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PARENTING STRESS AND ITS RELATIONSHIP TO ADAPTIVE SKILLS AND CHILD
BEHAVIOR OBSERVED DURING LANGUAGE INTERVENTIONS

by

EVELYN LISA FISHER

Under the Direction of MaryAnn Ronski, PhD

ABSTRACT

The purpose of this study was to examine parenting stress over time and its relationship to adaptive behavior and observed child behavior during language interventions in a sample of 113 toddlers with significant developmental delays. The data included are from two longitudinal studies of language outcomes following augmented or spoken language interventions (Ronski et al., *In preparation*; Ronski et al., 2010). We found that parenting stress was elevated relative to the normative sample, however, there was no relationship between parenting stress and observed child behavior. Lower child adaptive behavior was associated with both higher parenting stress and more observed child challenging behaviors. Our results suggest a complex picture of the relationships between parenting stress, child challenging behavior, and child adaptive behavior, in which child adaptive behavior has a stronger influence on parenting stress among parents of toddlers.

INDEX WORDS: Developmental delay, Developmental disability, Parenting stress, Adaptive behavior, Language intervention, Challenging Behavior

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EVELYN LISA FISHER

A Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of

Master of Arts

in the College of Arts and Sciences

Georgia State University

2014

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2014

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by

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December 2014

DEDICATION

I dedicate this project to friends and family who encourage and inspire me, especially Faye Fisher, James Fisher, Louise Harvey, Alyson Bouyea, and Evan Wong.

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1 INTRODUCTION

1.1 Parenting Stress

Past research indicates that parents of children with developmental disabilities experience higher levels of stress compared to parents of typically developing children (Beckman, 1991; Innocenti & Huh, 1992). These differences are most substantial in aspects of parenting stress relating to child mood and behavior (Donenberg & Baker, 1993; Smith, Ronski, Sevcik, Adamson, & Bakeman, 2011) and are strongly associated with the presence and intensity of child behavior problems, or challenging behaviors (Poehlmann, Clements, Abbeduto, & Farsad, 2005; Richman, Belmont, Kim, Slavin, & Hayner, 2009; Tomanik, Harris, & Hawkins, 2004; Walsh, Mulder, & Tudor, 2013). More severe deficits in adaptive behavior are associated with both higher parenting stress and challenging behaviors (Hodapp, Ricci, Ly, & Fidler, 2003; Matson, 2012). Deficits in adaptive behavior, and communication skills in particular, are often targeted for interventions which aim to reduce challenging behavior (Reichle, 1993). Limited information, however, is available on the relationship between child and family characteristics and challenging behavior in young children over time and how early intervention may affect this relationship. A clearer understanding of the interaction between these variables would be informative for early intervention efforts and early identification of families at risk for high parenting stress levels and child challenging behavior. The purpose of this study is to examine parenting stress over time and its relationship to adaptive behavior and observed child behavior during language interventions in a sample of toddlers with significant developmental delays. This introduction reviews current literature on both parenting stress and challenging behavior, as well as clinically meaningful correlates and considerations that likely play critical roles in efforts to ameliorate elevated parenting stress or reduce child challenging behavior.

Although most parents of children with disabilities have many positive perceptions regarding their children and engage in healthy, productive coping strategies in response to obstacles (Blacher & Baker, 2007; Hastings, Allen, McDermott, & Still, 2002; Peer & Hillman, 2012), they nonetheless report experiencing higher levels of parenting stress compared to parents of typically developing children. Studies indicate that between 23% and 53% of parents of children with developmental disabilities report parenting stress levels in the clinically elevated range on the Parenting Stress Index (Abidin, 1995), or above the 90th percentile relative to the normative sample (Hall et al., 2012; Perry, Sarlo-McGarvey, & Factor, 1992; Watson, Coons, & Hayes, 2013). These higher levels of stress are associated with a variety of undesirable outcomes that affect both parents and children, including poor parent physical health, parent depression, marital discord, less effective parenting practices, child abuse and neglect, and child psychopathology and behavioral problems (Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Coldwell, Pike, & Dunn, 2006; Crnic, Gaze, & Hoffman, 2005; Eisenhower, Baker, & Blacher, 2009; Hastings, Daley, Burns, & Beck, 2006; Kersh, Hedvat, Hauser-Cram, & Warfield, 2006).

Models of stress and families with children with developmental disabilities. The framework through which we understand the relationship between parenting stress and child disabilities has evolved considerably over the last several decades. Prior to the 1970's, the medical model prevailed as the dominant manner in which the relationship between person with a disability and society was understood (Olkin, 2001). In this model, the disability itself is a physiological or mental defect inherent in the person affected, and is treated by attempting to correct the defect. According to the medical model, stress experienced by family members of a person with a disability is a direct result of the person's impairments.

However, the medical model is insufficient for understanding the experience of disability because it fails to address the interaction between the person and the various levels of his or her social world. The development of transactional models, which emphasize the role that social relationships play in determining the experience of a disability, coincided with the rejection of the medical model. McCubbin and Figley's (1983) double ABCX model, in particular, addresses parenting stress in parents of children with disabilities using a transactional approach. In this model, the characteristics of the child, parent, and society are all important in determining the outcome following an event and whether or not the event is ultimately perceived as stressful. Specifically the outcome is determined by the build-up of stressors over time, family resources, family perceptions regarding the child and the situation, and societal influences on the family.

Child and family characteristics associated with parenting stress. Researchers have identified several child and family characteristics that are associated with parenting stress and can be understood in the context of the double ABCX model. These characteristics may directly influence parenting stress or affect the parents' perceptions regarding the child or relationship to the broader community and access to resources in ways that influence parenting stress.

Problem/challenging behavior. Studies of parenting stress in parents of children with disabilities have consistently found that the presence and intensity of child behavior problems or challenging behavior is strongly associated with parenting stress (Baker, Blacher, Crnic, & Edelbrock, 2002; Floyd & Gallagher, 1997; R. Koegel et al., 1992; Orr, Cameron, & Day, 1991; Quine & Pahl, 1985; Quittner et al., 2010; Richman et al., 2009). This relationship is especially robust on questionnaires or subscales that tap into the way in which the child's mood and behavior affect the parent (Abidin, 1995). In Baker et al.'s (2002) study of 225 children with and without development delays, parent report of child behavior problems accounted for 52% of the

variance in mothers' parenting stress levels. In a study of 200 families with children with severe intellectual disability in the United Kingdom, Quine and Pahl (1985) found that severity of children's behavior problems was the strongest determinant of family stress in regression analyses that included several variables. Similarly, in a mixed sample of 231 children with intellectual disability, chronic illness, or behavioral problems, Floyd and Gallagher (1997) found that the presence of behavioral problems was a more influential determinant of parenting stress level than child diagnosis.

