Ambient background noise and early development. *Children's Environments Quarterly, 3*(1), 23-33.

Wachs, T. D. (1987). Specificity of environmental action as manifest in environmental correlates of infant's mastery motivation. *Developmental Psychology, 23*(6), 782-790. doi:10.1037/0012-1649.23.6.782

Wachs, T. D. (1989). The nature of the physical microenvironment: An expanded classification system. *Merrill-Palmer Quarterly, 35*(4), 399-419.

Wachs, T. D. (1991). Environmental considerations in studies with nonextreme groups. In T. D. Wachs & R. Plomin (Eds.), *Conceptualization and measurement of organism-environment interaction* (pp. 44-67). Washington, D. C.: American Psychological Association.

Wachs, T. D. (1993). Nature of relations between the physical and social microenvironment of the two-year-old child. *Early Development and Parenting,2,* 81-87. doi: 10.1002/edp.2430020202

Wachs, T. D. (1999). Celebrating complexity: Conceptualization and assessment of the environment. In S. L. Friedman, & T. D. Wachs (Eds.), *Measuring environment across the life span: Emerging methods and concepts.* (pp. 357-392). Washington, DC, US: American Psychological Association. doi:10.1037/10317-012

Wachs, T. D. (2000). *Necessary but not sufficient: The respective roles of single and multiple influences on individual development*. Washington, DC, US: American Psychological Association. doi:10.1037/10344-000

Wachs, T. D. (2003). Expanding our view of context: The bio-ecological environment and development. In R. V. Kail (Ed.), *Advances in child development and behavior, vol. 31.* (pp. 363-409). San Diego, CA, US: Academic Press.

Wachs, T. D. (2010). Viewing microsystem chaos through a Bronfenbrenner bioecological lens. In G. W. Evans, & T. D. Wachs (Eds.), *Chaos and its influence* *on children's development: An ecological perspective.* (pp. 97-112). Washington, DC, US: American Psychological Association. doi:10.1037/12057-007

Wachs, T. D., & Camli, O. (1991). Do ecological or individual characteristics mediate the influence of the physical environment upon maternal behavior. *Journal of Environmental Psychology, 11*(3), 249-264. doi:10.1016/S0272-4944(05)80186-0

Wachs, T. D., & Chan, A. (1986). Specificity of environmental action, as seen in environmental correlates of infants' communication performance. *Child Development, 57*(6), 1464-1474. doi:10.2307/1130424

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: An ecological perspective.* (pp. 3-13). Washington, DC, US: American Psychological Association. doi:10.1037/12057-001

Wachs, T. D., & Gruen, G. E. (1982). *Early experience and human development.* New York: Plenum.

Wachs, T. D., Gurkas, P., & Kontos, S. (2004). Predictors of preschool children's compliance behavior in early childhood classroom settings. *Journal of Applied Developmental Psychology, 25*(4), 439-457. doi:10.1016/j.appdev.2004.06.003

Wahler, R. G., & Dumas, J. E. (1989). Attentional problems in dysfunctional mother-child interactions: An interbehavioral model. *Psychological Bulletin, 105*(1), 116-116.

Walker, D., Greenwood, C. R., Hart, B., & Carta, J. (1994). Prediction of school outcomes based on early language production and socioeconomic factors. *Child Development, 65*(2), 606-621. doi:10.2307/1131404

Watt, N., Wetherby, A., & Shumway, S. (2006). Prelinguistic predictors of language outcome at 3 years of age. *Journal of Speech, Language, and Hearing Research, 49*(6), 1224-1237.

Webster-Stratton, C. (1990). Stress: A potential disruptor of parent perceptions and family interactions. *Journal of Clinical Child Psychology.Special Issue: The Stresses of Parenting, 19*(4), 302-312.

West, J., Denton, K., & Reaney, L. M. (2000). The kindergarten year: Findings from the early childhood longitudinal study, kindergarten class of 1998-99. *Education Statistics Quarterly, 2*(4), 25-30.

Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child Development, 69*(3), 848-872. doi:10.2307/1132208

Williams, B. R., Ponesse, J. S., Schachar, R. J., Logan, G. D., & Tannock, R. (1999). Development of inhibitory control across the life span. *Developmental Psychology, 35*(1), 205-213.

Willoughby, M., Kupersmidt, J., Voegler-Lee, M., & Bryant, D. (2011). Contributions of hot and cool self-regulation to preschool disruptive behavior and academic achievement. *Developmental Neuropsychology, 36*(2), 162-180. doi:10.1080/87565641.2010.549980

Winer, B. J. (1971). *Statistical principles in experimental design.* New York: McGraw-Hill.

Winkel, G., Saegert, S., & Evans, G. W. (2009). An ecological perspective on theory, methods, and analysis in environmental psychology: Advances and challenges. *Journal of Environmental Psychology, 29*(3), 318-328. doi:10.1016/j.jenvp.2009.02.005

Wohlwill, J. F. (1983). The concept of nature: A psychologist's view. *Human Behavior & Environment: Advances in Theory & Research, 6*(0148-8686, 0148-8686), 5-37.

Wohlwill, J. & Heft, H. (1987). The physical environment and the development of the child. In I. Altman & D. Stokols (Eds.), *Handbook of environmental psychology* (pp. 281-328). New York: Wiley.

Wood, D. D., Halfon, N. N., Scarlata, D. D., Newacheck, P. P., & Nessim, S. S. (1993). Impact of family relocation on children's growth, development, school function, and behavior. *JAMA : The Journal of the American Medical Association, 270*(11), 1334-1338.

Table 1

Demographic Variables

	T1 (*N* = 230)	T2 (*N* = 210)	T3 (*N* = 192)
Child's sex	Boys = 128; Girls = 102	Boys = 117; Girls = 93	Boys = 108; Girls = 84
Child race	Caucasian = 192 African American = 13 Asian = 6 Native American = 11 Other = 2 Mix of 2 races = 3 Unreported = 3	Caucasian = 174 African American = 13 Asian = 5 Native American = 12 Other = 2 Mix of 2 races = 3 Unreported = 1	Caucasian = 160 African American = 12 Asian = 4 Native American = 12 Other = 1 Mix of 2 races = 2 Unreported = 1
Child ethnicity	Not Hispanic/Latino = 177 Hispanic/Latino = 53	Not Hispanic/Latino = 163 Hispanic/Latino = 47	Not Hispanic/Latino = 151 Hispanic/Latino = 41
Mother race	Caucasian = 200 African American = 8 Asian = 6 Native American = 6 Other = 1 Mix of 2 races = 2 Unreported = 7	Caucasian = 176 African American = 8 Asian = 5 Native American = 7 Other = 1 Mix of 2 races = 2 Unreported = 5	Caucasian = 169 African American = 7 Asian = 4 Native American = 7 Other = 0 Mix of 2 races = 1 Unreported = 4
Mother ethnicity	Not Hispanic/Latina = 191 Hispanic/Latina = 39	Not Hispanic/Latina = 176 Hispanic/Latina = 34	Not Hispanic/Latina = 161 Hispanic/Latina = 31
Annual family income	< $15,000 = 18 $15-30,000 = 29 $30-45,000 = 37 $45-60,000 = 39 $60-75,000 = 32 $75-100,000 = 31 > $100,000 = 33	< $15,000 = 10 $15-30,000 = 25 $30-45,000 = 29 $45-60,000 = 50 $60-75,000 = 21 $75-100,000 = 29 > $100,000 = 37	< $15,000 = 6 $15-30,000 = 25 $30-45,000 = 21 $45-60,000 = 39 $60-75,000 = 22 $75-100,000 = 32 > $100,000 = 40
Mother education	Grade school = 0 Some high school = 10 High school grad = 29 Some college = 76 College grad = 84 Graduate school = 25 Unreported = 8	Grade school = 0 Some high school = 8 High school grad = 18 Some college = 79 College grad = 75 Graduate school = 24 Unreported = 6	*Data not collected at T3*
Father education	Grade school = 2 Some high school = 14 High school grad = 29 Some college = 87 College grad = 53 Graduate school = 34 Unreported = 11	Grade school = 1 Some high school = 14 High school grad = 31 Some college = 72 College grad = 52 Graduate school = 31 Unreported = 9	*Data not collected at T3*

Table 2

Means and Standard Deviations of Study Variables at T1, T2, and T3

	Time 1						Time 2						Time 3					
	Total (*N* = 204 – 227)		Male (*N* = 117 – 126)		Female (*N* = 93 – 101)		Total (*N* = 191- 209)		Male (*N* = 103 – 116)		Female (*N* = 88 – 93)		Total (*N* = 168 – 190)		Male (*N* = 89 – 106)		Female (*N* = 79 – 84)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Vocab	72.88[a]	22.90	69.26	24.87	77.35	19.41	---	---	---	---	---	---	---	---	---	---	---	---
M chaos	1.27	0.22	1.25	0.22	1.28	0.23	1.27	0.21	1.25	0.19	1.30	0.23	1.26	0.20	1.26	0.19	1.26	0.22
A EC	4.47	0.55	4.42	0.57	4.53	0.52	4.42	0.50	4.36	0.49	4.49	0.51	4.56	0.53	4.50	0.52	4.63	0.53
O EC	3.55[b]	0.85	3.43	0.87	3.69	0.80	3.46[f]	0.82	3.32	0.88	3.63[h]	0.71	3.86	0.62	3.74	0.65	3.98	0.57
O dinky	2.29	0.63	2.27	0.61	2.31	0.65	2.44	1.05	2.38	1.03	2.52	1.08	3.55	0.80	3.47	0.84	3.65	0.73
O gift	3.14[c]	1.54	2.92	1.54	3.42	1.50	2.85	1.04	2.73	1.11	2.99	0.93	3.48	0.63	3.42	0.67	3.54	0.57
O rabbit	2.55	3.00	2.49	2.92	2.61	3.11	10.02	3.53	9.55	3.66	10.57	3.31	10.65	2.20	10.36	2.20	10.99	2.16
O speech	3.25	0.62	3.23	0.69	3.28	0.51	3.55	0.50	3.57	0.53	3.53	0.47	3.23	0.47	3.24	0.53	3.21	0.41
M ctnp	5.78	0.65	5.83	0.64	5.73	0.66	5.64	0.66	5.59	0.64	5.70	0.67	5.66	0.59	5.65	0.60	5.68	0.58
O sens	3.30[d]	0.36	3.25	0.37	3.37	0.32	3.09	0.42	3.06	0.43	3.13	0.40	3.58	0.31	3.55	0.34	3.61	0.28
O warm	3.50	0.47	3.47	0.47	3.55	0.46	2.96	0.33	2.96	0.31	2.95	0.35	3.24	0.40	3.19	0.38	3.30	0.42
O pos	1.54	0.32	1.54	0.31	1.54	0.33	1.44	0.28	1.44	0.30	1.43	0.26	1.60	0.32	1.58	0.33	1.61	.31
M ctnn	2.84	0.86	2.79	0.90	2.89	0.82	3.07	0.83	3.09	0.83	3.04	0.84	2.41	0.67	2.45	0.66	2.36	0.68
FP int	1.25[e]	0.24	1.29	0.26	1.20	0.21	1.35	0.31	1.37	0.31	1.32	0.31	1.27	0.27	1.27	0.28	1.27	0.26
PZ int	1.10	0.22	1.10	0.20	1.10	0.25	1.18	0.24	1.18	0.23	1.17	0.24	1.06	0.17	1.07	0.15	1.04	0.18
FP neg	1.05	0.12	1.06	0.15	1.03	0.07	1.04	0.10	1.03	0.08	1.05	0.11	1.01	0.04	1.02	0.04	1.01	0.04
PZ neg	1.00	0.01	1.00	0.01	1.00	0.02	1.03	0.12	1.04	0.16	1.02	0.04	1.03	0.06	1.03	0.06	1.03	0.06
Exp	---	---	---	---	---	---	---	---	---	---	---	---	11.34[i]	3.44	10.81	3.23	11.95	3.60
Rec	---	---	---	---	---	---	---	---	---	---	---	---	11.14	3.11	10.89	3.07	11.43	3.15

Note. Vocab = vocabulary; M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect; Exp = expressive language; Rec = receptive language.
[a] Sex difference, $t(217) = -2.64$, $p < .01$. [b] Sex difference, $t(214) = -2.28$, $p < .05$. [c] Sex difference, $t(212) = - 2.40$, $p < .05$. [e] Sex difference, $t(214) = 2.45$, $p < .05$. [e] Sex difference, $t(214) = 2.72$, $p < .01$. [f] Sex difference, $t(190) = -2.68$, $p < .01$. [h] Sex difference, $t(189) = -2.00$, $p < .05$. [h] Sex difference, $t(166) = -2.53$, $p < .05$; [i] Sex difference, $t(165) = -2.16$, $p < .05$.

Table 3

Initial and Final (Post-Transformation) Skewness and Kurtosis Statistics for Study Variables at T1, T2, and T3

	Time 1				Time 2				Time 3			
	Initial		Final		Initial		Final		Initial		Final	
Variable	Skew	Kurt	Skew	Kurt	Skew	Kurt	Skew	Kurt	Skew	Kurt	Skew	Kurt
PZ int	3.07	11.46	2.41	6.03	1.70	3.25	1.23	1.04	5.28	36.92	3.89	19.48
FP neg	4.97	36.98	3.67	18.71	3.03	9.35	2.79	8.19	3.27	10.99	3.16	9.97
PZ neg	8.37	68.62	8.37	68.62	10.39	126.82	7.84	81.49	2.97	9.81	2.75	8.19

Note. Skew = skewness; Kurt = kurtosis; PZ = puzzle; int = intrusiveness; FP = free play; neg = negative affect.

Table 4

Correlations between the Covariates and Study Variables at T1, T2, and T3

	SES			Vocabulary		
Variable	Time 1 (*df* = 198-223)	Time 2 (*df* = 185-200)	Time 3 (*df* = 141-181)	Time 1 (*df* = 203-219)	Time 2 (*df* = 188-196)	Time 3 (*df* = 163-181)
CHAOS	-.19**	-.21**	-.10	-.04	.02	-.01
A EC	.13	.17*	.19*	.18**	.16*	.16*
O EC	.33***	.26***	.20*	.25***	.22**	.21**
O dinky	.04	.23**	.12	.06	.09	.06
O gift	.26***	.30***	.21**	.30***	.12	.04
O rabbit	.17*	.33***	.10	.06	.12	.08
O speech	.08	.06	.13†	.10	.04	-.08
M ctnp	-.01	.03	-.10	.08	.13	.23**
O sens	.38***	.43***	.35***	.14*	.23**	.18*
O warm	.36***	.29***	.36***	.06	.03	.16*
O pos	.08	.14†	.23**	-.02	.05	.12
M ctnn	-.36***	-.35***	-.15	-.07	-.02	-.09
FP int	-.40***	-.24***	-.31***	-.14†	-.07	-.13†
PZ int	-.29***	-.28***	-.19*	-.09	-.04	-.03
FP neg	-.36***	-.07	-.07	-.06	-.17*	-.11
PZ neg	-.15*	-.13†	-.14	-.11	.01	-.15
Exp	--	--	.36***	--	--	.27**
Rec	--	--	.41***	--	--	.25**

*Note.*M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect; Exp = expressive language; Rec = receptive language.
†$p < .10$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Table 5

Correlations among Study Variables at T1

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	CHAOS	---	-.31***	.03	-.08	-.07	.05	.01	-.16*	-.09	.01	-.07	.22**	.09	.07	.04	.19**
2.	A EC		---	.13	.10	.18**	.12	.02	.15*	.25***	.20**	.07	-.25***	-.19**	-.12	-.11	-.07
3.	O EC			---	.27***	.34***	.13†	.18**	-.01	.29***	.23**	.08	-.12†	-.15*	-.19**	-.18**	-.21**
4.	O dinky				---	.22**	.12†	.13†	-.05	.13†	.07	.15*	-.05	-.02	-.12†	.01	-.12†
5.	O gift					---	.13†	.07	.07	.26***	.19**	-.05	-.04	-.15*	-.26**	-.17*	-.14*
6.	O rabbit						---	-.02	.06	.15*	.06	-.03	-.16*	-.14*	-.17*	.03	-.05
7.	O speech							---	.08	.33***	.30***	.22**	-.15*	.08	-.03	.01	-.05
8.	M ctnp								---	.13†	.12†	.04	-.26***	-.05	-.10	.03	-.10
9.	O sens									---	.49***	.29***	-.37***	-.50***	-.56***	-.33***	-.20**
10.	O warm										---	.47***	-.24***	-.07	-.25***	-.22**	-.21**
11.	O pos											---	-.08	.01	.01	-.13†	-.02
12.	M ctnn												---	.27***	.08	.14*	.10
13.	FP int													---	.25***	.31***	.05
14.	PZ int														---	.09	.37***
15.	FP neg															---	.01
16.	PZ neg																---

Note. M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect.
Note. df = 202-216.
†$p < .10$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Table 6