Baker et al. (2003) hypothesized a transactional, mutually escalating relationship between parenting stress and child behavior problems. In this relationship, child behavior problems directly cause increases in parenting stress. Increased stress leads parents to engage in less effective parenting practices, which in turn, cause more increases in child behavior problems. Studies have demonstrated that parents experiencing high stress levels engage in more authoritarian parenting, which is characterized by harsh discipline and unresponsiveness (Crnic et al., 2005). These practices are associated with more child behavior problems and poorer developmental outcomes compared to authoritative parenting, which is characterized by warmth and responsiveness (Mathis & Bierman, 2012). The presence of bidirectional effects between parenting stress and child behavior problems was also confirmed by cross-lagged panel analyses in Neece and Baker's (2008) longitudinal study of 237 children, ages 3 to 9, with or without developmental delays. Thus, there is considerable support for a transactional relationship between child behavior problems and parenting stress, in which child behavior problems increase parenting stress and vice versa, with the latter relationship possibly being mediated by parenting practices.

Adaptive behavior. Lower child adaptive behavior are also associated with higher parenting stress (Hodapp et al., 2003; Tomanik et al., 2004). Adaptive behavior are behaviors that enable a person to function well in everyday life and care for him or herself independently (Sparrow, Cicchetti, & Balla, 2005). Domains of adaptive behavior included in the Vineland Adaptive Behaviors Scales (VABS) are communication, daily living, motor, and social skills. In Tomanik et al.'s (2004) study of 60 mothers of young children with pervasive developmental disorders, both lower adaptive behavior and higher maladaptive behaviors predicted significant variance in maternal parenting stress when entered simultaneously into a regression model. In a study of 42 children with Down syndrome or other disabilities, Hodapp et al. (2003) found that mothers of children with Down syndrome reported significantly lower levels of parenting stress, and hypothesized that this may be due the relative strengths in adaptive behavior, and especially social behavior, of children with Down syndrome.

However, some researchers have suggested that this apparent relationship is driven by the fact that children with lower adaptive behavior exhibit more behavior problems. In this way, adaptive behavior may be only peripherally associated with parenting stress whereas the behavior problems directly cause stress. In Baker et al.'s (2003) study of parenting stress in parents of 205 preschool children with and without developmental delays, child delay status did not account for a significant amount of variance in parenting stress when behavior problems was entered into the hierarchical multiple regression model in an earlier step. Likewise, Herring et al. (2006) examined longitudinal data from 123 young children with pervasive developmental disorder or other developmental delays and found that the presence of behavior problems, but not severity of developmental delay, was associated with maternal stress.

Race. Several studies have also examined the influence of parent race on report of parenting stress among parents of typically developing children. Differences in reports of parenting stress among racial groups may reflect either cultural differences in perceptions about parenting experiences or differences in the parent's relationship to the broader social context, which may determine his or her access to various types of resources and support. Research in the United States indicates that black or African American parents of typically developing children report higher levels of parenting stress than white parents of typically developing children (Cardoso, Padilla, & Sampson, 2010; Franco, Pottick, & Huang, 2010; Pinderhughes, Dodge, Bates, Pettit, & Zelli, 2000; Raphael, Zhang, Liu, & Giardino, 2010; Yu & Singh, 2012). In Cardoso et al.'s (2010) study, parenting stress was significantly higher among 1,750 black or African American mothers in the sample. These differences were reduced, but still present, after controlling for education as a proxy for socio-economic status. Greater maternal depression symptoms, more difficult child temperament, and lower partner support, were all associated with increased parenting stress among black or African American mothers.

However, the relationship between parent race and parenting stress has been less studied among parents of children with developmental disabilities. It is possible that the experience of having a child with a disability alters differences in parenting stress between parents of different groups. In support this, Burke and Hodapp (2014) found that black or African American parents reported significantly lower stress relative to white parents in a sample 965 parents of children with disabilities reached via online survey.

1.2 Challenging Behavior

. Challenging behaviors are behaviors exhibited by people with developmental disabilities that are socially inappropriate and either endanger the safety of the person or others

or limit the ability of the person to participate in activities. Emerson (2001) defines challenging behavior as, "...culturally abnormal behavior of such intensity, frequency, or duration that the physical safety of the person or others is placed in serious jeopardy, or behavior which is likely to seriously limit or deny access to the use of ordinary community facilities," (p. 5). The term 'challenging behavior' is sometimes used interchangeably with 'behavior problems,' 'aberrant behavior,' or 'maladaptive behavior' in the literature. Many of the specific forms of behavior called 'challenging behavior' in research with people with developmental disabilities are also studied in typically developing children under the labels of 'disruptive behavior,' 'behavior problems,' or 'externalizing behavior'. The overall prevalence of challenging behavior among people with developmental disabilities is estimated to be 13-30 percent (Emerson et al. 2001; Holden & Gitlesen 2006; Lundqvist, 2013; Sturmey & Fitzner, 2006).

The types of challenging behavior delineated by practitioners and researchers are aggression, destruction of property, self-injurious behavior, stereotypy, and other disruptive or non-compliant behaviors (Matson, 2012). Aggressive and destructive behaviors are often grouped together as behaviors intended to inflict damage to other people or to property (Vitiello & Stoff, 1997). Forms of aggressive/destructive behaviors include kicking, biting, or hitting others as well as damaging or destroying objects. Self-injurious behaviors are deliberate behaviors directed toward oneself that cause, or have the potential to cause, harm to the body (Sturmey & Fitzner, 2006). Common forms of self-injurious behaviors include head banging and biting, hitting, or scratching oneself. Stereotypies are repetitive, non-functional movements or vocalizations that interfere with normal activities (Matson, 2012). Common stereotypies include hand flapping, body-rocking, and mouthing objects. The category of disruptive or non-compliant behaviors is meant to capture other behaviors that either endanger the safety of the

person or are likely to interfere with his or her ability to engage in activities or use community facilities. Examples of such behaviors include tantrums, running away from adults, body-dropping, and removing clothes in public.

Specific forms of challenging behavior often co-occur with one another, such that people exhibiting challenging behaviors are usually affected by a combination of behaviors rather than only one. For example, in Holden and Gitlesen's (2006) study of challenging behavior in 904 children and adults with intellectual disability, caregiver reports indicated that people with any challenging behavior exhibited an average of 3.7 different forms of challenging behaviors. In Oliver, Petty, Ruddick, and Bacarese-Hamilton's (2012) study of repetitive or stereotyped behavior in 943 children with severe intellectual disability, children who engaged in stereotypies were at 16 times greater risk for exhibiting self-injurious behavior and 12 times greater risk for exhibiting aggressive behavior than children who did not engage in stereotypies.

Methods of Investigating Challenging Behavior

Observational methods. Observational methods are often used to evaluate challenging behaviors in the course of interventions as part of a functional behavior analysis (FBA) (Matson, 2012). The method of recording behavior may be interval or event-based, and is usually individualized to target specific behaviors of concern in a specific person (Carr & Durand, 1985). Standardized methods of observing challenging behavior across groups of people are less commonly used (Rahman, Oliver, & Alderman, 2010; Zaghlawan & Ostrosky, 2011). Rahman, Oliver, and Alderman (2010) succeeded in developing a reliable coding scheme to measure challenging behavior in eight preschool classrooms of 15 to 20 typically and atypically developing children (*mean inter-observer agreement* = 94.6%). Zaghlawan and Ostrosky (2011) also developed a coding scheme for challenging behavior for use with nine adults with acquired

brain injuries. However, reliability varied considerably for the coding of different behavior types (*Kappa range* = .49 to .84). A number of studies have reported on other behavior problem coding schemes intended for use with typically developing children that code many behaviors that overlap with challenging behaviors. These include the Disruptive Behavior Observation Schedule (DBOS), which was designed to distinguish between children exhibiting normal misbehavior and clinically elevated behavior problems in the domains of non-compliance, aggression, and temper-loss (Wakschlag, Briggs-Gowan, et al., 2008; Wakschlag, Hill, et al., 2008). The DBOS includes several standardized situations in which adults behave in ways that might evoke misbehavior in children. This instrument has demonstrated reliability and validity in typically developing children.

Parent/caregiver report. Several empirically validated parent or caregiver report instruments are available for the assessment of challenging behaviors in people with developmental disabilities. These include the *Aberrant Behavior Checklist* (Aman & Singh, 1986), *Nisonger Child Behavior Rating Form* (Aman & Singh, 1991), *Behavior Problem Inventory- 01* (Rojahn, Matson, Lott, Esbensen, & Smalls, 2001), and *Repetitive Behavior Scale* (Bodfish, Symons, & Lewis, 1999). Several more instruments specifically designed for use with people with autism spectrum disorders are also available, including the *PDD Behavior Inventory* (Cohen & Sudhalter, 2005) and *Autism Spectrum Disorders –Behaviors Problem for Adults* (Matson & Rivet, 2008). All of these instruments differ somewhat in their organization and the types of behaviors they emphasize, but nonetheless demonstrate strong convergent validity with one another (Rojahn et al., 2013).

However, prior to 2007, no empirically validated instrument was available for evaluating challenging behavior in children with developmental disabilities under three years old (Matson,

Boisjoli, & Wilkins, 2007). Advances in early identification of children with developmental disabilities as well as an increased awareness of the importance of early intervention for this population led to investigations of the psychometric properties of existing instruments designed for use with adults in young children, as well as the development of new instruments intended for use with infants and toddlers (Matson, Fodstad, Mahan, & Rojahn, 2010; Rojahn et al., 2010, 2013; Schmidt, Huete, Fodstad, Chin, & Kurtz, 2013). For example, the *Baby and Infant Screen for Children with Autism Traits- Part III* (2007) was designed to assess challenging behavior in children with autism spectrum disorders from 17 to 37 months. It was normed using a sample of 644 children with developmental delays and demonstrates promising evidence of reliability and validity (Matson et al., 2010).

Concordance between observation and parent report. Studies of typically developing children demonstrate moderate to high levels of agreement between parent report of behavior problems and behavior observed in a laboratory setting (Crnic et al., 2005; Hill, Maskowitz, Danis, & Wakschlag, 2008; Quittner et al., 2010; Wakschlag, Briggs-Gowan, et al., 2008). For example in Wakschlag et al.'s (2008) study of 327 preschool children, ratings on the highly standardized Disruptive Behavior Observation Schedule (DBOS) were significantly correlated with both parent and teacher report of disruptive behavior. Likewise, Quittner et al. (2010) found significant correlations between parent report of child behavior problems and child negativity and externalizing behavior during behavioral observation of deaf children. Thus, although the setting of observation may be different from the settings in which the parent normally interacts with the child, researcher observation of child behavior problems tends to be congruent with parent reports, especially in the context of standardized observation schedules, such as the DBOS.

Use of the Parenting Stress Index. The Child-Domain or Difficult Child subscale of the Parenting Stress Index inquires about the ways that child mood and behavior affect the parent and extent to which parent perceives the child as being difficult to manage. Although not specifically designed to assess it, the Difficult Child subscale does tap into child behavior problems (Abidin, 1995). The Difficult Child subscale is associated with both parent report and observation of behavior problems or challenging behaviors (Baker et al., 2002; Crnic et al., 2005; Floyd & Gallagher, 1997; Guajardo, Snyder, & Petersen, 2009; R. Koegel et al., 1992; Orr et al., 1991; Quine & Pahl, 1985; Quittner et al., 2010; Richman et al., 2009). It has also been used for the explicit purpose of assessing behavior problems in children under 2 years old due to the limited number of validated instruments available for infants and toddlers (Briggs-Gowan et al., 2001).

Moreover, the fact that the Difficult Child subscale directly asks about parent perception of child behavior and the effect of child behavior on the parent may actually be a strength of the instrument in terms understanding challenging behavior in an ecological manner (Abidin, 1995). Some behaviors are challenging exclusively because they cause additional limitations to be placed on the activities of a person with a disability, and parent perception may mediate the relationship between a specific behavior and limitations being imposed (Emerson, 2001). For example, repetitive stereotyped vocalizations or hand-flapping might be highly disruptive to one parent and cause them to decide not to engage in certain activities with the child, but not at all disruptive to another parent. For this reason, it is possible that there is even greater clinical utility in understanding the way that child behavior impacts the family system than understanding the details of the behavior itself. Ultimately the degree of disruption to the family caused by a behavior may determine its harmfulness.

Consequences of challenging behavior. Challenging behaviors are among the most serious problems facing people with developmental disabilities and their families. The consequences of challenging behaviors include injury to the person or others, additional limitations placed on the activities of the person or placement in a more restrictive environment, increased caregiver stress and social isolation, interruptions in education, and increased utilization of costly medical and psychiatric services (Holden & Gitlesen, 2006). Though most injuries from self-injurious behavior are relatively minor, rare reports of extreme cases indicate that self-injurious behavior can cause permanent tissue damage resulting in blindness, brain damage, or death (Nissen & Haveman, 1997). In day programs, people with challenging behavior are given fewer opportunities to engage in community activities compared to people with similar disabilities and no challenging behavior (Hill & Bruininks, 1984). People with challenging behaviors are also more likely to be admitted to and retained in more restrictive institutional settings (Emerson, 2001), which are associated with lower quality of life for people with intellectual disability (Perry, Felce, Allen, & Meek, 2011). Teachers note that challenging behaviors often interrupt the education of students with intellectual disability because other educational programming must be set aside to address the behaviors when they emerge (Durand, 1990). Challenging behavior can also result in poly-pharmacy, which may cause unpleasant or even dangerous side-effects for people with developmental disabilities (Aman & Singh, 1991). In 1991, the National Institutes of Health estimated that treatment for an individual with severe self-injurious behaviors could cost up to \$100,000 per year (NIH, 1991).

Models of the emergence and maintenance of challenging behavior. Current theories suggest that the etiology of challenging behavior is highly complex and involves the interaction of many biological and environmental factors. Biological factors may influence challenging

behaviors at multiple levels, including genes, neuroanatomy, and neurochemistry. Self-injurious behavior, in particular, is characteristic of several syndromes with known genetic causes. For example, virtually 100% of people with Lesch-Nyhan syndrome engage in self-biting (Anderson & Ernst, 1994). There is mounting evidence from human MRI studies and mouse model studies to suggest that neuroanatomical abnormalities in the basal ganglia may also contribute to challenging behavior (Bodfish, 2007). Studies of neurochemistry have also found abnormalities in dopamine, serotonin, and opioid peptide levels of people with developmental disabilities who exhibit challenging behaviors (Emerson, 2001). Some people experience a reduction in challenging behavior in response to pharmacological interventions designed to normalize these neurotransmitter levels (Aman & Singh, 1991).