Correlations among Study Variables at T2

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	CHAOS	---	-.35***	.00	.04	-.16*	-.08	-.02	-.16*	-.12†	-.04	.08	.14*	.06	.13†	.10	-.04
2.	A EC		---	.16*	.14†	.34***	.15*	.04	.14†	.27***	.10	.05	-.28***	-.19**	-.17*	-.06	-.13†
3.	O EC			---	.33***	.44***	.42***	-.07	.07	.28***	.15*	-.03	-.15*	-.33***	-.13†	-.05	-.20**
4.	O dinky				---	.40***	.32***	-.03	.03	.28***	.19**	.15*	-.13†	-.34***	-.14†	-.15*	-.16*
5.	O gift					---	.41***	-.08	-.06	.36***	.17*	.06	-.18*	-.31***	-.27**	-.22**	-.22**
6.	O rabbit						---	-.07	-.003	.29***	.11	-.01	-.25***	-.27***	-.14†	-.17*	-.23**
7.	O speech							---	.02	.11	.07	.04	-.07	.20**	.15*	.14†	.11
8.	M ctnp								---	.11	.12	.12	-.14†	-.06	-.04	-.15*	.01
9.	O sens									---	.51***	.25***	-.24**	-.58***	-.41***	-.42***	-.33***
10.	O warm										---	.26***	-.20**	-.17*	-.16*	-.39***	-.49***
11.	O pos											---	-.06	-.08	-.18*	-.12†	-.04
12.	M ctnn												---	.21**	.07	.12†	.03
13.	FP int													---	.10	.31***	.25***
14.	PZ int														---	.17*	.17*
15.	FP neg															---	.43***
16.	PZ neg																---

Note. M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect.
Note. df = 202-216.
†$p < .10$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Table 7

Correlations among Study Variables at T3

	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	CHAOS	---	-.32***	.00	.00	.04	.06	-.08	-.06	-.09	-.12	-.09	.20*	.01	.17*	.11	.11	-.11	-.20**
2.	A EC		---	.34***	.26**	.20*	.20**	-.01	.12	.28***	.21**	.07	-.19*	-.09	-.32***	-.33***	-.23**	.28***	.41***
3.	O EC			---	.26**	.33***	.27***	-.16*	.08	.31***	.27***	.13†	-.14†	-.10	-.33***	-.06	-.27***	.38***	.20**
4.	O dinky				---	.20*	.18*	-.12	.03	.15†	.14†	-.12	.04	-.04	-.26**	-.01	-.19*	.16*	.27**
5.	O gift					---	.10	-.09	-.05	.23**	.10*	.13†	.11	-.14†	-.38***	-.05	-.16*	.18*	.21**
6.	O rabbit						---	-.14†	-.03	.00	.03	.00	.00	-.13	-.17*	-.14†	-.01	.17*	.11
7.	O speech							---	.07	.12	.03	.12	-.02	.30***	-.02	.09	.10	.02	-.01
8.	M ctnp								---	.13	.13	.18*	-.28***	.18*	-.09	-.02	-.10	.03	.07
9.	O sens									---	.57***	.32***	-.17*	-.46***	-.43***	-.31***	-.55***	.19*	.20*
10.	O warm										---	.45***	-.09	-.17*	-.26**	-.22**	-.42***	.25**	.23**
11.	O pos											---	.06	-.10	-.16*	.03	-.02	.11	.20
12.	M ctnn												---	.08	.05	.08	.18*	-.04	-.10
13.	FP int													---	.09	.10	.19*	-.06	-.13
14.	PZ int														---	.18*	.25**	-.21**	-.15†
15.	FP neg															---	.41***	-.18*	-.11
16.	PZ neg																---	-.17*	-.18*
17.	Exp																	---	.46***
18.	Rec																		---

Note. M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect; Exp = expressive language; Rec = receptive language.
Note. df = 166-168.
Note. †p < .10. * p < .05. ** p < .01. ***p < .001.

Table 8

Correlations among Study Variables from T1 to T2

	Time 1 Variable	Time 2 Variable															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.	CHAOS	.79***	-.28***	.03	.09	-.03	.01	-.10	-.11	-.09	-.07	.10	.12	.04	.08	.04	-.08
2.	A EC	-.27***	.61***	.06	.04	.19**	.10	-.02	.14†	.14†	.09	.13†	-.23	-.10	-.18*	-.07	-.03
3.	O EC	.04	.27***	.53***	.28***	.36***	.37***	.05	.14†	.28***	.09	.06	-.09	-.27***	-.09	-.09	-.13†
4.	O dinky	.02	.18*	.16*	.15*	.18*	.13	.05	-.11	.07	-.03	-.03	.07	-.14†	-.03	.12†	.09
5.	O gift	-.05	.25**	.35***	.23**	.34***	.22**	.01	.11	.28***	.13†	.01	-.04	-.25**	-.17*	-.24**	-.12†
6.	O rabbit	.12	.07	.17*	.11	.09	.24**	.01	-.01	.19**	.13†	.07	-.18*	-.14†	-.10	-.06	-.03
7.	O speech	.04	.07	.05	.05	-.06	-.02	.53***	.09	.10	.02	.09	-.14†	.05	.03	.16*	.12
8.	M ctnp	-.23**	.06	.11	.00	-.11	.02	-.02	.75***	.11	.09	.15*	-.17*	-.07	-.04	-.03	.07
9.	O sens	-.08	.31***	.26***	.20**	.35***	.32***	.13†	.11	.50***	.27***	.19**	-.37***	-.38***	-.25***	-.25***	-.17*
10.	O warm	-.11	.15*	.15*	.08	.12†	.14†	.26***	.16*	.20**	.17*	.26***	-.27***	-.17*	-.03	-.19**	.01
11.	O pos	.02	-.02	-.12	.02	-.01	-.03	.12†	.07	.01	.11	.47***	-.05	.03	.09	.04	.12
12.	M ctnn	.19**	-.25***	-.11	-.13†	-.20**	-.22**	-.08	-.15*	-.38***	-.17*	-.13†	.75***	.30***	.16*	.16*	.02
13.	FP int	.06	-.27***	-.12	.18*	-.26***	-.16*	.14	.00	-.34***	-.20**	-.06	.27***	.35***	.20**	.28***	.14*
14.	PZ int	.13†	-.20**	-.23***	-.12†	-.26***	-.26***	.04	-.14†	-.25***	-.15*	.08	.10	.31***	.17*	.15*	.20**
15.	FP neg	.05	-.20**	-.08	-.11	-.20**	-.02	-.03	-.05	-.20**	-.18*	-.16*	.11	.09	.11	.28***	.30***
16.	PZ neg	.20**	-.09	-.20**	-.05	-.10	-.10	-.08	.01	-.15*	.02	.08	.03	.22**	-.09	.06	-.03

Note. Vocab_vocabulary; M _ mother-reported; A _ adult-reported composite; EC _ effortful control; O_observed; dinky_dinky toys task; gift _ gift delay task; rabbit_rabbit and turtle task; ctnp_CTNES/CCNES positive composite; sens_sensitivity; warm_warmth; pos_positive affect; ctnn_CTNES/CCNES negative composite; FP_free play; int_intrusiveness; PZ_puzzle; neg_negative affect.
Note. df = 179-190.
†$p < .10$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Table 9

Correlations among Study Variables from T1 to T3

	Time 1 Variable	Time 3 Variable 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	CHAOS	.75***	-.26***	.00	-.05	-.03	.08	-.11	-.09	-.20*	-.20*	-.17*	.07	.01	.23**	.04	.17*	-.13†	-.30***
2.	A EC	-.24	.52***	.17*	.04	.09	.09	.00	.12	.28***	.20*	.19*	-.20**	-.17*	-.23**	-.19*	-.19*	.01	.24**
3.	O EC	-.01	.29***	.40***	.21**	.15†	.10	.00	.03	.25**	.24**	.15*	-.14†	-.19*	-.21**	-.15†	-.13	.35***	.29***
4.	O dinky	-.13†	.10	.09	-.05	.14	.15†	.00	-.04	.07	-.08	.05	.06	-.10	-.11	-.05	-.02	.08	.09
5.	O gift	.03	.21**	.27***	.21**	.21**	.14†	-.10	.06*	.13	.14†	.11	.03	-.08	-.17*	-.04	-.02	.18*	.20*
6.	O rabbit	.03	.10	.10	.05	.00	.09	.02	-.04	.15†	.06	.07	-.14†	-.15†	-.13†	-.08	-.11	.02	.17*
7.	O speech	-.04	.02	.04	.03	.08	-.19*	.35***	.02	.15*	.14†	.05	-.11	.21**	-.18*	-.08	-.07	.05	.07
8.	M ctnp	-.11	.14†	.08	-.09	-.10	.04	.08	.64***	.21**	.14†	.22**	-.31***	.03	-.14†	.00	-.13†	.04	.09
9.	O sens	-.06	.32***	.31***	.22**	.21**	.16*	.09	.07	.47***	.37***	.25**	-.23**	-.24**	-.40	-.10	-.33***	.23**	.37***
10.	O warm	-.04	.12	.05	.12	.11	.12	.17*	.10	.19*	.28***	.32***	-.05	-.11	-.22**	.06	.02	.07	.18*
11.	O pos	.00	-.02	-.12	-.14	-.06	-.04	.14†	.01	-.03	.05	.42***	-.03	-.02	-.03	.16*	.07	-.09	-.03
12.	M ctnn	.21**	-.21**	-.09	.09	-.07	.04	-.02	-.08	-.25**	-.21**	-.21**	.57***	.19*	.08	.11	.17*	-.11	-.29***
13.	FP int	.08	-.23**	-.13	-.10	-.12	-.11	.07	.03	-.32***	-.14*	-.03	.15†	.28***	.26**	.03	.23**	-.11	-.21**
14.	PZ int	.07	-.27***	-.24**	-.32***	-.19*	-.24**	.07	-.16*	-.24**	-.24**	-.07	.12	.16*	.52***	.03	.18*	.18*	-.30**
15.	FP neg	.03	-.16*	-.07	-.14	-.08	-.04	-.01	-.11	-.15*	-.17*	-.22**	-.01	.05	-.01	.24**	.18*	-.05	-.21**
16.	PZ neg	.11	-.19*	-.20**	-.15†	-.25**	-.14†	.09	-.06	-.11	-.16*	-.14†	.03	.03	.53***	-.05	.00	-.11	-.21**

Note. M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect; Exp = expressive language; Rec = receptive language.
Note. *df*s = 165-184.
†$p < .10$. * $p < .05$. ** $p < .01$. ***$p < .001$.

Table 10

Correlations among Study Variables from T2 to T3

	Time 2 Variable	Time 3 Variable 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1.	CHAOS	.73***	-.36***	-.04	-.06	-.12	.01	-.12	-.15†	-.25**	-.20*	-.14†	.09	.01	.28***	.07	.17*	-.13†	-.35***
2.	A EC	-.27***	.65***	.12	.10	.17*	.15†	-.05	.11	.31**	.19*	.08	-.18*	-.18*	-.20**	-.31***	-.26**	.16*	.37***
3.	O EC	.05	.28***	.48***	.20*	.24**	.16*	-.06	-.01	.14†	.23**	.13†	-.05	-.03	-.17*	.00	-.11	.36***	.37***
4.	O dinky	.07	.20*	.26**	.26**	.14†	.10	-.03	.10	.18*	.19*	.10	-.04	-.02	-.08	-.21**	-.19*	.30***	.32***
5.	O gift	-.10	.31***	.32***	.22**	.36***	.14†	.00	-.08	.19*	.18*	.17*	-.06	-.17*	-.27***	-.18*	-.29***	.24**	.40***
6.	O rabbit	-.04	.27***	.38***	.24**	.15†	.21**	-.04	-.05	.19*	.17*	.11	-.11	-.20*	-.22**	.09	-.12	.23**	.30***
7.	O speech	-.05	-.02	-.15†	.01	-.05	-.11	.44***	.07	.16*	.02	.06	-.09	.15†	-.15†	-.06	.07	-.01	.02
8.	M ctnp	-.02	.12	.10	-.04	-.06	-.02	.08	.72***	.17*	.14†	.19*	-.32***	.04	-.05	-.03	-.09	.06	.07
9.	O sens	-.07	.21**	.20**	.03	.20**	.09	.02	-.02	.46***	.33***	.24**	-.10	-.32***	-.21**	-.22**	-.31***	.22**	.32***
10.	O warm	-.06	.04	.10	-.08	-.02	.00	.11	-.02	.22**	.28***	.21**	-.09	-.11	.01	-.12	-.23**	.06	.06
11.	O pos	.18*	.01	-.05	-.18*	.00	-.07	.12	.10	.16*	.13	.48***	-.02	-.07	-.01	-.13†	-.02	.00	-.08
12.	M ctnn	.17*	-.21**	-.07	.03	-.02	.03	.00	-.10	-.18*	-.21**	-.08	.57***	.15†	.07	.09	.16*	-.09	-.22**
13.	FP int	-.04	-.11	-.23**	-.14†	-.25**	-.16*	.24**	.04	-.25**	-.21**	-.06	.06	.41***	.19*	.18*	.19*	-.32***	-.40***
14.	PZ int	.03	-.17*	-.13†	-.06	-.15†	-.06	.06	.03	-.18*	-.21**	-.04	.00	.21**	.06	.20*	.30***	-.16*	-.17*
15.	FP neg	-.01	-.10	-.12	-.06	-.03	-.22**	.09	-.05	-.19*	-.25**	-.18*	.06	.18*	-.03	.15†	.22**	-.13†	-.19*
16.	PZ neg	-.05	-.02	-.19*	-.05	-.07	-.32***	.09	.04	-.06	-.11	-.08	-.02	.16*	-.01	.13†	.17*	-.13	-.18*

Note. M = mother-reported; A = adult-reported composite; EC = effortful control; O = observed; dinky = dinky toys task; gift = gift delay task; rabbit = rabbit and turtle task; ctnp = CTNES/CCNES positive composite; sens = sensitivity; warm = warmth; pos = positive affect; ctnn = CTNES/CCNES negative composite; FP = free play; int = intrusiveness; PZ = puzzle; neg = negative affect; Exp = expressive language; Rec = receptive language.
Note. dfs = 166-185.*Note.* †p < .10.
* p < .05. ** p < .01. ***p < .001.

Table 11

Summary of Path Analysis for Model 1

Residual Variances Allowed to Covary		
Chaos		
T1 with T2		
T1 with T3		

Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.04**	-.09
SES with vocabulary	.30*	.16
Chaos with vocabulary	*ns*	---
Time 3		
Chaos with vocabulary	*ns*	---

Path Estimates		
	Unstandardized	Standardized
Autoregressive Paths		
Chaos		
T1 to T2	.72***	.78
T2 to T3	.47†	.49
SES to Chaos		
T1 to T2	*ns*	---
SES to Language		
T1 to T3	.24***	.36
Chaos to Language		
T2 to T3	-.51**	-.19

R-square Statistics for Endogenous Constructs	
Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.47**
T3 language	.29***

Note. $\chi^2(12) = 10.34$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .06); SRMR = 0.02

Table 12

Unstandardized and Standardized Loadings and R-square Statistics for Combined Reported and Multiple Observed Indicator Measurement Model for Effortful Control

	Time 1			Time 2			Time 3		
Variable	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2
Adult-reported EC	.27***	.26	.07	.27***	.31	.10	.59***	.54	.29
Observer-rated EC	1.00	.62	.39	1.00	.70	.49	1.00	.76	.58
Gift delay	1.27***	.44	.20	1.27***	.69	.47	.59***	.44	.20
Dinky toys	.63***	.49	.24	.63***	.36	.13	.63***	.39	.15
Rabbit and turtle	1.67***	.29	.08	3.78***	.62	.38	1.67***	.37	.13

Note. Unstdz = unstandardized; Stdz = standardized; EC = effortful control.
*** $p < .001$.

Table 13

Summary of Path Analysis for Model 2a

Residual Variances Allowed to Covary		
Chaos		
T1 with T3		

Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.03**	-.18
SES with EC	.27***	.31
SES with vocabulary	.29*	.15
Chaos with EC	*ns*	---
Chaos with vocabulary	*ns*	---
EC with vocabulary	.59***	.25
Time 2		
Chaos with EC	-.03**	-.22
Time 3		
Chaos with EC	*ns*	---
Chaos with language	*ns*	---
EC with language	.05*	.20

Path Estimates		
	Unstandardized	Standardized
Autoregressive Paths		
Chaos		
T1 to T2	.72***	.78
T2 to T3	.37***	.38
EC		
T1 to T2	.46***	.37
T2 to T3	.26***	.47
SES to Chaos		
T1 to T2	*ns*	---
SES to EC		
T1 to T2	.34***	.23
SES to Language		
T1 to T3	.17***	.26

Table 13 (cont.)

Path Estimates		
	Unstandardized	Standardized
Chaos to EC		
T1 to T2	*ns*	---
T2 to T3	*ns*	---
EC to Language		
T2 to T3	.12***	.28
Vocabulary to EC		
T1 to T2	*ns*	---
Vocabulary to Language		
T1 to T3	.06**	.22

R-square Statistics for Endogenous Constructs	
Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.40***
T2 EC	.26***
T3 EC	.24***
T3 language	.35***

Note. Model fit indices: χ^2 (12) = 10.34, *p* = *ns*; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .06); SRMR = 0.02.