According to operant conditioning theory, challenging behavior is maintained by socially-mediated environmental events (Reichle, 1993). Similarly, behaviors can be changed by manipulating the environmental events that accompany them. Studies indicate that challenging behaviors do increase when reinforcement, including social attention, tangible items, or escape from an undesired activity, is given in response to those behaviors (Matson, 2012). Challenging behaviors often decrease in response to punishment or reinforcement for other, non-challenging behaviors (Sturmey & Fitzer, 2006).

Several comprehensive models have been put forth which acknowledge biological factors as a context in which the effects of operant conditioning may lead to challenging behaviors. Emerson (2001) posits a model in which biological and environmental contexts produce a motivational state, in which a person feels driven to obtain a certain reinforcement. During this motivational state, the presence of discriminative stimuli, or stimuli that indicate that reinforcement is available, may lead to the person performing a challenging behavior.

Emerson's model also directly addresses the roles of learning history and behavior repertoires in the context leading to the emergence and maintenance of challenging behaviors. He proposes that challenging behavior is partially the result of deficits in skills that would allow a person to respond to a motivational state in a socially appropriate way. For example, a person may become aggressive when hungry partly because he or she is not able to fix a snack or request one.

Models of the emergence of problem behaviors in typically developing children and adults also suggest that such behaviors may be used to regulate internal states rather than to influence other people in the environment. For example, some people appear to engage in a self-injurious behavior in order to either increase or decrease unpleasant levels of emotional arousal (Yates, 2004). In such a scenario, adaptive behaviors could relate to challenging behavior in that people with lower adaptive behavior experience a range of practical problems in day-to-day life that lead to more frequent undesirable emotional states (i.e. frustration). They then attempt to regulate their emotional states using challenging behaviors. Impairments in adaptive behaviors might also limit a person's ability to engage in socially appropriate methods for regulating emotions.

Characteristics associated with challenging behavior. On the basis of the idea that skill deficits may contribute to the emergence of challenging behaviors, investigators have examined the associations between specific skill domains and challenging behavior in people with developmental disabilities. In particular, investigators have emphasized the possible role of adaptive behavior in the development of challenging behavior. Results of these studies indicate that, on average, more severe adaptive impairments are associated with more challenging behavior (Holden & Gitlesen, 2006; Rojahn, Matson, Naglieri, & Mayville, 2004). However,

studies that have distinguished between people classified as having mild, moderate, severe, and profound intellectual disability have found that the highest rates of aggression are typically observed in people with severe intellectual disability, with both relatively less and more impaired groups demonstrating lower rates (Emerson et al., 2001; McLean, Brady, & McLean, 1996). Thus, the general pattern of relationship between severity of adaptive impairments and challenging behavior appears to be such that people with more adaptive impairments exhibit more challenging behavior, with the exception of aggression, which is most common among people with severe rather than profound intellectual disability.

Investigations of the relationship between specific domains of adaptive behavior and challenging behavior in school-age children and adults have revealed associations between each domain and challenging behavior. However, these studies are somewhat difficult to interpret because of the strong correlations between domains of adaptive behavior (McClintock, Hall, & Oliver, 2003). For example, several studies have independently identified severity of intellectual disability, measured using assessments of adaptive behavior, and severity of communication or language deficits as being associated with increased challenging behavior using multiple chi-square or t-tests (Emerson et al., 2001; Holden & Gitlesen, 2006). However, severity of intellectual disability and severity of communication deficits are strongly associated with one another, so there is still uncertainty as to whether communication ability adds unique information to the risk of challenging behavior. Nonetheless, the relevance of communication deficits to challenging behavior is supported by the effectiveness of interventions to address challenging behavior by boosting communication skills (Reichle, 1993).

Studies investigating the relationship between communication skills and challenging behavior in school-age children and adults with developmental disabilities have almost

unanimously found that lower levels of both expressive and receptive communication skills are associated with the presence and/or greater severity of challenging behavior (Chiang, 2008; Chung, Jenner, Chamberlain, & Corbett, 1995; Emerson et al., 2001; Holden & Gitlesen, 2006; Matson, Boisjoli, & Mahan, 2009; Sigafos, 2000). However, an investigation of this relationship in toddlers revealed the opposite pattern. In Matson et al.'s (2009) study of 168 of 17-36 month-old toddlers with autism spectrum disorders, the authors found that lower communication skills were associated with lower rates of challenging behaviors. They suggested that this finding may be due to the especially young age of their sample, in that toddlers experiencing more severe delays may actually also be delayed in the emergence of challenging behaviors. This interpretation is consistent with Berkson's (2002) finding that mild self-injurious behaviors and stereotypies peak and then decline at two years old in typically developing children and three years old in children with developmental disabilities. Moreover, Matson's finding highlighted the fact that correlates of current challenging behavior and risk factors for future challenging behavior in toddlers are probably unique rather than identical to those observed in older children and adults. An investigation of the relationships between skill development and challenging behavior across time in toddlers with developmental disabilities could be invaluable to early identification of children at risk for challenging behavior. Further, it may lead to possible targets for preventative efforts or interventions.

Studies of the relationship between other domains of adaptive behavior and challenging behavior have been limited in number, but consistently indicate that school-age children and adults with more severe impairments are more likely to evince challenging behavior. In terms of daily living or self-care skills, Emerson et al. (2001) found that people requiring greater assistance with eating, dressing, or washing, and those who were incontinent were more likely to

exhibit challenging behavior in a total population study of people with intellectual disability, ages 5 and older, in two districts in England. Matson, Hess, and Mahan (2013) and Kearney and Healey (2011) each found associations between lower social skills and higher rates of challenging behavior in school-age children, ages 4 and older. However, both studies used informant reports of social skills and, as Matson pointed out, challenging behavior may have a negative effect on the informant's perception of the person's social skills. Examinations of motor skills revealed a unique relationship between mobility impairments and self-injury. In Emerson et al.'s (2001) study, the authors found that people with motor impairments were more likely to exhibit self-injurious behaviors than people without motor impairments. Similarly, Lundqvist (2013) found that people with cerebral palsy were more likely to exhibit self-injurious behavior in a total population study of people with intellectual disability in Sweden.

Child development and challenging behavior. The examination of challenging behavior in a developmental context warrants special consideration. Emerson's (2001) definition of challenging behavior indicates that a behavior must meet two criteria in order to be accurately described as challenging. First, the behavior must be abnormal or socially inappropriate within the context. Second, the behavior must either endanger the safety of the person or others or limit the ability of the person to engage in activities or use community facilities. Given these criteria, it may be possible for specific forms of behavior that are not challenging in young children to become challenging as the child ages and reaches adulthood. For example, tantrums may not be challenging in a two-year-old because they are relatively normal and manageable for the caregiver, but seriously challenging in a twenty-year-old.