Table 14

Unstandardized and Standardized Loadings and R-square Statistics for Adult-reported EC and Gift Delay Indicator Measurement Model for Effortful Control

	Time 1			Time 2			Time 3		
Variable	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2
Adult-reported EC	1.00	.70	.49**	1.00	.89	.79***	1.00	.86	.75***
Gift delay	.95***	.25	.06*	.95***	.41	.17**	.31**	.23	.05

Note. Unstdz = unstandardized; Stdz = standardized; EC = effortful control.
** $p < .01$. *** $p < .001$.

Table 15

Summary of Path Analysis for Model 2b

Residual Variances Allowed to Covary		
Chaos		
T1 with T3		

Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.03**	-.18
SES with EC	.27***	.26
SES with vocabulary	.29*	.15
Chaos with EC	-.03*	-.12
Chaos with vocabulary	*ns*	---
EC with vocabulary	.86***	.32
Time 2		
Chaos with EC	-.03***	-.27
Time 3		
Chaos with EC	*ns*	---
Chaos with language	*ns*	---
EC with language	.04**	.21

Path Estimates		
	Unstandardized	Standardized
Autoregressive paths		
Chaos		
T1 to T2	.72***	.78
T2 to T3	.37***	.38
EC		
T1 to T2	.27***	.38
T2 to T3	.29***	.97
SES to Chaos		
T1 to T2	*ns*	---
SES to EC		
T1 to T2	.22***	.21

Table 15 (cont.)

	Path Estimates	
	Unstandardized	Standardized
SES to Language		
T1 to T3	.09***	.30
Chaos to EC		
T1 to T2	*ns*	---
T2 to T3	-.54***	.22
EC to Language		
T2 to T3	.15***	.24
Vocabulary to EC		
T1 to T2	*ns*	---
Vocabulary to Language		
T1 to T3	.05**	.21

R-square Statistics for Endogenous Constructs

Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.41***
T2 EC	.25***
T2 EC	.35***
T3 language	.33***

Note. $\chi^2(12) = 11.66$, $p < .001$; CFI = 1.00; RMSEA = .00 (90% CI = .00 - .07); SRMR = 0.03.

Table 16

Unstandardized and Standardized Loadings and R-square Statistics for Measurement Model for Supportive Parenting

	Time 1			Time 2			Time 3		
Variable	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2	Unstdz	Stdz	R^2
Maternal sensitivity	.63***	.64	.38***	1.36***	.71	.48***	.63***	.68	.45***
Maternal warmth	1.00	.77	.59***	1.00	.64	.48***	1.00	.83	.73***
Maternal positive affect	.49***	.54	.29***	.49***	.36	.15***	.49***	.52	.29***

Note. Unstdz = unstandardized; Stdz = standardized.
***$p < .001$.

Table 17

Summary of Structural Equation Modeling for Model 3

Factor Loading Constraints		
Supportive Parenting		
T1 and T2 maternal sensitivity		
T1, T2, and T3 maternal warmth		
T1, T2, and T3 maternal positive affect		
Residual Variances Allowed to Covary		
Chaos		
T1 with T2		
T1 with T3		
Maternal sensitivity		
T1 with T2		
T2 with T3		
T1 with T3		
Maternal positive affect		
T1 with T2		
T2 with T3		
T1 with T3		
Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.03**	-.18
SES with parenting	.13***	.44
SES with vocabulary	.30*	.15
Chaos with parenting	*ns*	---
Chaos with vocabulary	*ns*	---
Parenting with vocabulary	*ns*	---
Time 2		
Chaos with parenting	*ns*	---
Time 3		
Chaos with parenting	*ns*	---
Chaos with language	*ns*	---
Parenting with language	*ns*	---

Table 17 (cont.)

	Path Estimates	
	Unstandardized	Standardized
Autoregressive paths		
Chaos		
T1 to T2	.72***	.78
T2 to T3	.37***	.38
Parenting		
T1 to T2	.18*	.29
T2 to T3	.90***	.58
SES to Chaos		
T1 to T2	*ns*	---
SES to Parenting		
T1 to T2	.11***	.42
SES to Language		
T1 to T3	.25***	.39
Chaos to Parenting		
T1 to T2	*ns*	---
T2 to T3	-.32**	-.20
Parenting to Language		
T2 to T3	*ns*	---
Vocabulary to Language		
T1 to T3	.06***	.25

R-square Statistics for Endogenous Constructs

Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.40***
T1 sensitivity	.40***
T2 sensitivity	.49***
T3 sensitivity	.46***
T1 warmth	.60***
T2 warmth	.44***
T3 warmth	.69***
T1 positive affect	.29***
T2 positive affect	.14***
T3 positive affect	.27***
T3 language	.29***

Note. $\chi^2(70) = 107.46$, $p < .001$; CFI = .96; RMSEA = .05 (90% CI = .03 - .07); SRMR = .07.

Table 18

Summary of Path Analysis for Model 3

Residual Variances Allowed to Covary		
Chaos		
T1 with T3		

Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.03**	-.18
SES with parenting	.09***	.38
SES with vocabulary	.30*	.15
Chaos with parenting	*ns*	---
Chaos with vocabulary	*ns*	---
Parenting with vocabulary	*ns*	---
Time 2		
Chaos with parenting	*ns*	---
Time 3		
Chaos with parenting	*ns*	---
Chaos with language	*ns*	---
Parenting with language	*ns*	---

Path Estimates		
	Unstandardized	Standardized
Autoregressive paths		
Chaos		
T1 to T2	.77***	.78
T2 to T3	.37***	.38
Parenting		
T1 to T2	.23*	.23
T2 to T3	.42***	.46
SES to Chaos		
T1 to T2	*ns*	---
SES to Parenting		
T1 to T2	.11***	.35

Table 18 (cont.)

Path Estimates		
	Unstandardized	Standardized
SES to Language		
T1 to T3	.23***	.66
Chaos to Parenting		
T1 to T2	*ns*	---
T2 to T3	-.21**	-.17
Parenting to Language		
T2 to T3	*ns*	---
Vocabulary to Language		
T1 to T3	.06***	.25

R-square Statistics for Endogenous Constructs

Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.40***
T2 parenting	.28***
T3 parenting	.23***
T3 language	.25***

Note. $\chi^2(13) = 27.32$, $p < .001$; CFI = .97; RMSEA = .07 (90% CI = .03 - .11); SRMR = 0.05.

Table 19

Summary of Path Analysis for Model 4

Residual Variances Allowed to Covary		
Chaos		
T1 with T3		

Within-Time Construct Correlations		
	Unstandardized	Standardized
Time 1		
SES with chaos	-.03**	-.17
SES with parenting	.09***	.37
SES with EC	.26***	.25
SES with vocabulary	.29*	.15
Chaos with parenting	*ns*	---
Chaos with EC	-.03*	-.12
Chaos with vocabulary	*ns*	---
Parenting with EC	.07**	.21
Parenting with vocabulary	*ns*	---
EC with vocabulary	.86***	.32
Time 2		
Chaos with parenting	*ns*	---
Chaos with EC	-.03***	-.27
Parenting with EC	.03**	.09
Time 3		
Chaos with parenting	*ns*	---
Chaos with EC	*ns*	---
Chaos with language	*ns*	---
Parenting with EC	*ns*	---
Parenting with language	*ns*	---
EC with language	.04**	.21

Path Estimates		
	Unstandardized	Standardized
Autoregressive paths		
Chaos		
T1 to T2	.72***	.78
T2 to T3	.37***	.38
Parenting		
T1 to T2	.23***	.23
T2 to T3	.42***	.46
EC		
T1 to T2	.25***	.35
T2 to T3	.28***	.48

Table 19 (cont.)

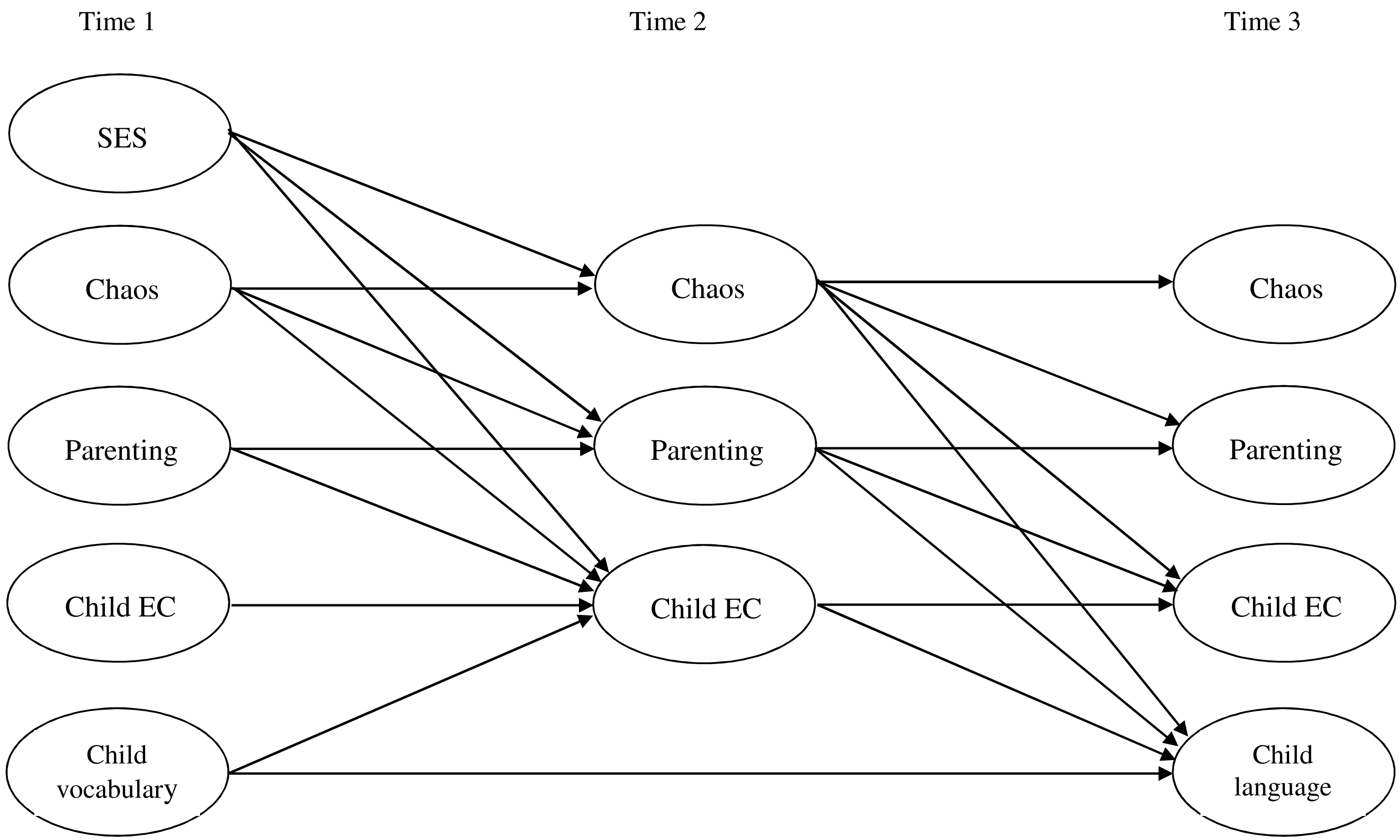
	Path Estimates	
	Unstandardized	Standardized
SES to Chaos		
T1 to T2	*ns*	---
SES to Parenting		
T1 to T2	.11**	.35
SES to EC		
T1 to T2	.20**	.20
SES to Language		
T1 to T3	.20***	.31
Chaos to Parenting		
T1 to T2	*ns*	---
T2 to T3	.20**	.20
Chaos to EC		
T1 to T2	*ns*	---
T2 to T3	-.55***	.23
Parenting to Language		
T2 to T3	*ns*	---
EC to Language		
T2 to T3	.16***	.25
Vocabulary to EC		
T1 to T2	*ns*	---
Vocabulary to Language		
T1 to T3	.05***	.22

R-square Statistics for Endogenous Constructs

Observed Variable	R^2
T2 chaos	.62***
T3 chaos	.40***
T2 parenting	.23***
T3 parenting	.25***
T2 EC	.23***
T2 EC	.34***
T3 language	.33***

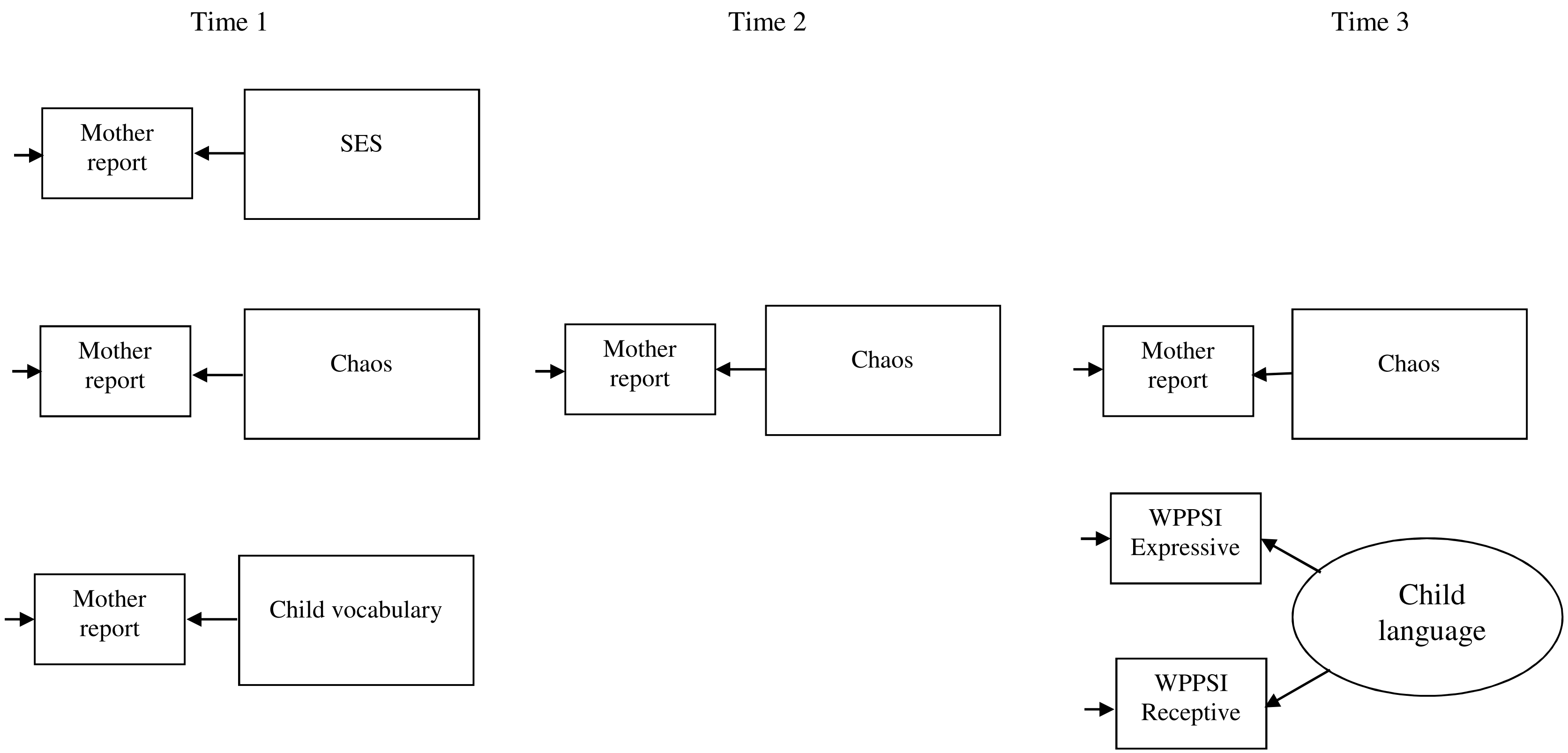
Note. $\chi^2(25) = 41.21$, $p < .001$; CFI = .98; RMSEA = .05 (90% CI = .02 - .08); SRMR = 0.05.

Figure 1



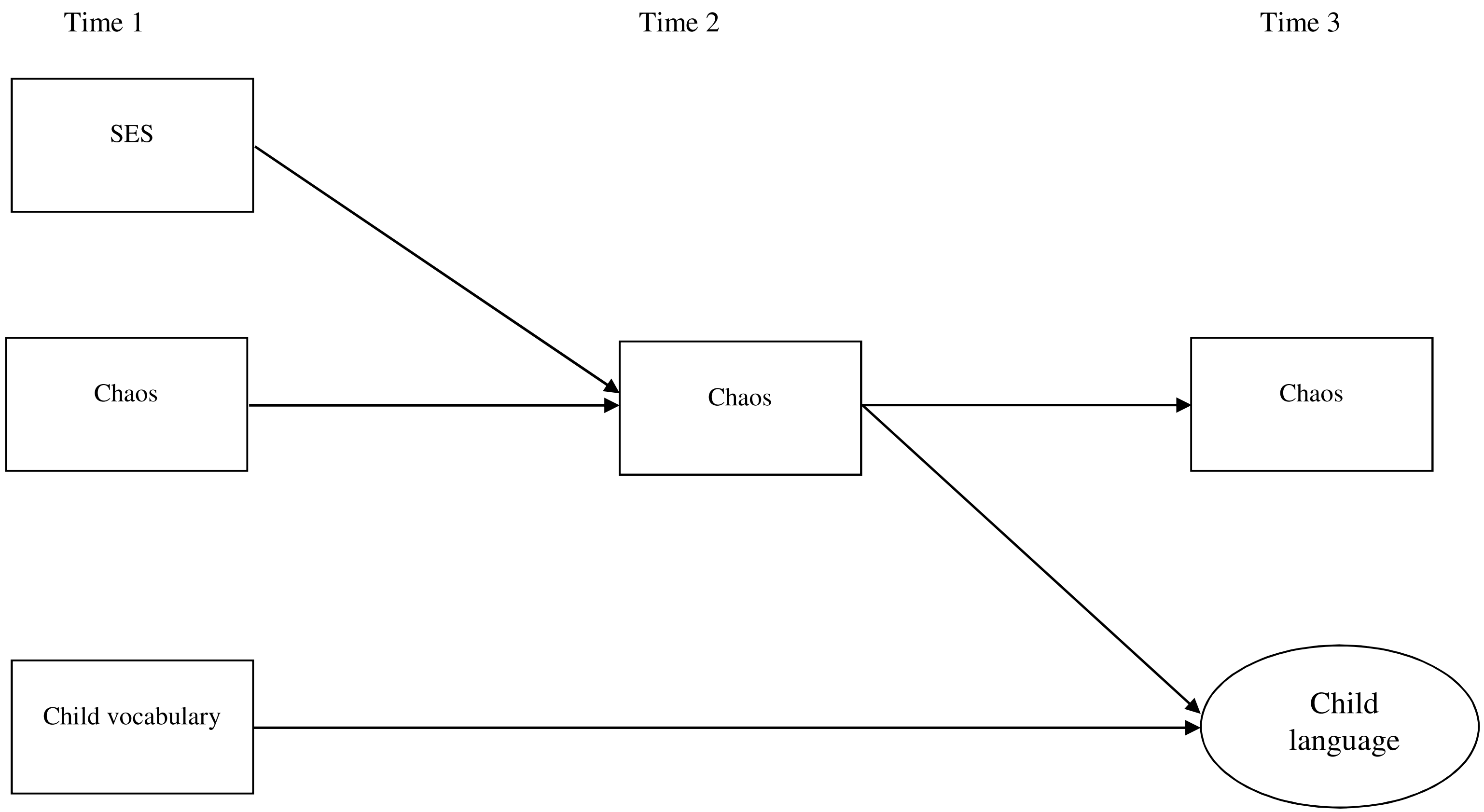
Time 1
Time 2
Time 3
SES
Chaos
Parenting
Child EC
Child vocabulary
Chaos
Parenting
Child EC
Chaos
Parenting
Child EC
Child language

Figure 2



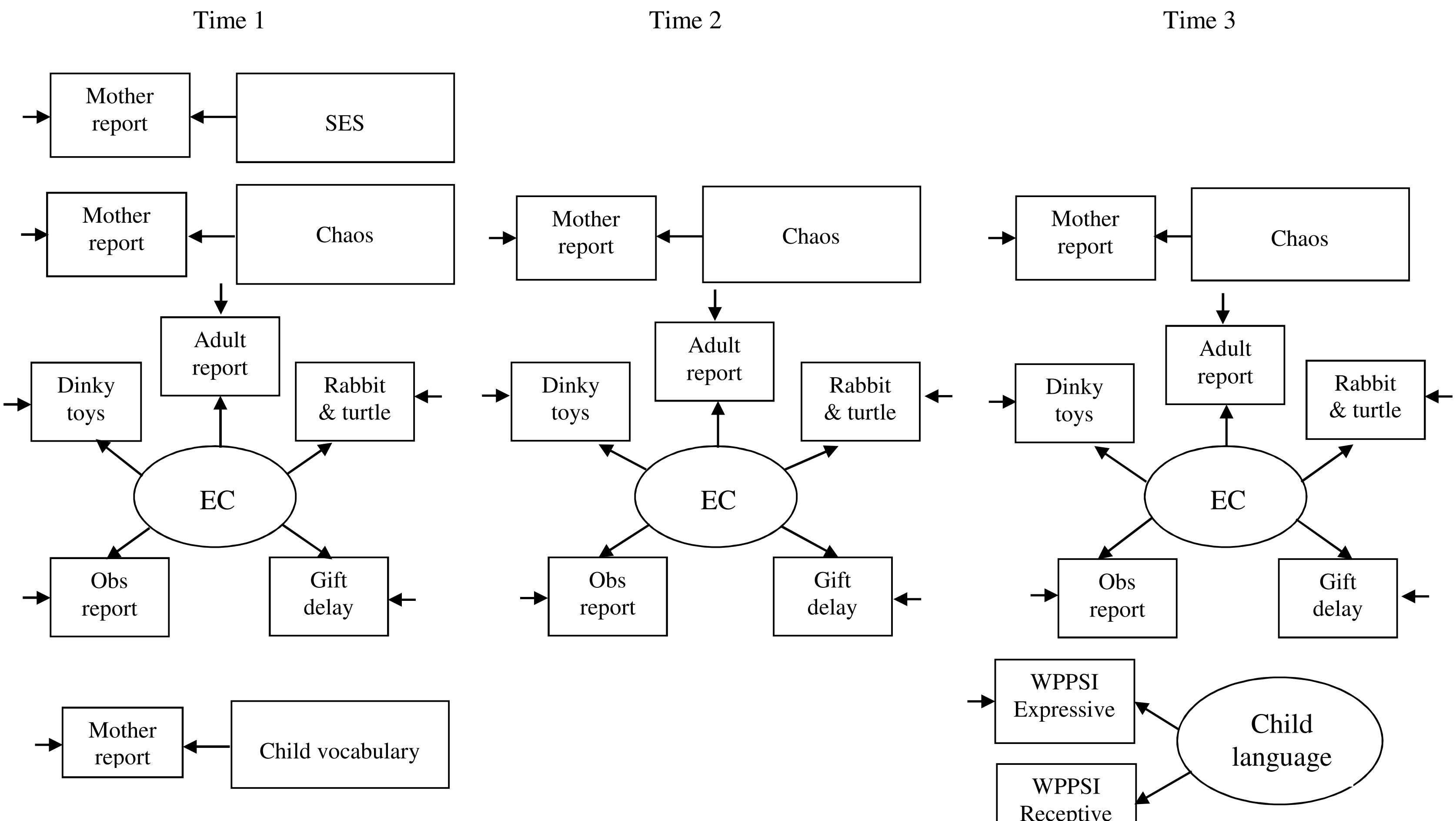
Note. Correlations between constructs also will be estimated.

Figure 3



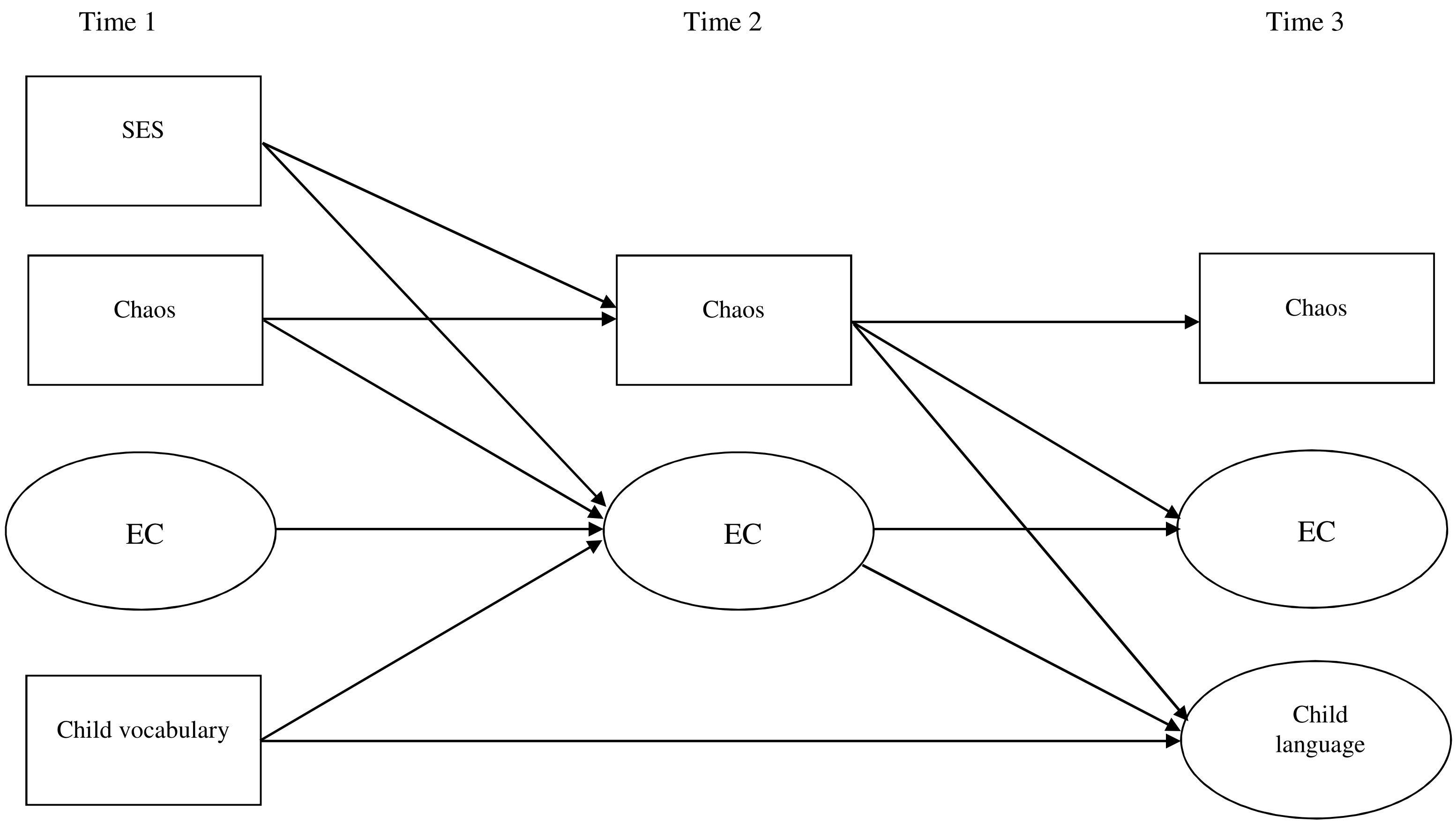
Note. Correlations between constructs within time also will be estimated. For simplicity and clarity in the figure, only the constructs are represented.

Figure 4



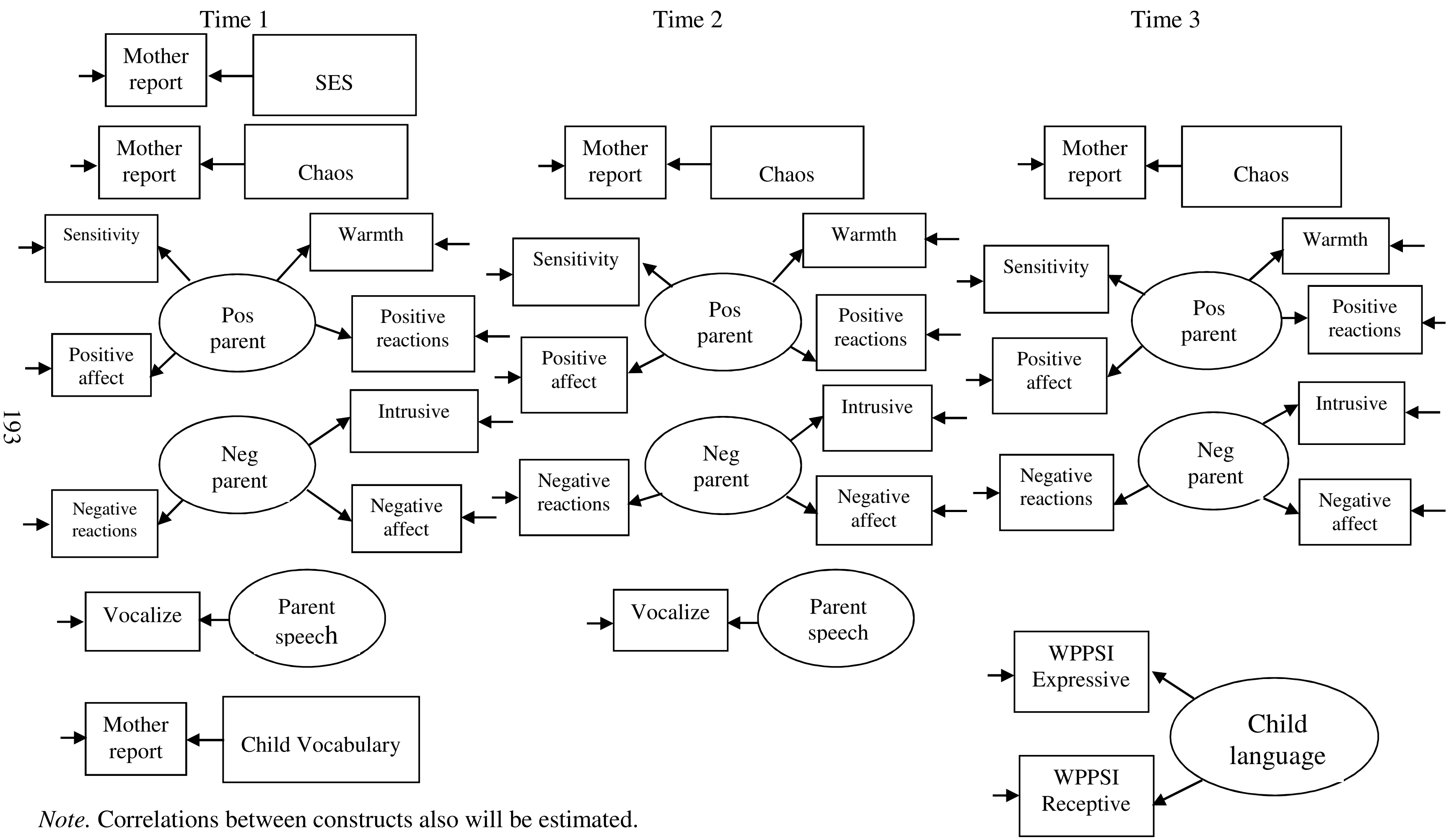
Note. Correlations between constructs also will be estimated.

Figure 5



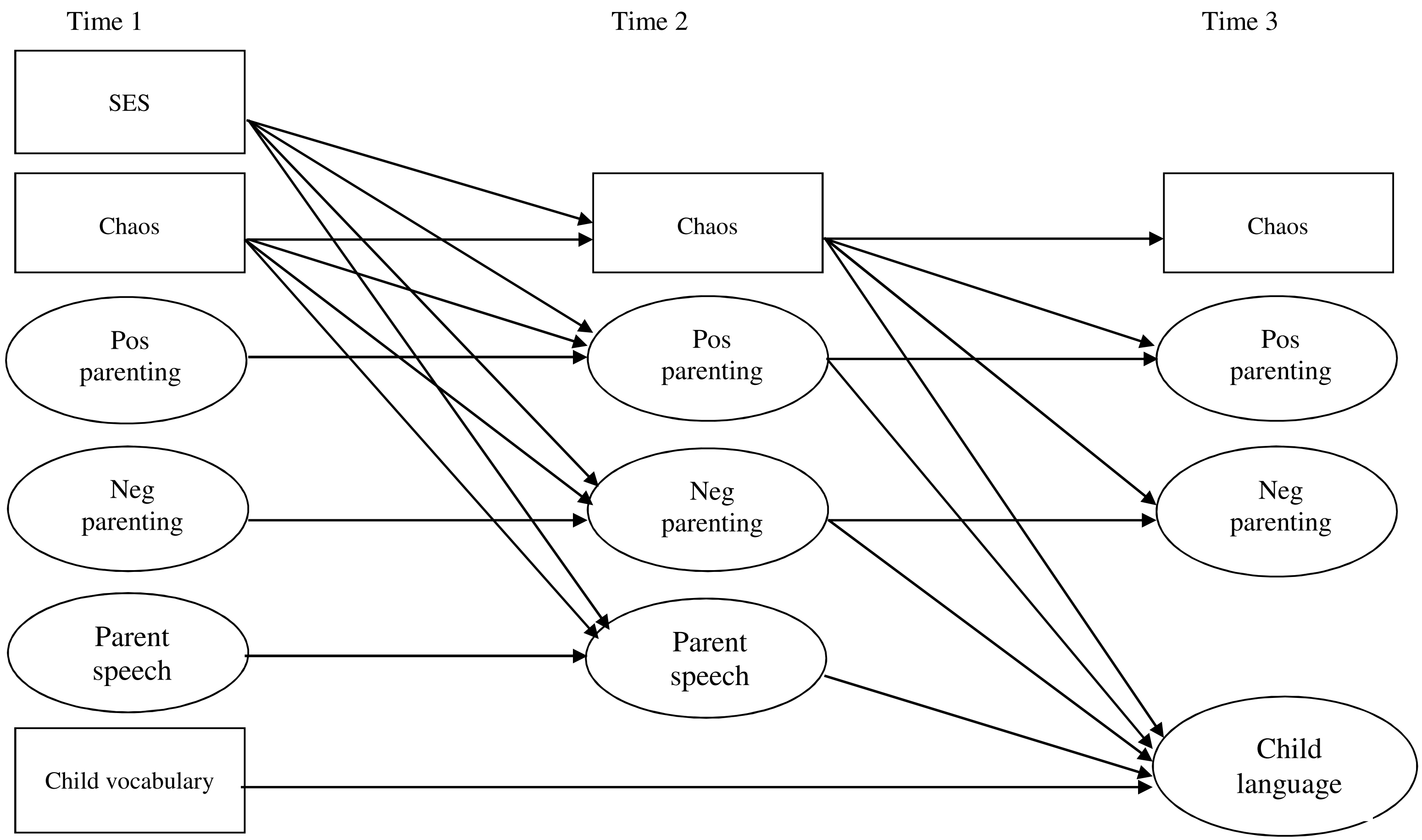
Note. Correlations between constructs within time also will be estimated. For simplicity and clarity in the figure, only the constructs are represented.