However, investigations of specific forms of behaviors that are consistently regarded as challenging in adults with developmental disabilities in samples of young children with

developmental disabilities are nonetheless informative. Research demonstrates that a significant proportion of children with or at risk for developmental disabilities do exhibit aggressive, self-injurious, or stereotyped behaviors in infancy and early childhood (Berkson, 2002; Kroeker, Unis, & Sackett, 2002; Schneider, Bijam-Schulte, Janssen, & Stolk, 1996). Longitudinal studies of challenging behaviors among children have been few in number, but found that challenging behaviors are associated with later cognitive outcomes and persist for many children who exhibit them. In a longitudinal study of 13 preschool children with developmental disabilities, Green, O'Reilly, Itchon, and Sigafos (2005), found that parent ratings of challenging behavior remained elevated at three-year follow-up among 100% of the 9 children whose rating were initially elevated. The majority of parents of children with elevated ratings also retrospectively reported that the behaviors were first observed between 18 and 24 months of age. In Schneider et al.'s (1996) retrospective study of school-age children with severe self-injurious behaviors, 68 percent of parents reported that the behaviors began before the age of five. Interestingly, despite these indications from retrospective reports that persistent challenging behavior may appear in toddlerhood, extremely few longitudinal studies of challenging behavior have begun following children prior to pre-school-age. An in-depth understanding of the development of challenging behavior in infants and toddlers is likely to be critical to mitigating its long term consequences because past research demonstrates that early intervention is most effective in supporting the development of children with developmental delays (Gimpel & Holland, 2003; Long, 2013).

Trajectories of behaviors. Research on the overall prevalence of behavior problems or challenging behaviors in children indicate that children with developmental disabilities or delays exhibit significantly more of these behaviors than typically developing children. In Baker et al.'s (2002) study of 225 children with or without developmental delays, 26.1% of children with

developmental delays and 8.3% of children without developmental delays exhibited clinically significant behavior problems at three years of age by parent report. Between three and nine years of age, behavior problems gradually decreased at a similar rate for both groups (Neece, Green, & Baker, 2012). Likewise, in a sample of 2,896 children without or with intellectual disability Dekker, Koot, van der Endt, and Verhulst (2002) found that children with intellectual disability were over 3 times as likely to exhibit clinically elevated behavioral problems on a parent report measure. In longitudinal data, behavior problems declined between ages 6 and 18 at a similar rate for children with and without intellectual disability. Studies have also indicated that, although behavior problems do decrease over time for many children as self-regulatory skills improve across development, they persist at school age in 50% to 67% percent of children who exhibit clinically elevated or severe behavior problems at pre-school age (Campbell, 1995; Richman, Stevenson, & Graham, 1982). Thus, markedly high levels of behavior problems in young children both with and without developmental delays may still be a cause for concern because research indicates that they may be a precursor for persistent behavior problems or challenging behavior rather than a transient childhood phase.

Investigations of specific types of challenging behaviors in typically and atypically developing children have revealed similar patterns. Aggressive/destructive behaviors and tantrums are both very common in typically and atypically developing young children (Thompson & Gray, 1994). Research on the characteristics of aggressive/destructive behaviors and tantrums in young children with developmental delays is limited, but suggests that these behaviors occur more frequently and decline later in development compared to typically developing children, especially among children with autism spectrum disorders (Fodstad, Rojahn, & Matson, 2012; Matson, 2012). Mild forms of self-injurious behavior and stereotypies

have been observed in 5% and 18-20% of typically developing children, respectively (Berkson, Tupa, & Sherman, 2001; Sallustro & Atwell, 1978) and have been described as a normal part of motor development. These behaviors emerge at approximately 8 months of age, peak at 2 years, and then decline and usually disappear by 5 years of age (Berkson, 2002). Similarly, in children with developmental disabilities, self-injurious behavior and stereotypies emerge at approximately 8 months, peak at 3 years, and subsequently decline. However, a significant proportion of children with developmental disabilities will continue to exhibit self-injurious and stereotyped behaviors beyond this time frame. In Berkson's (2002) study of 40 children with developmental disabilities who exhibited self-injurious behavior at 6 months of age, 25% still exhibited the behavior at 36 months.

Interventions for challenging behavior. Current interventions for challenging behavior include both behavioral and pharmacological treatments. Behavioral interventions may reduce challenging behaviors by three mechanisms: 1. altering contextual factors to decrease the likelihood of challenging behavior occurring, 2. disrupting the contingencies that maintain challenging behavior, or 3. increasing the rate of other, competing behaviors (Emerson, 2001). Research suggests that intervention plans that include a combination of these components are most effective (Fisher et al., 1993; Wacker et al., 1990). Contextual changes that may reduce challenging behaviors include increasing the amount of stimulation in the environment, increasing opportunities for choice-making, or modifying specific setting events that may increase challenging behaviors in a particular person (i.e. reducing background noise in a room, changing uncomfortable clothing, etc.) (Emerson, 2001). Disrupting contingencies that maintain challenging behavior would require changing the consequences that typically follow a challenging behavior by either eliminating the reinforcement, imposing a punishment, or both.

Strategies which increase the frequency of behaviors other than the challenging ones may involve either differential reinforcement of other behaviors or functional displacement. In differential reinforcement, the clinician increases reinforcement for engaging in any non-challenging behavior.

Functional displacement involves teaching a person to substitute a socially appropriate behavior for a challenging behavior. This substitute behavior must fulfill the same function that the challenging behavior does. In order to be maximally effective, the substitute behavior should also either require less effort or result in a more reinforcing consequence than the challenging behavior. Functional communication training is a specific type of functional displacement in which a socially appropriate communication is substituted for challenging behavior. It is based on the communication hypothesis of challenging behavior, which asserts that challenging behaviors are communicative acts, or requests for socially-mediated reinforcement (Carr & Durand, 1985). In Carr and Durand's (1985) seminal study, four children with developmental disabilities demonstrated dramatic decreases in challenging behavior when they were taught to use relevant verbal phrases to gain the type of reinforcement that prior observation indicated they were using the challenging behavior to gain. According to Walker and Snell's (2013) meta-analysis of approaches to addressing challenging behavior using augmentative/alternative communication (AAC), functional communication training using AAC is also effective in reducing challenging behavior, especially in children and when used in conjunction with functional behavior analysis.

Less is known about whether or not interventions using AAC that are more broadly targeted to improve communication skills and foster independence may reduce challenging behavior. Studies of AAC interventions do not often examine challenging behavior as an

outcome variable (Ronski, Sevcik, Cheslock, & Barton, 2006). However, the hypothesis that challenging behavior is partially caused by deficits in communication, the association between communication deficits and challenging behavior among people with developmental disabilities, and the established effectiveness of functional communication training in treating challenging behavior all suggest that broadly targeted AAC interventions might reduce challenging behavior. Further, Walker's and Snell (2013) finding that functional communication training using AAC was more effective in reducing challenging behavior in children under five years old than adolescents or adults highlights the possibility of a relationship between broadly targeted AAC intervention and challenging behavior in toddlers or young children, in particular.

Summary. In summary, research indicates that parents of children with developmental disabilities experience elevated levels of parenting stress, and that children's challenging behavior is an important source of this stress. Limited information, however, is available on the relationship between parenting stress and challenging behavior in young children over time and how early language intervention may affect this relationship. A clearer understanding of the interaction between these variables would be informative for early intervention efforts and early identification of families at risk for high parenting stress levels and child challenging behavior.