Figure 6



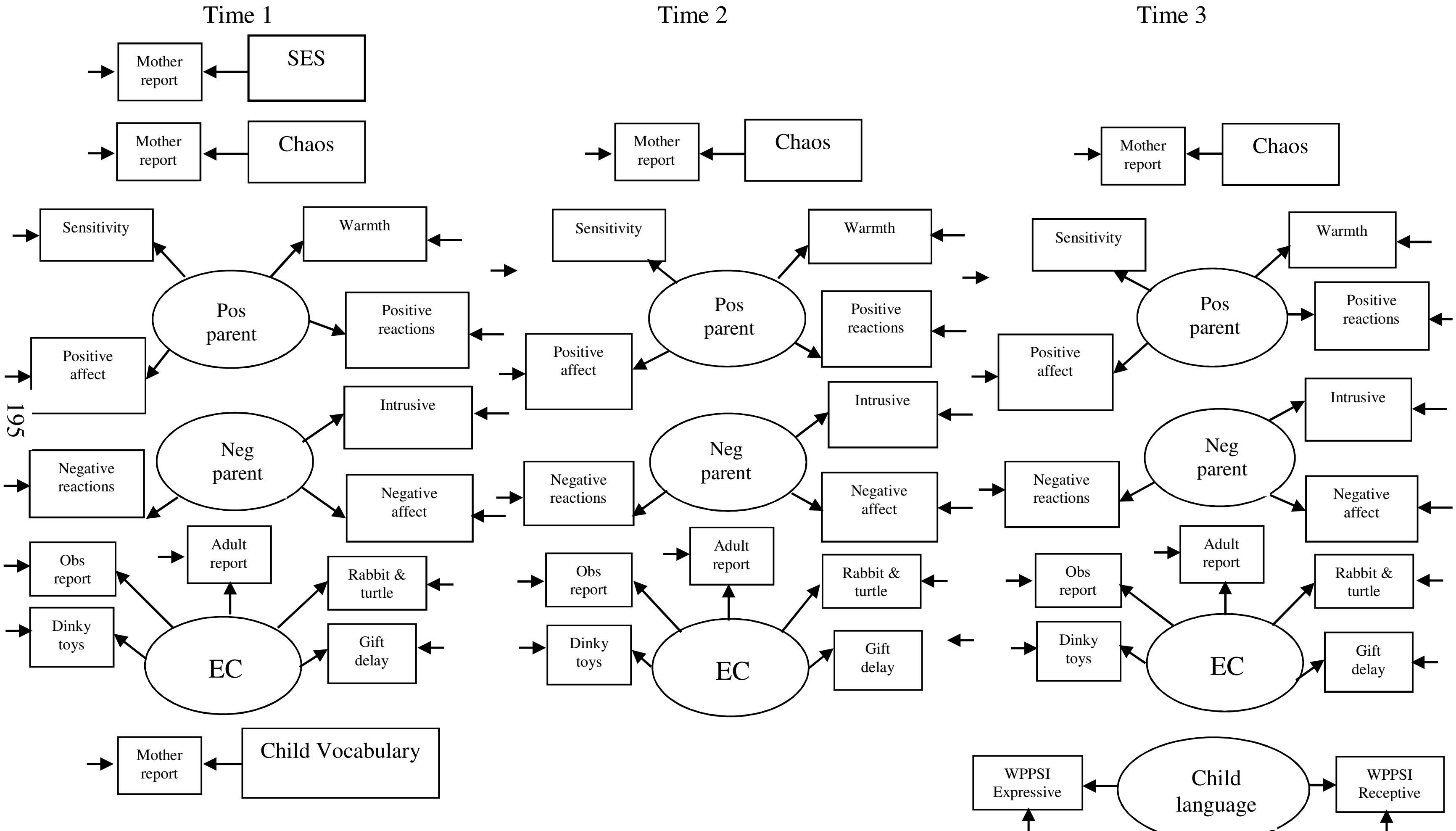
Note. Correlations between constructs also will be estimated.

Figure 7



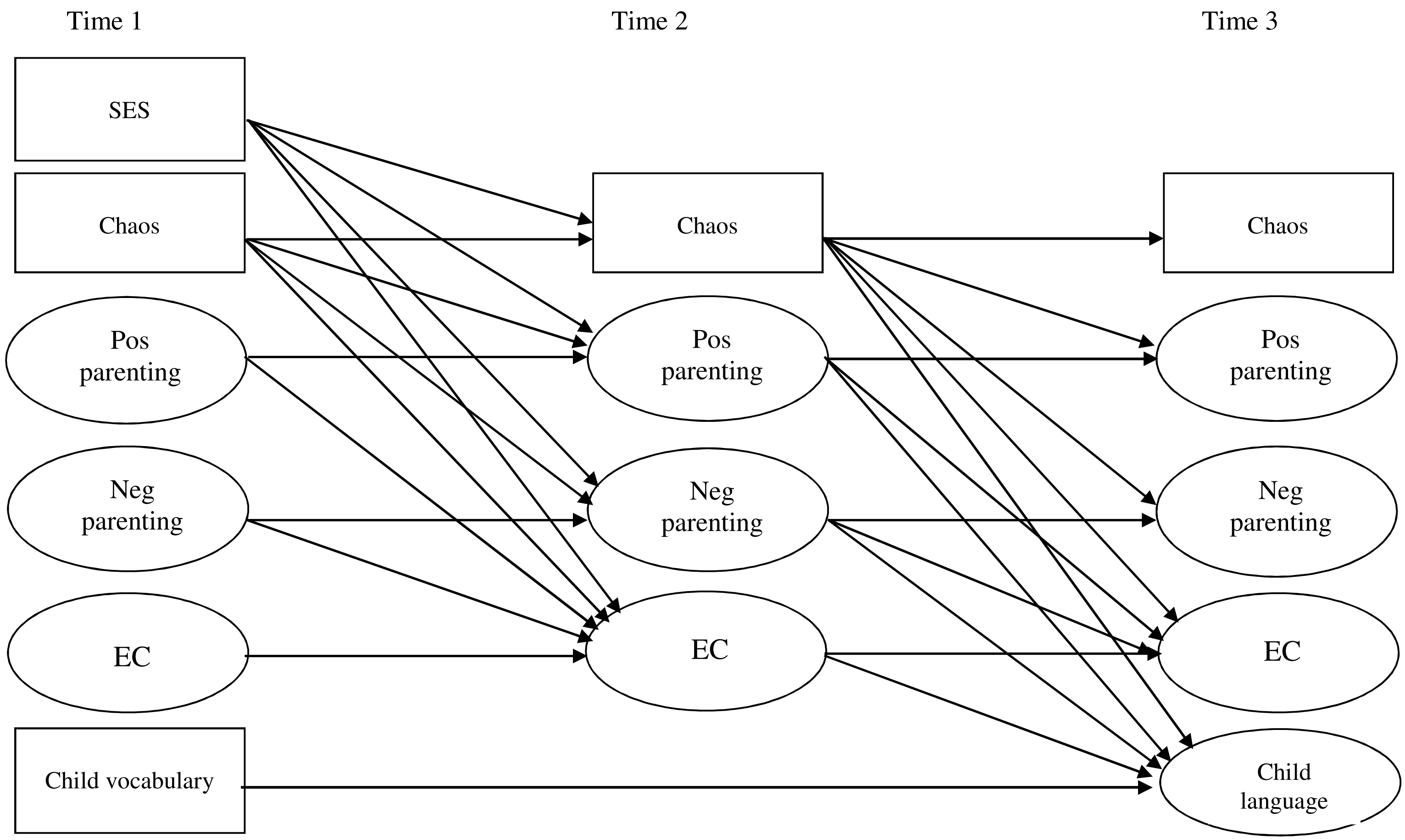
Note. Correlations between constructs within time also will be estimated. For simplicity and clarity in the figure, only the constructs are represented.

Figure 8



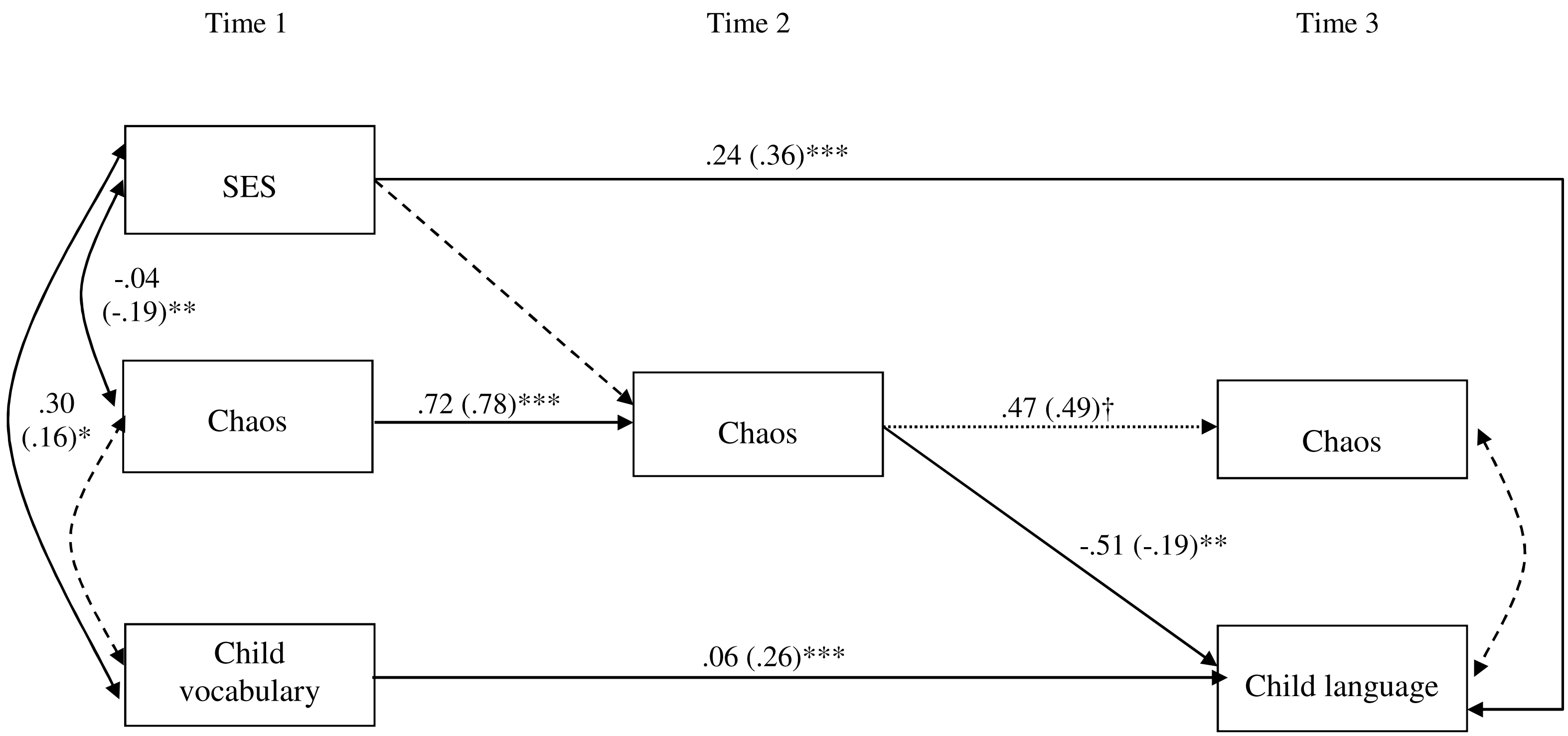
Note. Correlations between constructs also will be estimated.

Figure 9



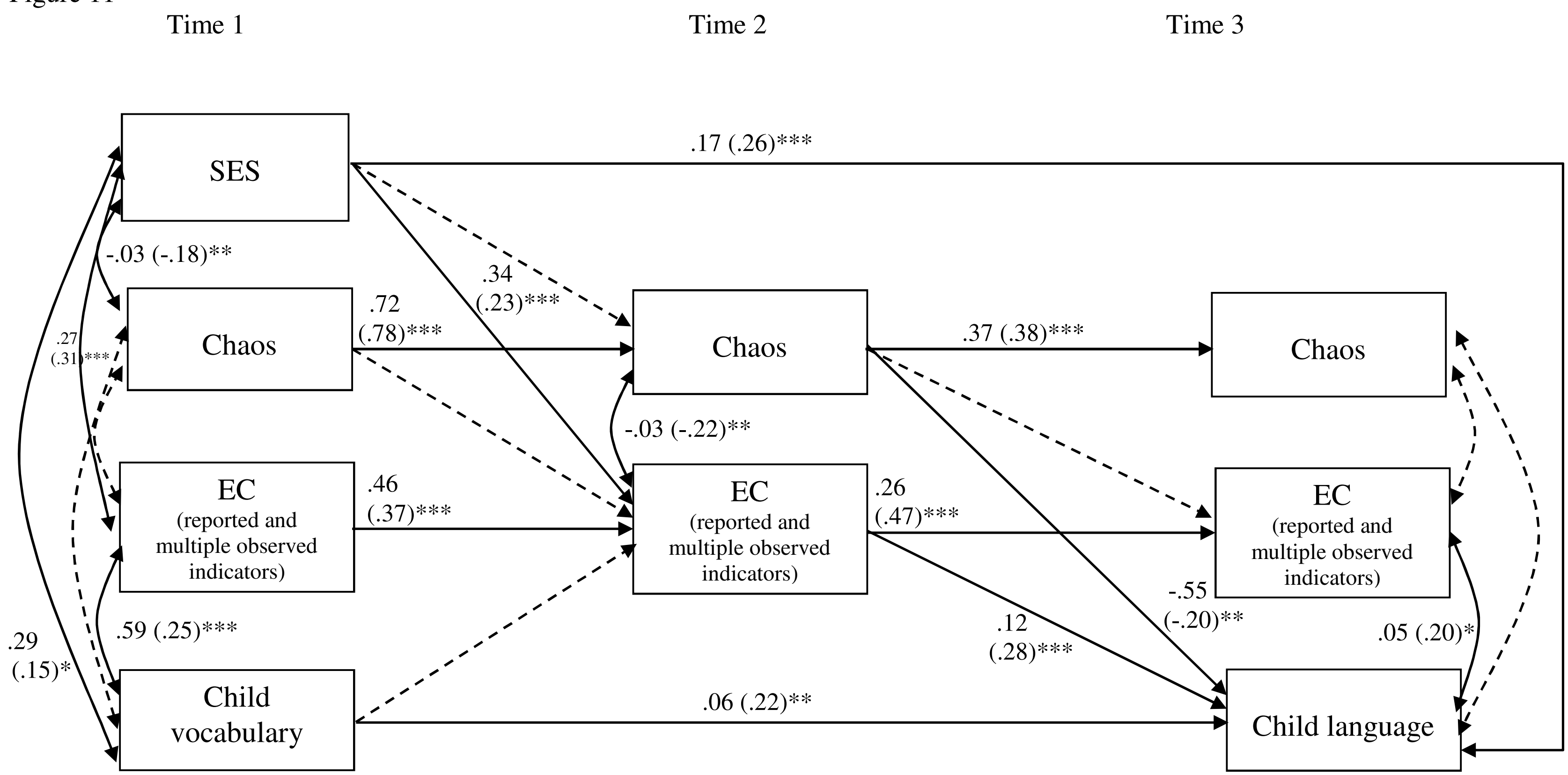
Note. Correlations between constructs within time also will be estimated. For simplicity and clarity in the figure, only the constructs are represented.

Figure 10



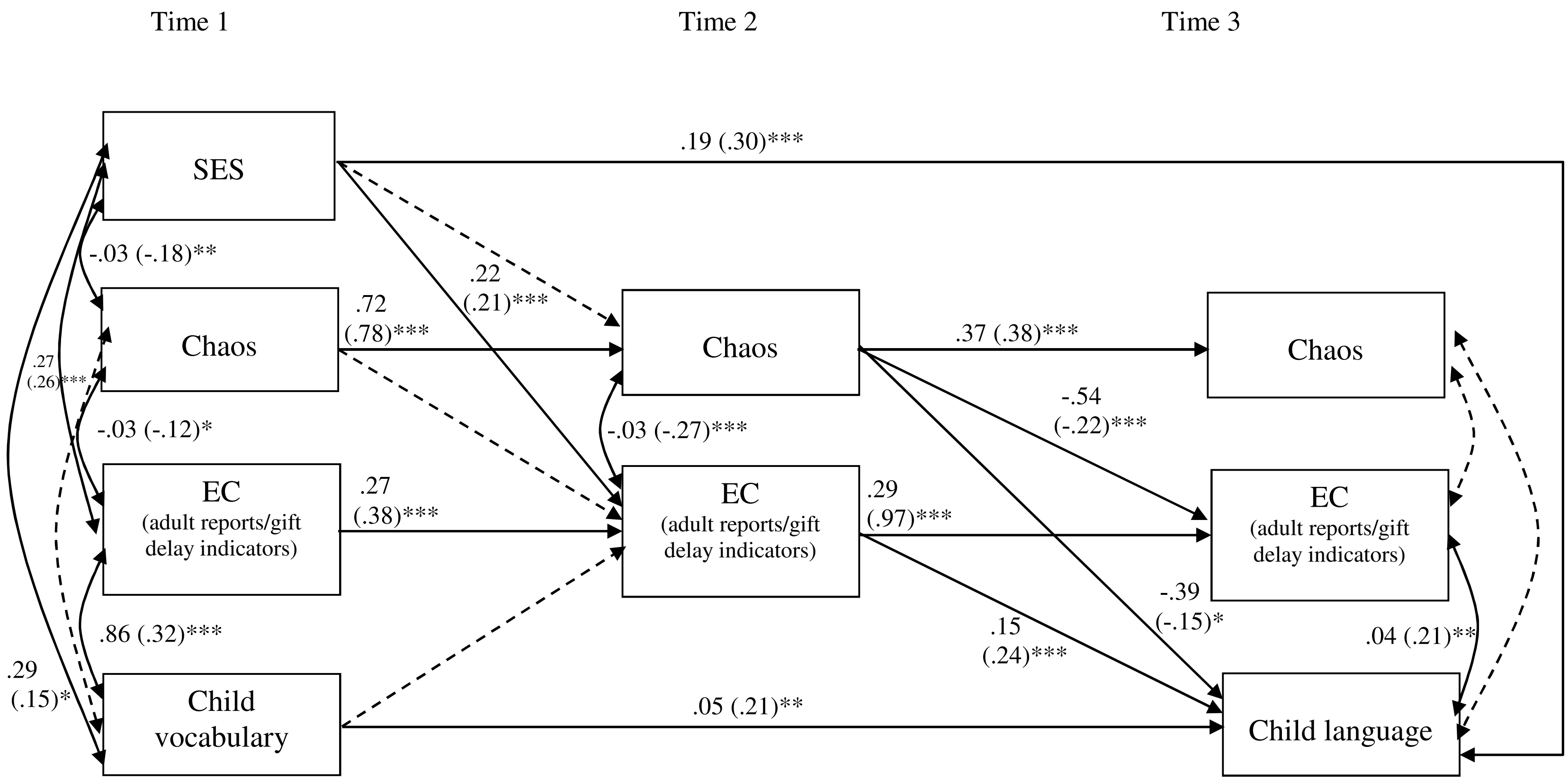
Note. Model fit indices: $\chi^2(3) = .94$, *ns*; CFI = 1.00; RMSEA = .00 (CI = .00 - .07); SRMR = 0.01. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dotted lines are marginal ($p < .10$); dashed lines are non-significant.

Figure 11



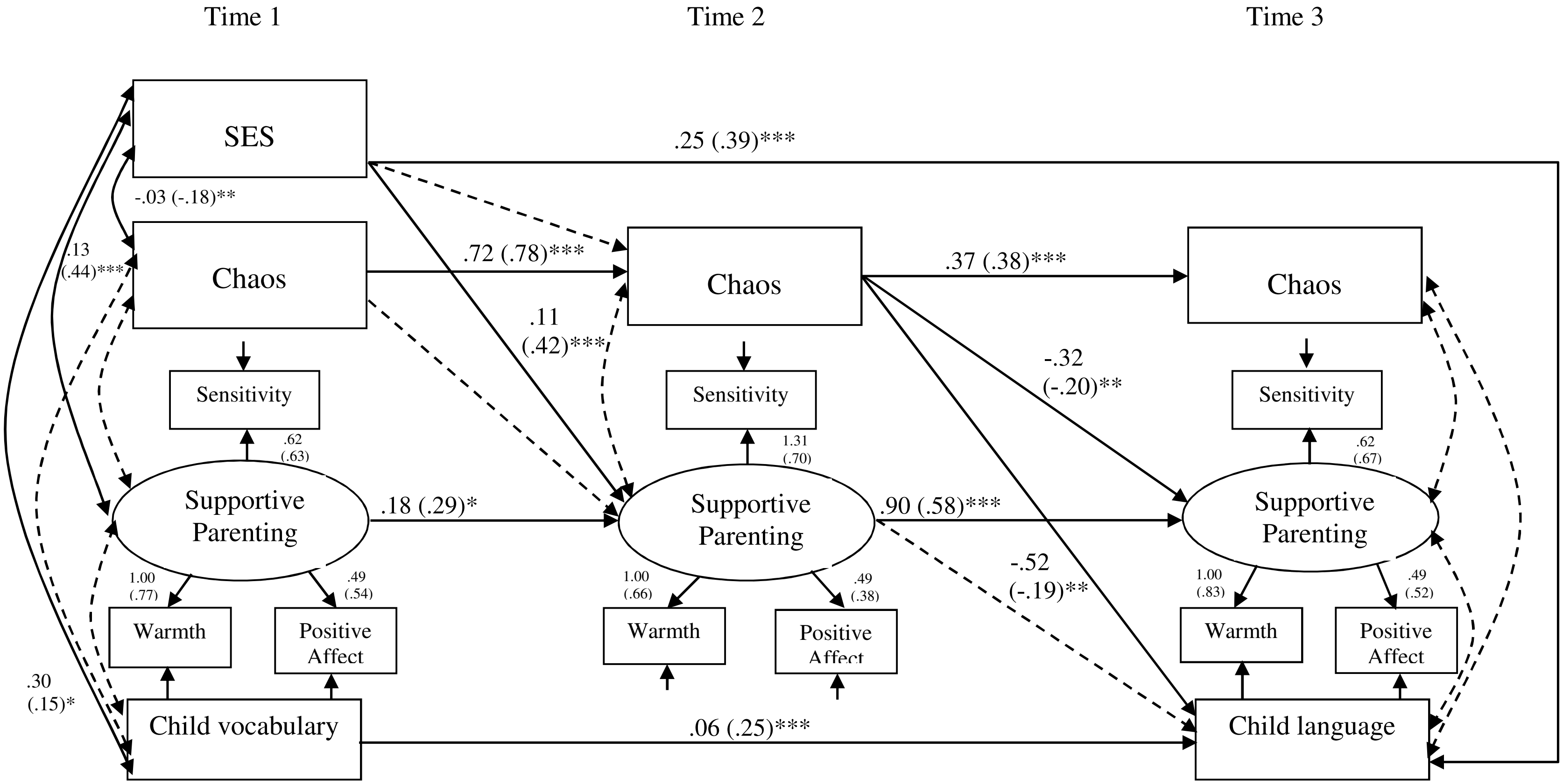
Note. Model fit indices: $\chi^2(12) = 10.34$, $p = ns$; CFI = 1.00; RMSEA = .00 (90% confidence interval [CI] = .00 - .06); SRMR = 0.02. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dashed lines are non-significant.

Figure 12



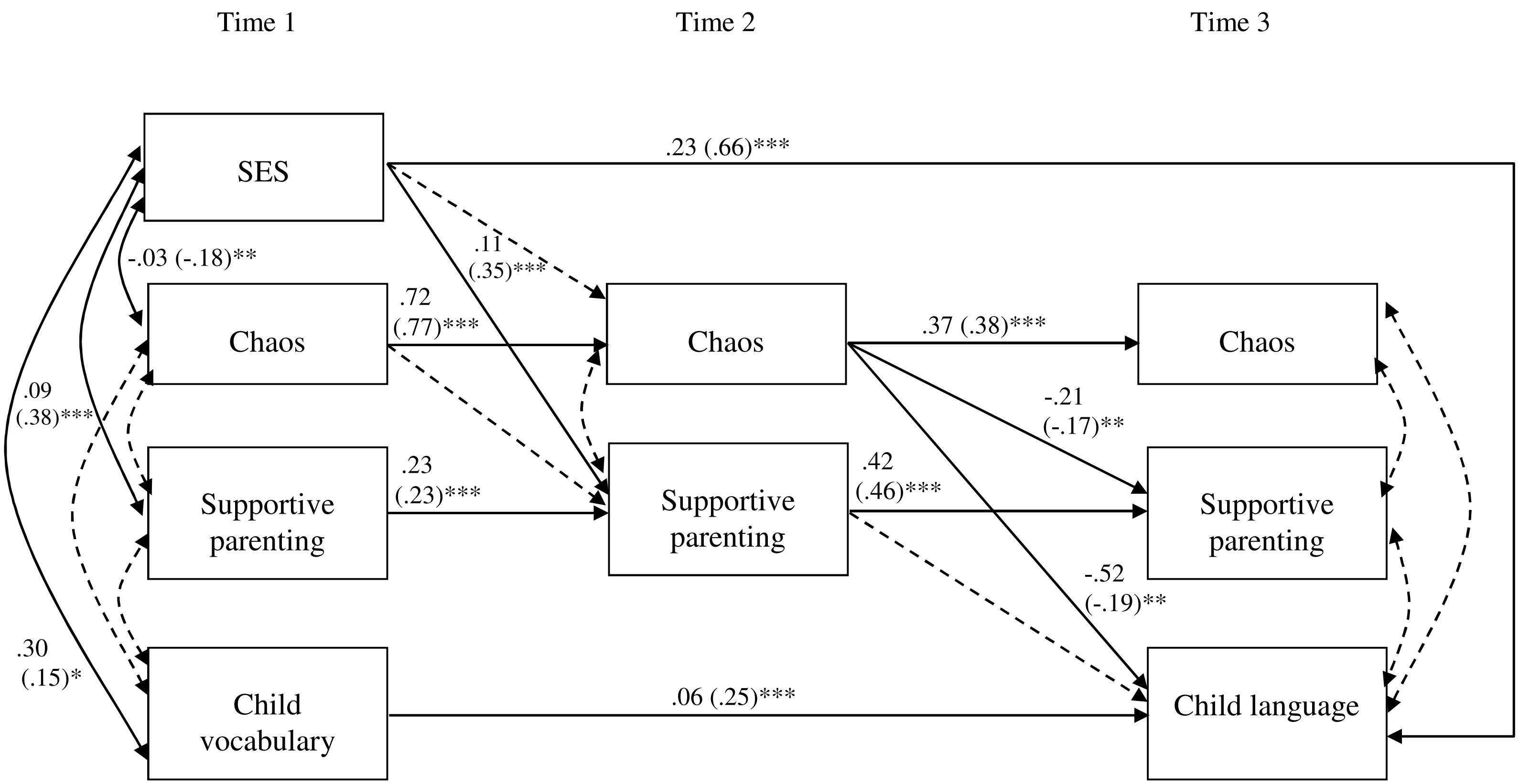
Note. Model fit indices: $\chi^2(12) = 11.66$, $p < .001$; CFI = 1.00; RMSEA = .00 (90% confidence interval [CI] = .00 - .07); SRMR = 0.03. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dashed lines are non-significant.

Figure 13



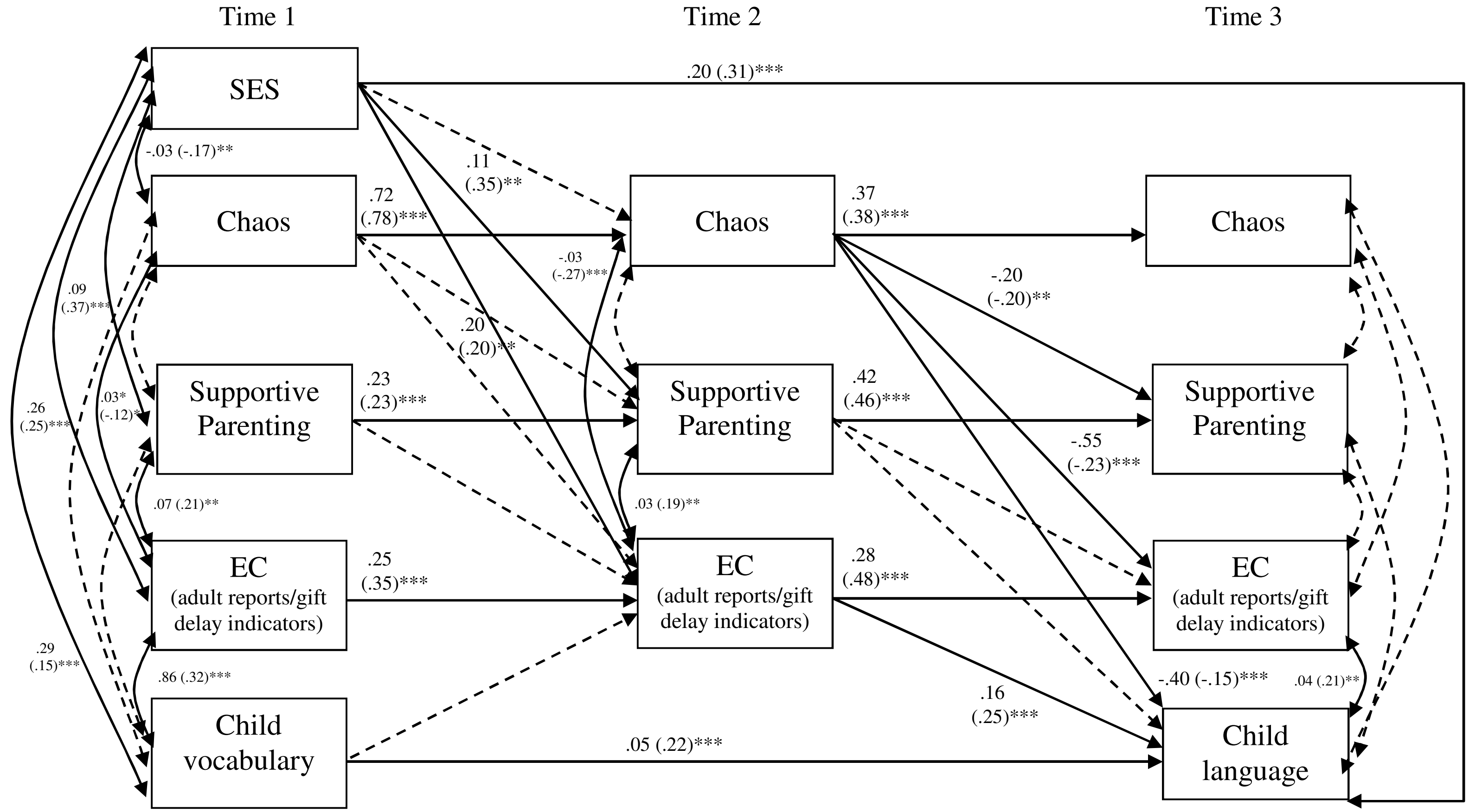
Note. Model fit indices: $\chi^2(70) = 107.46$, $p < .001$; CFI = .96; RMSEA = .05 (90% confidence interval [CI] = .03 - .07); SRMR = .07. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dashed lines are non-significant.

Figure 14



Note. Model fit indices: $\chi^2(13) = 27.32$, $p < .001$; CFI = .97; RMSEA = .07 (90% confidence interval [CI] = .03 - .11); SRMR = 0.05. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dashed lines are non-significant.

Figure 15



Note. Model fit indices: $\chi^2(13) = 27.32$, $p < .001$; CFI = .97; RMSEA = .07 (90% confidence interval [CI] = .03 - .11); SRMR = 0.05. Unstandardized estimates are presented first; completely standardized estimates are presented in parentheses. Solid lines are significant, $p < .05$; dashed lines are non-significant.