1.3 Research Questions

In this study, we investigated parenting stress and children's challenging behavior in a sample of parent-child dyads who participated in parent-implemented language interventions as part of either of two longitudinal studies of language development in toddlers with significant developmental delays (Ronski et al., *In preparation.*; Ronski et al., 2010). We used standardized and observational measures collected as part of those studies, as well as one observational measure developed specifically for this investigation. We asked five questions:

1. Initial levels of parenting stress and child challenging behavior.

- A. What is the initial level of parenting stress, in a sample of parents of children with significant developmental delays? We examined both total parenting stress (PSI-SF Total) and parenting stress related to child behavior (PSI-SF Difficult Child subscale). We hypothesized that both total parenting stress and parenting stress related to child behavior in our sample would be elevated relative to the normative sample. This hypothesis was based on previous literature demonstrating that parents of children with developmental disabilities experience higher levels of parenting stress, especially around topics related to managing their children's behavior (Beckman, 1991; Donenberg & Baker, 1993; Innocenti & Huh, 1992). It is also based on descriptive statistics reported by Smith et al. (2011) regarding parenting stress in the sample from the first study only.
- B. What is the initial pattern of challenging behavior observed during the 30 minute baseline intervention session? We hypothesized that some children from our in our study would exhibit each form of challenging behavior, but the proportions exhibiting each behavior type would not exceed 50%. This hypothesis is based on previous literature regarding the prevalence of challenging behaviors in infants and toddlers with developmental delays (Berkson et al., 2001; Fodstad, Rojahn, & Matson, 2012).

2. Relationship between parenting stress and challenging behavior.

- A. What is the relationship between parenting stress related to child behavior and challenging behaviors observed during the intervention? We hypothesized that higher parenting stress related to child behavior would be associated with more challenging behaviors observed during the intervention. This hypothesis was based on past literature indicating a strong relationship between parenting stress and child behavior problems (Abidin, 1995).

3. Child and parent characteristics potentially associated with parenting stress and challenging behavior.

A. Is race, as self-reported on parent questionnaires, related to parenting stress among parents of children with developmental delays? We hypothesized that black or African American parents would report higher levels of parenting stress related to child behavior compared to white parents. This hypothesis was based on the fact the majority of previous literature indicates that black or African American parents report higher levels of parenting stress compared to white parents (Cardoso et al., 2010).

B. Is child adaptive behavior related in to parenting stress? We examined child adaptive behavior, as measured by each domain of the Vineland Adaptive Behavior Scales (VABS and VABS-II). We hypothesized that lower adaptive behavior in each domain would be associated with higher levels of parenting stress related to child behavior. This hypothesis was based on literature indicating that more severe impairments in adaptive behavior are usually associated with higher levels of parenting stress among parents of children with disabilities (Neece & Baker, 2008; Pinderhughes et al., 2000).

C. What child characteristics are associated with challenging behavior? Specifically we investigated whether child adaptive behavior, as measured by each domain of the Vineland Adaptive Behavior Scales (VABS and VABS-II), was associated with challenging behavior. We hypothesized that lower adaptive behavior would be associated with more challenging behavior than higher adaptive behavior. This hypothesis is based on past literature showing that children with more severe adaptive behavior impairments engage in more challenging behavior (Holden & Gitlesen, 2006; Rojahn et al., 2004).

4. Change over time in parenting stress and challenging behavior over time.

- A. What is the trajectory of parenting stress related to child behavior change over time, and does this trajectory vary among parent-child dyads who participated in different types of language interventions, augmented or communication? We hypothesized that, on average, parenting stress related to child behavior would decrease over time, but this pattern would not vary by language intervention type. This hypothesis is based on the idea that participating in intervention and receiving coaching in ways to promote child language development may decrease parents' stress regarding their child's development. It is also based on previous findings that parenting stress and child behavioral problems both tend to decrease as children age (Baker et al., 2003; Dekker, Koot, van der Ende, & Verhulst, 2002). Finally, it is based on the previous finding that changes in parenting stress over time are not significantly different among parents who participate in various types of interventions with their children (Smith et al., 2011).
- B. What is the trajectory of child challenging behavior over time, and does this trajectory vary among children who participated in different types of language interventions? We hypothesized that, on average, child challenging behavior would decrease over time. We also hypothesized that decreases in challenging behavior would not vary across children who participated in different types of language interventions. This hypothesis is also based on previous findings that child behavior problems both tend to decrease as children age (Baker et al., 2003; Dekker, Koot, van der Ende, & Verhulst, 2002). It is also based on literature about functional communication training, which would suggest that children who are successful in learning to communicate might experience decreases in challenging behaviors (Dunlap, Ester, Langhans, & Fox, 2006; Durand, 1990; Reichle, 1993).

Previous literature does not indicate that one would expect to see a difference in challenging behavior among children who participated in different types of intervention.

5. Relationship of vocabulary gains to change in parenting stress and challenging behavior.

A. Finally, do vocabulary gains over the course of the study moderate the relationship between pre-intervention and post-intervention levels of parenting stress related to child behavior? We hypothesized that larger vocabulary gains over the course of intervention would be associated with greater decreases in parenting stress related to child behavior. This hypothesis is based on ideas about the effect of child developmental progress in the area of communication on parenting stress. Parents who observe their children making large gains may experience a sense of relief that lowers their stress levels.

2 METHODS

2.1 Participants

In the present study, we examined parenting stress related to child behavior in a total of 113 parent-child dyads who participated in either of two longitudinal studies of language development in toddlers with significant developmental delays. The overarching goals of these studies were to investigate the communication profiles of toddlers with significant developmental delays and to compare the effectiveness of several parent-implemented interventions designed to improve communication skills. Sixty-two dyads participated in a randomized comparison of one spoken and two augmented language interventions (Ronski et al., 2010). Fifty-one dyads participated in a subsequent randomized comparison of two augmented language interventions (Ronski et al., *In preparation*).

Parent-child dyads were recruited through referrals from a variety of professionals in the Atlanta metropolitan area who frequently provide services to children with developmental delays, including pediatricians, neurologists, speech-language pathologists, and psychologists. Interested parents contacted the principle investigator to discuss participation. Selection criteria included child age between 24 and 36 months at the time of enrollment, at least primitive intentional communication abilities, upper-extremity gross motor skills that enabled the child to touch symbols on a speech-generating communication device, and a primary diagnosis other than delayed speech or deafness/hearing impairment. In addition, eligible participants exhibited significant risk for speech and language impairment, which was operationally defined as being able to produce fewer than 10 intelligible spoken words and having an age-equivalent score of less than 12 months on the Expressive Language scale of the Mullen Scales of Early Learning (MSEL; Mullen, 1995).

Toddlers. The toddler sample consisted of 79 boys and 34 girls. The mean child age at the beginning of the study was 30.6 months ($SD = 5.3$). Medical etiology of developmental delay included a wide variety of conditions. See Table 1 for a summary of toddler information.

Table 2.1 *Toddler Information*

	n	%
Gender		
Male	79	69.9
Female	34	30.1
Race		
White	64	56.6
Black or African	36	31.9
American		
Asian	10	8.8
Other	3	2.7
Medical Etiology		
Unknown or no condition	31	27.4
Down syndrome	28	24.8
Preterm birth	21	18.6
Cerebral palsy	19	16.8
Angelman syndrome	3	2.7
Epilepsy	3	2.7
Mitochondrial disorder	2	1.8
Neurofibromatosis	2	1.8
Other conditions	4	3.5

All toddlers underwent a developmental assessment before beginning the intervention. The average Early Learning Composite standard score on the MSEL observed in our sample was 58.53 ($SD = 12.11$). This score falls in the Very Low range, which was expected due to our

selection criteria of fewer than 10 spoken words. Ninety-five percent of the sample scored more than one standard of deviation below the mean on the Early Learning Composite.