Figure 16

The Interaction of T2 Chaos and SES in Predicting Supportive Parenting at T3

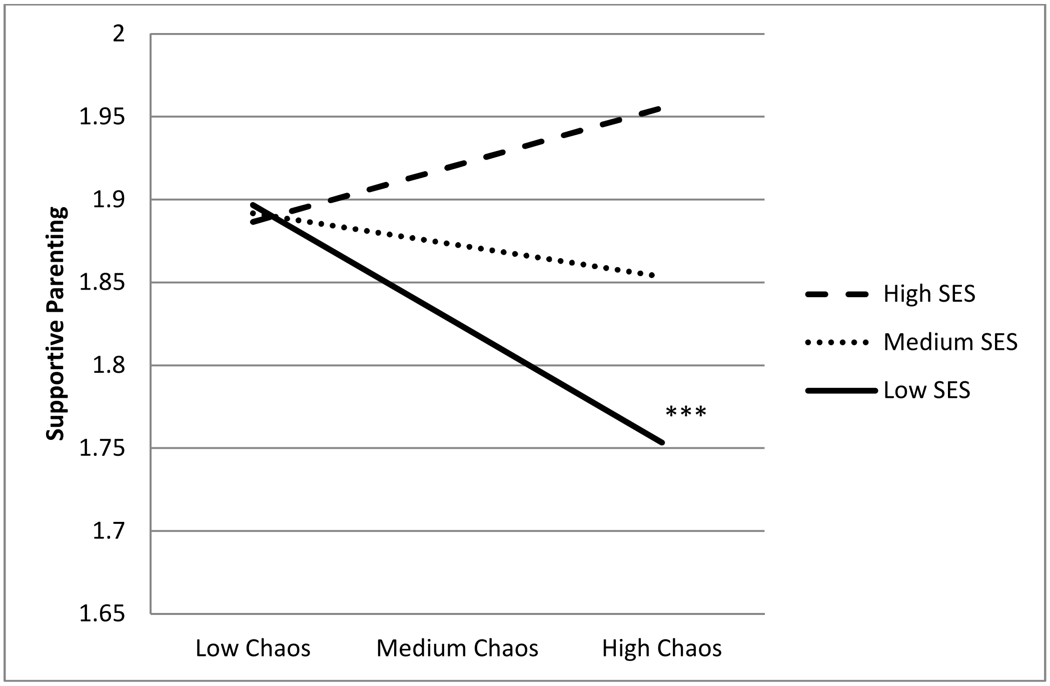
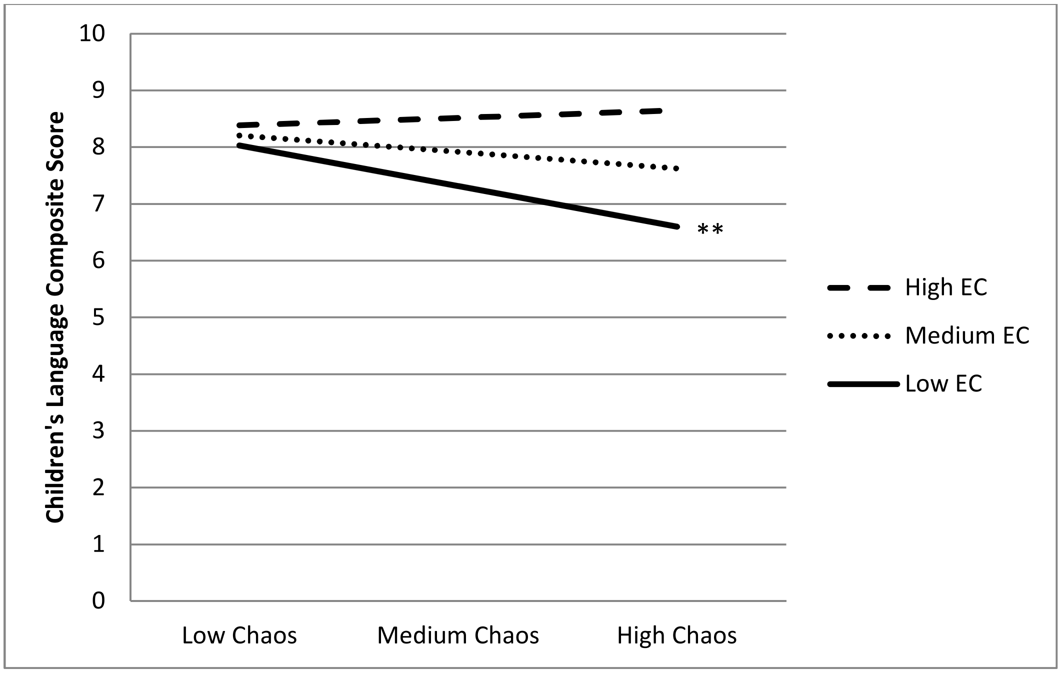


Figure 17

The Interaction of T2 Chaos and T2 EC in Predicting Children's Language at T3



APPENDIX A

QUESTIONNAIRE MEASURES

Household Chaos:
Confusion, Hubbub, and Order Scale (CHAOS)

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*(3), 429-444. doi:10.1016/0193-3973(95)90028-4

CHAOS

1. There is very little commotion in our home.
2. We can usually find things when we need them.
3. We almost always seem to be rushed.
4. We are usually able to stay on top of things.
5. No matter how hard we try, we always seem to be running late.
6. It's a real zoo in our home.
7. At home we can talk to each other without being interrupted.
8. There is often a fuss going on at our home.
9. No matter what our family plans, it usually doesn't seem to work out.
10. You can't hear yourself think in our home.
11. I often get drawn into other people's arguments at home.
12. Our home is a good place to relax.
13. The telephone takes up a lot of our time at home.
14. The atmosphere in our home is calm.
15. First thing in the day, we have a regular routine at home.

Vocabulary:
MacArthur Communicative Development Inventory (CDI)

Fenson, L., Pethick, S., Renda, C., Cox, J., Dale, P. & Reznick, J.S. (2000). Short-form versions of the MacArthur Communicative Development Inventories. *Applied Psycholinguistics, 21*, 95-115.

MacArthur Short Form Vocabulary Checklist (Level II) – Form A

1. baa baa
2. meow
3. ouch
4. uh oh
5. woof woof
6. bear
7. bird
8. cat
9. dog
10. duck
11. horse
12. airplane
13. boat
14. car
15. ball
16. book
17. game
18. applesauce
19. candy
20. coke
21. cracker
22. juice
23. meat
24. milk
25. peas
26. hat
27. necklace
28. shoe
29. sock
30. chin
31. car
32. hand
33. leg
34. broom
35. comb
36. mop
37. plate
38. trash
39. tray
40. towel
41. bed
42. bedroom
43. bench
44. oven
45. stairs
46. flag
47. rain
48. star
49. swing
50. school
51. sky
52. party
53. friend
54. mommy
55. person
56. bye
57. hi
58. no
59. shopping
60. thank you
61. carry
62. chase
63. dump
64. finish
65. fit
66. hug
67. listen
68. like
69. pretend
70. rip
71. shake
72. taste
73. gentle
74. think
75. wish
76. all gone
77. cold
78. fast
79. happy
80. hot
81. last
82. tiny
83. wet
84. after
85. day
86. tonight
87. our
88. them
89. this
90. us
91. where
92. beside
93. down
94. under
95. all
96. much
97. could
98. need
99. would
100. if

MacArthur Short Form Vocabulary Checklist (Level II) – Form B

1. baa baa
2. moo
3. ouch
4. yum yum
5. quack quack
6. bird
7. duck
8. fish
9. kitty
10. moose
11. penguin
12. boat
13. truck
14. balloon
15. present
16. puzzle
17. cheese
18. chicken
19. cookie
20. juice
21. pretzel
22. salt
23. sauce
24. vanilla
25. cup
26. beads
27. hat
28. jeans
29. shoe
30. feet
31. nose
32. tongue
33. bottle
34. bowl
35. clock
36. glass
37. jar
38. keys
39. light
40. telephone
41. bathtub
42. chair
43. crib
44. porch
45. sofa
46. cloud
47. hose
48. sidewalk
49. sun
50. house
51. store
52. zoo
53. baby
54. mommy
55. child
56. mailman
57. bath
58. bye
59. lunch
60. night night
61. no
62. bite
63. build
64. catch
65. drink
66. drop
67. find
68. go
69. hide
70. jump
71. kick
72. look
73. pick
74. run
75. sit
76. big
77. black
78. then
79. careful
80. dirty
81. fine
82. mad
83. noisy
84. slow
85. before
86. today
87. tomorrow
88. she
89. their
90. they
91. yourself
92. why
93. above
94. away
95. up
96. none
97. some
98. does
99. don’t
100. were

Effortful Control:
Early Childhood Behavior Questionnaire (ECBQ)

Rothbart, M.K. (2000). *The Early Childhood Behavior Questionnaire*. Retrieved January 27, 2002 from University of Oregon, Mary Rothbart's Temperament Laboratory Web site: http://www.uoregon.edu/~maryroth

Attentional focusing

When engaged in play with his/her favorite toy, how often did your child:

1. play for 5 minutes or less? REVERSED
2. play for more than 10 minutes?

When engaged in an activity requiring attention, such as building with blocks, how often did your child:

3. move quickly to another activity? REVERSED
4. stay involved for 10 minutes or more?
5. tire of the activity relatively quickly? REVERSED

When playing alone, how often did your child:

6. become easily distracted? REVERSED
7. play with a set of objects for 5 minutes or longer at a time?
8. move from one task or activity to another without completing any? REVERSED
9. have trouble focusing on a task without help? REVERSED

While looking at picture books on his/her own, how often did your child:

10. stay interested in the book for 5 minutes or less? REVERSED
11. stay interested in the book for more than 10 minutes at a time?
12. become easily distracted? REVERSED

Attentional shifting

When playing outdoors, how often did your child:

1. look immediately when you pointed at something?

When engaged in play with his/her favorite toy, how often did your child:

2. continue to play <u>while at the same time</u> responding to your remarks or questions?

After having been interrupted, how often did your child

3. return to a previous activity?
4. have difficulty returning to the previous activity? REVERSED

During everyday activities, how often did your child:

5. pay attention to you right away when you called to him/her?
6. stop going after a forbidden object (such as a VCR) when you used a toy to distract him/her?

During everyday activities, how often did your child seem able to:

7. easily shift attention from one activity to another?
8. do more than one thing at a time (such as playing with a toy while watching TV)?

When interrupted during a favorite TV show, how often did your child:

9. immediately return to watching the TV program?
10. not finish watching the program?

While you were talking with someone else, how often did your child:

11. easily switch attention from speaker to speaker?

When you were busy, how often did your child:

12. find another activity to do when asked?

Inhibitory control

When asked NOT to, how often did your child:

1. run around your house or apartment anyway?
2. touch an attractive item (such as an ornament) anyway?
3. play with something anyway?

When told “no”, how often did your child:

4. stop an activity quickly?
5. stop the forbidden activity?
6. ignore your warning?

When asked to wait for a desirable item (such as ice cream), how often did your child:

7. seem unable to wait for as long as 1 minute?
8. go after it anyway?
9. wait patiently?

When asked to do so, how often was your child able to:

10. stop an ongoing activity?
11. lower his or her voice?
12. be careful with something breakable?

Effortful Control:
Children’s Behavior Questionnaire (CBQ)

Rothbart, M. K., Ahadi, S. A., Hershey, K., & Fisher, P. (2001). Investigations of temperament at three to seven years: The Children's Behavior Questionnaire. *Child Development, 72*, 1287-1604.

Attentional focusing

My (This) child:

1. When picking up toys or doing other tasks, usually keeps at the task until it’s done.
2. When working on an activity, has a hard time keeping her/his mind on it. REVERSED
3. Will move from one task to another without completing any of them. REVERSED
4. When drawing or coloring in a book, shows strong concentration.
5. When building or putting something together, becomes very involved in what s/he s doing, and works for long periods.
6. Has difficulty leaving a project s/he has begun.
7. Is easily distracted when listening to a story. REVERSED
8. Sometimes becomes absorbed in a picture book and looks at it for a long time.
9. Has a hard time concentrating on an activity when there are distracting noises. REVERSED
10. Has trouble concentrating when listening to a story. REVERSED
11. When watching TV, is easily distracted by other noises or movements. REVERSED
12. Is distracted from her/his projects when you enter the room. REVERSED
13. Often shifts rapidly from one activity to another. REVERSED
14. Will ignore others when playing with an interesting toy.

Caregiver version the same except for:

1. When cleaning up or doing other tasks, usually keeps at the task until it's done.
2. When working on a school activity, has a hard time keeping her/his mind on it.
11. Not included in caregiver version.

Attentional shifting

My (This) child:

1. Is hard to get her/his attention when s/he is concentrating on something.

REVERSED

2. Can easily shift from one activity to another.
3. Has a lot of trouble stopping an activity when called to do something else. REVERSED
4. Has an easy time leaving play do another activity.
5. Sometimes doesn't seem to hear me when I talk to her/him. REVERSED
6. Has a hard time shifting from one activity to another. REVERSED
7. Is good at games with rules, such as card games.
8. Can easily leave off working on a project if asked.
9. Often doesn't seem to hear me when s/he is working on something. REVERSED
10. Sometimes has a "dreamy" quality when others talk to her/him, as if s/he were somewhere else. REVERSED
11. Needs to complete one activity before being asked to start on another one. REVERSED
12. Seems to follow her/his own direction, even when asked to do something different. REVERSED

Inhibitory control

My (This) child:

1. Can lower his/her voice when asked to do so.
2. Is good at games like "Simon Says," "Mother, May I?" and "Red Light, Green Light."
3. Has a hard time following instructions. REVERSED
4. Prepares for trips and outings by planning things s/he will need.
5. Can wait before entering into new activities if s/he is asked to.
6. Has difficulty waiting in line for something. REVERSED
7. Has trouble sitting still when s/he is told to (at movies, church, etc.). REVERSED
8. Is able to resist laughing or smiling when it isn't appropriate.
9. Is good at following instructions.
10. Approaches places s/he has been told are dangerous slowly and cautiously.
11. Is not very careful and cautious in crossing streets. REVERSED
12. Can easily stop an activity when s/he is told "no."
13. Is usually able to resist temptation when told s/he is not supposed to do something.

Effortful Control:
Infant Behavior Record (IBR)

Bayley, N. (1969). *The Bayley Scales of Infant Development*. Training and Scoring Manual.
Stifter, C. & Corey, J. (2001). Vagal regulation and observed social behavior in infancy. *Social-Development, 10*, 189-201.

Attention to Tasks

The degree to which the child remains focused on the tasks presented by the examiner; in other words, the degree to which the child sustains interest in the tasks.
1 = Constantly off-task, does not attend
2 = Attends to a toy, task or person, but is easily distracted and typically off-task
3 = Moderate attention to each new toy, person, or situation; soon ready for another; off-task half the time
4 = Continues interest in persons, tasks or things for rather long periods
5 = Long continued absorption in a toy, activity or person

Persistence in Attempting to Complete Tasks

The degree to which the child persists at tasks in attempting to complete them. Persistence should be distinguished from perseveration, in which the child repeats a part of the task without the aim of completing the entire task.
1 = Consistently lacks persistence
2 = Typically not persistent; one or two instances of persistence
3 = Lacks persistence half the time
4 = Typically persistent; lacks persistence in one or two instances
5 = Consistently persistent

Parenting:
Coping with Toddlers' Negative Emotions Scale (CTNES)

Spinrad, T. L., Eisenberg, N., Gaertner, B., Popp, T., Smith, C. L., Kupfer, A., Greving, K., Liew, J. & Hofer, C. (2007). Relations of maternal socialization and toddlers' effortful control to the quality of children's social functioning: *Developmental Psychology, 43,* 1170-1186.

Expressive Encouragement (EE)
Emotion-Focused Reactions (EFR)
Problem-Focused Reactions (PFR)
Minimizing Reactions (MR)
Punitive Reactions (PR)

*For each of the 12 hypothetical situations, items from additional subscales are not listed.