Parents. Each family chose one parent as the designated person who would complete intervention sessions with the child. One hundred and two mothers and eleven fathers participated in the study. The mean parent age was 37.5 years ($SD = 5.7$). See Table 2 for a summary of parent information.

Table 2.2 *Parent Information*

	n	%
Gender		
Male	11	9.7
Female	102	90.3
Race		
White	68	60.2
Black or African	36	31.9
American		
Asian	8	7.1
Other	1	0.9
Education*		
High school	9	8.1
Some college	19	17.1
Bachelor degree	51	45.9
Graduate or professional	32	28.8
degree		

Note: *N = 111 for education because two parents did not report this.

2.2 Procedures

Assessments. Before beginning the interventions, parent-child dyads completed a battery of assessments designed to allow researchers to evaluate each child's development across several domains, including communication, visual-spatial skills, motor skills, and adaptive behavior. Parents also completed questionnaires regarding parenting stress and the children's medical and intervention histories. The assessment battery was re-administered to the dyads immediately following the intervention.

Interventions. After completing pre-intervention assessments, parent-child dyads were randomly assigned to one of four language interventions: Augmented Communication-Input (AC-I), Augmented Communication-Output (AC-O), Augmented Communication-Input and Output Hybrid (AC-IO), or Spoken Communication (SC). See Appendix A for a comparison of the interventions. In the AC-I language intervention, the interventionist or parent encouraged the child to use a speech-generating device (SGD) to communicate by modeling SGD use without requiring the child use it. In the AC-O language intervention, the interventionist or parent required the child to use the SGD to produce augmented words through verbal, visual, and physical hand-over-hand prompts. In the AC-IO intervention, the interventionist or parent both modeled SGD use and required the child to use the SGD to produce augmented words through verbal, visual, and physical hand-over-hand prompts. In the SC language intervention, the parent or interventionist visually and verbally prompted the child to produce spoken words. For the purpose of our analyses, we will combine the three augmented intervention types in one group, and compare all augmented interventions to the spoken communication condition.

All interventions were delivered using the same protocol. Interventions consisted of 24 sessions implemented over an average of 16 weeks. Each session lasted 30 minutes, and

consisted of three 10 minute activities: play, book, and snack. Before the first intervention session, dyads participated in a baseline session at home. This session was designed to allow researchers to observe parent-child interaction in the play, book, and snack activities prior to parent instruction in specific strategies to promote child communication. After the baseline session, the first 18 intervention sessions were conducted in the Toddler Language Intervention Project Lab at Georgia State University. The final 6 sessions were conducted in the child's home. Target vocabulary words for each child were chosen collaboratively by the parent and the project's speech-language pathologist. When a child mastered the use of their target vocabulary set, additional words were added to it.

Over the course of the 24 sessions, parents were taught the intervention and gradually became more involved in its implementation. For the first 8 sessions, the project's interventionist implemented the intervention while the speech-language pathologist explained the techniques to the parent and answered his or her questions. For sessions 9-10, the parent implemented the intervention during the last 10 minutes, or snack. For sessions 11-12, the parent implemented the intervention during the last 20 minutes, or book and snack. Beginning in session 13, the parent implemented the entire 30 minute session, including all three activities. The interventionist continued to coach the parent as needed throughout the all of the sessions.

2.3 Measures

Four measures were used in order to answer the research questions of this study. These included two measures that were administered during the assessments, as well as a newly developed coding scheme applied to the intervention tapes and data derived from transcripts of intervention sessions.

Vineland Adaptive Behavior Scales (VABS) and the Vineland Adaptive Behavior Scales- Second Editions (VABS-II). The VABS and VABS-II (Sparrow, Cicchetti, & Balla, 1984; Sparrow et al., 2005) are measures of personal and social skills needed for daily living, from birth to 90 years of age. We examined data from both editions of the measure due to the fact that the second edition was published in between the first and second study of language development in toddlers. Both editions included the same domains and many similar or identical items, but the second edition was updated and expanded. Before changing to the second edition, we administered both editions to a subset of 12 families from our study, and verified that results across editions were consistent. The four domains of the VABS and VABS-II assess communication, daily living, socialization, and motor skills using an informant interview format. Items are rated 0 (never), 1 (sometimes), or 2 (usually) by the respondent, according to the extent to which the person being inquired about exhibits particular behaviors. Participants in our sample did not complete the Maladaptive Behavior subscale of the VABS, due to being outside of the age range for the subscale. The VABS and VABS-II were designed, in part, specifically to assess the adaptive behavior of people with developmental disabilities (Sparrow et al., 2005). For the purpose of this study, we used each of the four domain standard scores of the VABS and VABS-II to measure the adaptive behavior of children in our sample at the pre-intervention time point.

Parent Stress Index-Short Form-Third Edition (PSI-SF). The PSI-SF (Abidin, 1995) is a measure of the amount of stress a parent is experiencing related to his or her parenting role. The three subscales of the PSI-SF assess parent distress, parent-child dysfunctional interaction, and parent perception of the difficulty of the child in questionnaire format. Individual items include a statement about the parent or child and require respondents to select a response on a

five-point scale, from strongly disagree to strongly agree. The PSI-SF has a long history of being used to evaluate stress in families of children with disabilities (Lessenberry & Rehdfeldt, 2004).

For the purpose this study, we used the Total Parenting Stress score and the Difficult Child subscale raw scores to measure general parenting stress and parenting stress related to child behavior in our sample, respectively. No other parent report of child behavior problems was available. This questionnaire was administered to parents at pre-intervention and post-intervention evaluations. The PSI-SF manual specifies that scores $\geq 90^{\text{th}}$ percentile should be considered clinically elevated.

Intervention transcripts. Transcripts of intervention sessions were created using the Systematic Analysis of Language Transcripts (SALT) program (Miller & Chapman, 1985) in order to characterize parent and child communication over the course of the intervention (Ronski et al., 2010). Transcribers used an event-based coding scheme to document each instance in which a child used a target vocabulary word and the mode in which they used it: spoken, augmented, or both spoken and augmented. After transcripts were finalized, 20% of the tapes were re-examined by another transcriber in order to establish the reliability of the coding scheme. Transcribers demonstrated 86% agreement in terms of the number of target words identified in the first study. The kappa value for the agreement between transcribers was .97, indicating that the reliability of the coding scheme was excellent (Landis & Koch, 1977). For the purpose of this study, we used data from these transcripts to estimate improvement in expressive vocabulary over the course of intervention for each child. Specifically, we examined the number of augmented and spoken vocabulary words that each child used in the twenty-fourth session.