1. If my child becomes angry because he wants to play outside and cannot do so because he is sick, I would:

a. Tell my child we will not get to do something else fun (i.e., watch t.v., play games) unless he stops behaving like that **(PR)**

b. Tell my child it's ok to be angry **(EE)**

c. Soothe my child and/or do something with him to make him feel better **(EFR)**

c. Help my child find something he wants to do inside. **(PFR)**

e. Tell my child that he is making a big deal out of nothing **(MR)**

2. If my toddler spilled something and made a big mess on the carpet, and then gets upset and cries, I would:

a. Comfort my child by picking him up and/or trying to get him to forget about the accident **(EFR)**

b. Tell my child that he is overreacting or making a big deal out of nothing **(MR)**

c. Send my child to his room for making a mess **(PR)**

d. Help my child find a way to clean up the mess **(PFR)**

e. Tell my child that it is ok to be upset **(EE)**

3. If my child loses some prized possession (for example, favorite blanket or stuffed animal) and reacts with tears, I would:

a. Help my child think of other places to look for the toy **(PFR)**

b. Distract my child with another toy to make him feel better **(EFR)**

c. Tell my child that it is not that important **(MR)**

d. Tell my child it is his fault for not being careful with the toy **(PR)**

e. Tell my child it is okay to feel sad about the loss **(EE)**

4. If my child is afraid of going to the doctor or of getting shots and becomes quite shaky and teary, I would:

a. Tell him to shape up or he won't be allowed to do something he likes to do (i.e., go to playground) **(PR)**

b. Tell my child that it is ok to be nervous or afraid **(EE)**

c. Tell my child that it's really no big deal **(MR)**

d. Comfort my child before and/or after the shot **(EFR)**

e. Help him think of ways to make it less scary, like squeezing my hand when he gets a shot **(PFR)**

5. If my child is going to spend the afternoon with a new babysitter and becomes nervous and upset because I am leaving him, I would:

a. Distract my child by playing and talking about all of the fun he will have with the sitter **(EFR)**

b. Tell my child that he won't get to do something else enjoyable (i.e., go to playground, get a special snack) if he doesn't stop behaving like that **(PR)**

d. Tell him that it's nothing to get upset about **(MR)**

e. Help my child think of things to do that will make it less stressful, like me calling him once during the evening **(PFR)**

f. Tell my child that it's ok to be upset **(EE)**

6. If my child becomes upset and cries because he is left alone in his bedroom to go to sleep, I would:

a. Tell my child that if he doesn't stop crying, we won't do something fun when he wakes up **(PR)**

b. Tell my child it's okay to cry when he is sad **(EE)**

c. Soothe my child with a hug or kiss **(EFR)**

d. Help my child find ways to deal with my absence (hold a favorite stuffed animal, turn on a nightlight, etc) **(PFR)**

e. Tell him that there is nothing to be afraid of **(MR)**

7. If my child becomes angry because he is not allowed to have a snack (i.e., candy, ice cream) when he wants it, I would:

a. Send my child to his room **(PR)**

b. Distract child by playing with other toys or games **(EFR)**

c. Tell him that there is no reason to be upset **(MR)**

d. Tell my child it's okay to feel angry **(EE)**

e. Help my child think of something to eat that he is allowed to have between meals **(PFR)**

8. If my child becomes upset because I removed something that my child should have not been playing with, I would:

a. Tell my child that if he touches it again he will not be allowed to do something enjoyable **(PR)**

b. Help my child think of something else to do that is fun **(PFR)**

c. Tell my child it's okay to feel angry **(EE)**

d. Distract my child with something else interesting **(EFR)**

e. Ignore my child's upset reactions and take the object away **(MR)**

9. If my child wants me to play with him and I cannot do so right then (i.e., I am on the phone, in the middle of a conversation with someone), and my child becomes upset, I would:

a. Tell my child that there is nothing to be upset about **(MR)**

b. Help my child find something to do while he waits for me to play with him. **(PFR)**

c. Tell my child I won't play with him later if he doesn't stop behaving like that **(PR)**

d. Tell my child it's okay to be upset **(EE)**

e. Soothe my child and talk to him to make him feel better **(EFR)**

10. If my child is playing with a puzzle or shape sorter toy and cannot fit a piece correctly, and gets upset and cries, I would:

a. Take the toy away from my child **(PR)**

b. Comfort my child with a pat or a kiss **(EFR)**

c. Tell my child it's okay to get frustrated and upset **(EE)**

d. Help my child figure out how to put the piece in correctly **(PFR)**

e. Tell my child it's nothing to cry about **(MR)**

11. If my child has climbed onto a piece of playground equipment and gets stuck, and becomes nervous and begins to cry, I would:

a. Help my child figure out how to get down from the climber **(PFR)**

b. Tell my child he shouldn't have gone up by himself. **(PR)**

c. Tell my child its nothing to get upset about **(MR)**

d. Comfort my child with words or a pat **(EFR)**

e. Tell my child it's okay to be afraid **(EE)**

12. If my child fell down and scraped himself while trying to get a favorite toy, I would:

a. Help my child figure out how to feel better (getting a band-aid) **(PFR)**

b. Distract my child with something else **(EFR)**

c. Tell my child that he should be more careful **(PR)**

d. Tell my child its nothing to get upset about **(MR)**

e. Tell my child it's okay to cry **(EE)**

Parenting:
Coping with Children's Negative Emotions Scale (CCNES)

Eisenberg, N. & Fabes, R.A. (1994). Mother's reactions to children's negative emotions: Relations to children's temperament and anger behavior. *Merrill-Palmer Quarterly, 40*, 138-156.

Eisenberg, N., Fabes, R.A. & Murphy, B.C. (1996). Parents' reactions to children's negative emotions: Relations to Children's Social Competence and Comforting Behavior. *Child Development, 67*, 2227 – 2247.

Expressive Encouragement (EE)
Emotion-Focused Reactions (EFR)
Problem-Focused Reactions (PFR)
Minimizing Reactions (MR)
Punitive Reactions (PR)

*For each of the 12 hypothetical situations, items from additional subscales are not listed.

1. **If my child becomes angry because he/she is sick or hurt and can't go to his/her friend's birthday party, I would:**
   a. send my child to his/her room to cool off **(PR)**
   b. help my child think about ways that he/she can still be with friends (e.g., invite some friends over after the party) **(PFR)**
   c. tell my child not to make a big deal out of missing the party **(MR)**
   d. encourage my child to express his/her feelings of anger and frustration **(EE)**
   e. soothe my child and do something fun with him/her to make him/her feel better about missing the party **(EFR)**

2. **If my child falls off his/her bike and breaks it, and then gets upset and cries, I would:**
   a. comfort my child and try to get him/her to forget about the accident **(EFR)**
   b. tell my child that he/she is over-reacting **(MR)**
   c. help my child figure out how to get the bike fixed **(PFR)**
   d. tell my child it's ok to cry **(EE)**
   e. tell my child to stop crying or he/she won't be allowed to ride his/her bike anytime soon **(PR)**

3. **If my child loses some prized possession and reacts with tears, I would:**
   a. tell my child that he/she is over-reacting **(MR)**
   b. help my child think of places he/she hasn't looked yet **(PFR)**
   c. distract my child by talking about happy things **(EFR)**
   d. tell him/her it's ok to cry when you feel unhappy **(EE)**
   e. tell him/her that's what happens when you're not careful **(PR)**

4. **If my child is afraid of injections and becomes quite shaky and teary while waiting for his/her turn to get a shot, I would:**

a. tell him/her to shape up or he/she won't be allowed to do something he/she likes to do (e.g., watch TV) **(PR)**
b. encourage my child to talk about his/her fears **(EE)**
c. tell my child not to make big deal of the shot **(MR)**
d. comfort him/her before and after the shot **(EFR)**
e. talk to my child about ways to make it hurt less (such as relaxing so it won't hurt or taking deep breaths) **(PFR)**

5. **If my child is going over to spend the afternoon at a friend's house and becomes nervous and upset because I can't stay there with him/her, I would:**
a. distract my child by talking about all the fun he/she will have with his/her friend **(EFR)**
b. help my child think of things that he/she could do so that being at the friend's house without me wasn't scary (e.g., take a favorite book or toy with him/her) **(PFR)**
c. tell my child to quit over-reacting and being a baby **(MR)**
d. tell the child that if he/she doesn't stop that he/she won't be allowed to go out anymore **(PR)**
e. encourage my child to talk about his/her nervous feelings **(EE)**

6. **If my child is participating in some group activity with his/her friends and proceeds to make a mistake and then looks embarrassed and on the verge of tears, I would:**
a. comfort my child and try to make him/her feel better **(EFR)**
b. tell my child that he/she is over-reacting **(MR)**
c. tell my child to straighten up or we'll go home right away **(PR)**
d. encourage my child to talk about his/her feelings of embarrassment **(EE)**
e. tell my child that I'll help him/her practice so that he/she can do better next time **(PFR)**

7. **If my child is about to appear in a recital or sports activity and becomes visibly nervous about people watching him/her, I would:**
a. help my child think of things that he/she could do to get ready for his/her turn (e.g., to do some warm-ups and not to look at the audience) **(PFR)**
b. suggest that my child think about something relaxing so that his/her nervousness will go away **(EFR)**
c. tell my child that he/she is being a baby about it **(MR)**
d. tell my child that if he/she doesn't calm down, we'll have to leave and go home right away **(PR)**
e. encourage my child to talk about his/her nervous feelings **(EE)**

8. **If my child receives an undesirable birthday gift from a friend and looks obviously disappointed, even annoyed, after opening it in the presence of the friend, I would:**
a. encourage my child to express his/her disappointed feelings **(EE)**
b. tell my child that the present can be exchanged for something the child wants **(PFR)**
c. tell my child that he/she is over-reacting **(MR)**
d. scold my child for being insensitive to the friend's feelings **(PR)**
e. try to get my child to feel better by doing something fun **(EFR)**

9. **If my child is panicky and can't go to sleep after watching a scary TV**

show, I would:

a. encourage my child to talk about what scared him/her **(EE)**
b. tell my child that he/she is over-reacting **(MR)**
c. help my child think of something to do so that he/she can get to sleep (e.g., take a toy to bed, leave the lights on) **(PFR)**
d. tell him/her to go to bed or he/she won't be allowed to watch any more TV **(PR)**
e. do something fun with my child to help him/her forget about what scared him/her **(EFR)**

10. If my child is at a park and appears on the verge of tears because the other children are mean to him/her and won't let him/her play with them, I would:

a. tell my child that if he/she starts crying then we'll have to go home right away **(PR)**
b. tell my child it's ok to cry when he/she feels bad **(EE)**
c. comfort my child and try to get him/her to think about something happy **(EFR)**
d. help my child think of something else to do **(PFR)**
e. tell my child that he/she will feel better soon **(MR)**

11. If my child is playing with other children and one of them calls him/her names, and my child then begins to tremble and become tearful, I would:

a. tell my child not to make a big deal out of it **(MR)**
b. tell my child to behave or we'll have to go home right away **(PR)**
c. help my child think of constructive things to do when other children tease him/her (e.g., find other things to do) **(PFR)**
d. comfort him/her and play a game to take his/her mind off the upsetting event **(EFR)**
e. encourage him/her to talk about how it hurts to be teased **(EE)**

12. If my child is shy and scared around strangers and consistently becomes teary and wants to stay in his/her bedroom whenever family friends come to visit, I would:

a. help my child think of things to do that would make meeting my friends less scary (e.g., to take a favorite toy with him/her when meeting my friends) **(PFR)**
b. tell my child that it is OK to feel nervous **(EE)**
c. try to make my child happy by talking about the fun things we can do with our friends **(EFR)**
d. tell my child that he/she must stay in the living room and visit with our friends **(PR)**
e. tell my child that he/she is being a baby **(MR)**

APPENDIX B

OBSERVED BEHAVIORAL MEASURES

Effortful Control:
Dinky Toys

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36,* 220-232

Children were seated at a table and asked to place their hands in their lap. They were then shown a clear, open box containing a variety of small toys. The research assistant instructed children to keep their hands in their lap and to verbally indicate which prize they would like so that she could hand it to them. After the first prize choice, the procedure was repeated with the same instructions, allowing children to choose a second prize.

Strategy to Choose (the mean of Strategy to Choose for both trials is the "total" score)

0=Child grabs toy out of container immediately
1=Child waits >2secs before taking toy out of container
2=Child touches toy in container, but does not take out
3=Child points to toys
4=Child removes hands from lap
5=Child twitches or moves hands, but hands do not leave lap
6=Child does not remove hands from lap

Effortful Control:
Rabbit and Turtle

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36,* 220-232

A large mat was placed upon a table, which depicted a path (with 6 curves) leading through an outdoor setting. A toy barn was placed at the end of the mat, with the doors open. Using a toy figure of a same-gender child, the research assistant demonstrated how to move the figure down the path to reach the barn. During demonstration, the research assistant explained that the child figure "wanted to go home" and showed children how to move it along the path to the barn, instructing children (while pointing to the corresponding pictures on the mat), "We try not to step on these flowers; we are careful not to fall in the pond; we try to stay on the path and off of the grass." The research assistant modeled this procedure up to 3-4 times, using a hand-over-hand strategy with the child at times, until the child understood the task. The child was instructed to take the figure and "help the boy/girl go home." Next, a toy bunny figure was introduced and described as being "very fast," and the child was instructed to "help the bunny go home very fast." Finally, a toy turtle figure was introduced and described as being "very slow," and the child was instructed to "help the turtle go home very slowly."

Trials 1-2: boy/girl figure
Trials 3-4: rabbit
Trials 5-6: turtle

Scoring:
The child is given a baseline score of 1 point for each trial. To that score, the child is given credit for each curve of the path that they negotiate with the figure.

For each large curve the child must negotiate with the figure, score as follows:

Child keeps the figure on the mat and stays within the lines of the path – **2 points**
Child has the figure above the mat or follows general curvature of path – **1 point**
Child ignores this particular curve – **0 points**

Effortful Control:
Gift Delay

Kochanska, G., Murray, K. T., & Harlan, E. T. (2000). Effortful control in early childhood: Continuity and change, antecedents, and implications for social development. *Developmental Psychology, 36,* 220-232

The research assistant presented children with a gift bag containing a surprise for them, and then stated that she had "forgotten the bow" for the gift. The research assistant asked children not to touch the bag in front of them until she returned with the bow. Children were left alone in the room (3 minute delay at T1; 2 minute delay at T2 and T3).

Level of restraint during the delay:
1 = Child pulls box from bag.
2 = child puts hand into bag.
3 = Child peeks in bag.
4 = Child touches bag but does not peek.
5 = Child does not touch bag.

Parenting:
Sensitivity, Warmth, Positive Affect, Intrusiveness, and Negative Affect

During the free play session, mothers and children were given a basket of toys and encouraged to play "as they would at home."

In the teaching tasks mothers were asked to 1) teach their child how to put together a wooden puzzle (T1), 2) help their child build a copy of a pictured Lego model (T2), and 3) guide their child in completing a wooden puzzle inside of a box (mothers could see but not touch the puzzle and children could touch but not see the puzzle; T3).

Sensitivity

Sensitivity was coded during free play and the teaching task.
Sensitivity to the child is based upon behavioral evidence of her being appropriately attentive to the baby as well as appropriately and contingently responsive to his/her affect, current level of arousal, interests, and abilities. Sensitivity is evident when both the pace and the level of interaction are contingent upon the child's actions and responses. Essentially, a sensitive mother follows the Child's signals rather than imposing her own agenda on him/her--behavior which allows the infant to experience contingent responses from people and objects to his/her actions and affect.

1 = None observed during the 15-second epoch
2 = Low, minimal sensitivity
3 = Moderate, more than one instance of the behaviors above or one prolonged or intense instance, clear evidence that mother is more than minimally tuned into the baby
4 = High, mother is very aware of the infant and contingently responsive to his interests, affect, etc.; good timing is evident

Warmth

Warmth was coded during the teaching task.
General warmth between the child and parent was coded, with focus on the parents' actions and displays of warmth. Evidence of warmth included displays of closeness, friendliness, encouragement, and positive affect. Physical affection and quality of the tone/conversation was also considered.

1 = None. Parent ignores the child most of the time or displays primarily negative affect.
2 = Minimal. Parent generally does not initiate contact (verbal or physical), little positive affect is displayed – but is not negative or ignoring the child.

3 = Parent is responsive to the child and initiates contact. A little positive affect is displayed.
4 = Parent is engaged with the child for much of the time. The parent is warm and touches the child in an affectionate way.
5 = Parent is engaged with the child for most of the time. Affect toward the child is positive (frequent smiles and laughter). Positive affect is predominant. Mother is physically affectionate.

Positive Affect

Positive affect was coded during free play and the teaching task.

1 = No positive emotion
2 = Low intensity positive. Slight or very brief smile, uses positive tone.
3 = Moderate positive. Clear smile or prolonged slight smiles. Uses more prolonged positive tone.
4 = Intense positive. Intense smile or laugh, or smiling for more prolonged period. May use positive tone.

Intrusiveness

Intrusiveness was coded during free play and the teaching task.
Intrusive control reflected maternal verbal and physical behaviors that attempt to control children's actions or activities or impose a maternal agenda rather than following the child's goals. It includes behaviors such as physically manipulating the child or the child's actions on an object and failing to alter behavior that is clearly aversive to the child, such as interfering with the child's activity or focus or attention or interacting with an inappropriate (e.g., overstimulating) pace.

1 = None observed during the 15-second epoch
2 = Low, one instance
3 = Moderate, more than one instance of the behaviors above or one prolonged or intense instance
4 = High, mother is extremely intrusive or over- controlling

Negative Affect

Negative affect was coded during free play and the teaching task.

1 = No evidence of anger/frustration

2 = Low intensity anger/frustration--*mild, vague or brief facial expression of frustration, or frustrated/annoyed tone*
3 = Moderate anger/frustration--*moderate intensity annoyance/frustration, or prolonged facial expression*
4 = Intense anger/frustration--*intense or prolonged facial expression, or appears annoyed/angry for prolonged period*

Parenting:
Maternal Speech

During the free play session, mothers and children were given a basket of toys and encouraged to play “as they would at home.”

Parenting:
Maternal Speech

Maternal Vocalizations

This rating assesses the extent to which the mother vocalizes to her child during the episode, with extent defined in terms of the frequency, duration and intensity of mother's vocalizations.

1 = Mother does not vocalize during the 1-minute episode.

2 = Maternal vocalizations are rare and brief. Mother may have briefly vocalized, vocalizations are typically one-word utterances, maybe 1 or 2 strings.

3 = Mother vocalizes more frequently than would warrant a rating of 2, or fewer vocalizations are of greater duration.

4 = Mother’s vocalizations are frequent, lengthy and/or somewhat intense. A rating of 4 requires the judgment that vocalizations clearly characterize mother’s behavior during the 1-minute period.