Coding challenging behavior. We used an event-based coding scheme to describe the challenging behaviors exhibited by toddlers during the intervention. See Appendix B for a summary of the coding scheme. The categories of challenging behaviors that we coded included aggressive, destructive, self-injurious, disruptive, stereotyped or repetitive, non-compliant and other challenging behaviors. Examples of aggressive behaviors include hitting, kicking, biting, pinching, shoving, and scratching other people. Examples of destructive behaviors include throwing objects and damaging or destroying objects. Examples of self-injurious behaviors include head-banging, skin-picking, and hitting, biting, pinching, or scratching oneself. Examples of disruptive behaviors include running away from caregivers, screaming, and having temper tantrums. Examples of stereotyped or repetitive behavior include hand flapping, body rocking, and spinning. Non-compliant behaviors included dropping to floor and refusing to get up and engaging in any activity persistently after being prompted not to by an adult. The category of other challenging behaviors is meant to capture other behaviors that are clearly problematic, but do not fit into the previously mentioned categories. These types and specific behaviors are commonly described and reported on in the literature relating with challenging behavior in children and adults with developmental disabilities (Emerson, 2001; Matson, 2012).

Coders watched the entire video-recordings of the baseline session and session 24 for each toddler and documented instances in which a challenging behavior occurred. Behaviors were added up by category in order to determine the frequency of aggressive, destructive, self-injurious, disruptive, stereotyped or repetitive, non-compliant and other behaviors. Each behavior category also received a severity rating, which indicates the extent to which the behaviors interfered with the session on a three point scale. The severity coding process allowed the investigator to examine whether recording only the frequency of behaviors might obscure

important variation in the effects of those behaviors. A total count of challenging behaviors exhibited was also calculated by adding the category together. We used this total count in many of our analyses as an indication of the degree to which challenging behavior was exhibited by each toddler during the intervention.

Reliability. Three raters coded videotapes in order to allow for the examination of the reliability of the challenging behavior coding scheme. The primary rater was the principle investigator. The two secondary raters were undergraduate research assistants trained by the principle investigator. The secondary raters were masked as to the study's questions and hypotheses. Prior to beginning the official coding process, the raters coded tapes from parent-child dyads who withdrew from the study until they reached at least 80% agreement in their determination of codes. After this goal was reached, the primary rater coded all 226 tapes. The secondary raters coded a randomly selected 20% of the tapes ($n = 46$). After all coding was complete, we assessed the reliability of the coding scheme using Cohen's kappa. In accordance with past literature, we considered a kappa value of .7 or higher to establish substantial reliability (Landis & Koch, 1977). In our analyses, Cohen's kappa values by code type all demonstrated substantial agreement (see Table 3). Reliability for the entire coding scheme was excellent, *Cohen's kappa* = .86.

Table 2.3 *Reliability of the Challenging Behavior Codes*

Code	Cohen's Kappa
Total Across All Codes	.86
Aggression	.86
Self-Injury	.89
Destruction	.87
Disruption	.79
Stereotyped	.82
Non-Compliance	.82
Other	.89

3 RESULTS

3.1 Descriptive Statistics

Standardized Assessment Measures. Means and variance for standardized measures are displayed in Table 4. Six parents did not return the PSI-SF at the post-intervention time point. For this reason $n=107$ for post intervention parenting stress data, whereas $n=113$ for all other data. The PSI-SF Total Parenting Stress and Difficult Child subscale scores produced skew and kurtosis values indicating a normal distribution ($-1.96 < t < 1.96$) at both baseline and post-intervention time points. The VABS Communication, Socialization, and Daily Living Skills subdomains were also normally distributed ($-1.96 < t < 1.96$). The VABS Motor subdomain produced a statistically significant kurtosis value ($t = 2.50$), indicating the distribution was mildly leptokurtic. Zero-order correlations for all standardized measures are displayed in Table 5. Particularly high correlations were observed between pre and post-intervention measures of parenting stress, indicating consistency over time on this measure. We examined boxplots to determine the presence of outliers, using the Interquartile Range Rule (Field, 2013). Two low outliers were identified in the VABS Motor Subdomain distribution. Both of these children had a primary diagnosis of cerebral palsy. No other standardized measures contained outliers.

The PSI-SF contains a validity measure, called the Defensive Responding scale. A raw score of less than 10 on this scale indicates that the parent is selecting unusually low ratings for items related to parenting stress. The PSI-SF manual includes three hypotheses that could explain why a raw score of less than 10 might be attained: 1. The parent is not being forthcoming in order to portray themselves as stress-free and extremely competent, 2. The parent does not experience stress because they are not invested in their role as a parent, 3. The parent is extremely competent and has an excellent relationship to his or her child (Abidin, 1995). Fifteen

percent of our sample, or 18 parents, received a score of less than 10 on this scale at baseline. Sixteen percent of our sample, or 20 parents, received a score of less than 10 on this scale at post-intervention. Although the proportion of respondents with questionable scale validity should be noted, these parents were nonetheless included in analyses because their responses may have been genuine, as the third hypothesis from the manual suggests. Analyses including PSI-SF data were re-run without participants with questionable validity scale scores, and all study findings remained the same.

Table 3.1 *Descriptive Statistics for Standardized Measures*

Variable	Pre-Intervention	Post-Intervention
	M(SD)	M (SD)
VABS Subdomain Standard Scores		
Communication	68.53 (7.48)	
Socialization	74.66 (8.91)	
Daily Living Skills	72.40 (10.02)	
Motor Skills	74.20 (12.40)	
PSI-SF Raw Scores		
Total Parenting Stress	74.54 (20.36)	73.01 (20.85)
Difficult Child Subscale	27.26 (9.43)	27.27 (9.42)

Note. VABS = Vineland Adaptive Behavior Scales, PSI-SF = Parenting Stress Index - Short

Form. For Post-Intervention PSI-SF measures N=107. For all other measures N=113

Table 3.2 *Bivariate Correlations Among Standardized Measures*

Variable	1	2	3	4	5	6	7	8
1. VABS Communication	—							
2. VABS Socialization	.67**	—						
3. VABS Daily Living	.59**	.67**	—					
4. VABS Motor	.28**	.36**	.61**	—				
5. Baseline PSI-SF Total	-.33*	-.36**	-.24*	-.11	—			
6. Baseline PSI-SF Difficult Child Subscale	-.34**	-.40**	-.26**	-.06	.91**	—		
7. Post PSI-SF Total Parenting Stress	-.28*	-.35**	-.25*	-.11	.78**	.72**	—	
8. Post PSI-SF Difficult Child Subscale	-.25*	-.36**	-.21*	-.06	.73**	.77**	.90**	—

Note. * $p < .05$, ** $p < .01$ Note. VABS = Vineland Adaptive Behavior Scales, PSI-SF = Parenting Stress Index - Short Form. For Post-

Intervention PSI-SF measures $n=107$. For all other measures $n=113$

Intervention transcript data. Growth in expressive vocabulary over the course of the intervention was estimated using data from the final, 24th intervention session transcripts. Specifically, we used the number of different spontaneous augmented or spoken words used by the child, or Functional Vocabulary Use. The mean number of words used was 12.31 ($SD = 9.11$). The distribution demonstrated a significant, positive skew. See Figure 1 for a histogram of Functional Vocabulary Use. We examined a boxplot to determine the presence of outliers, using the Interquartile Range Rule (Field, 2013). Two high outliers were identified.

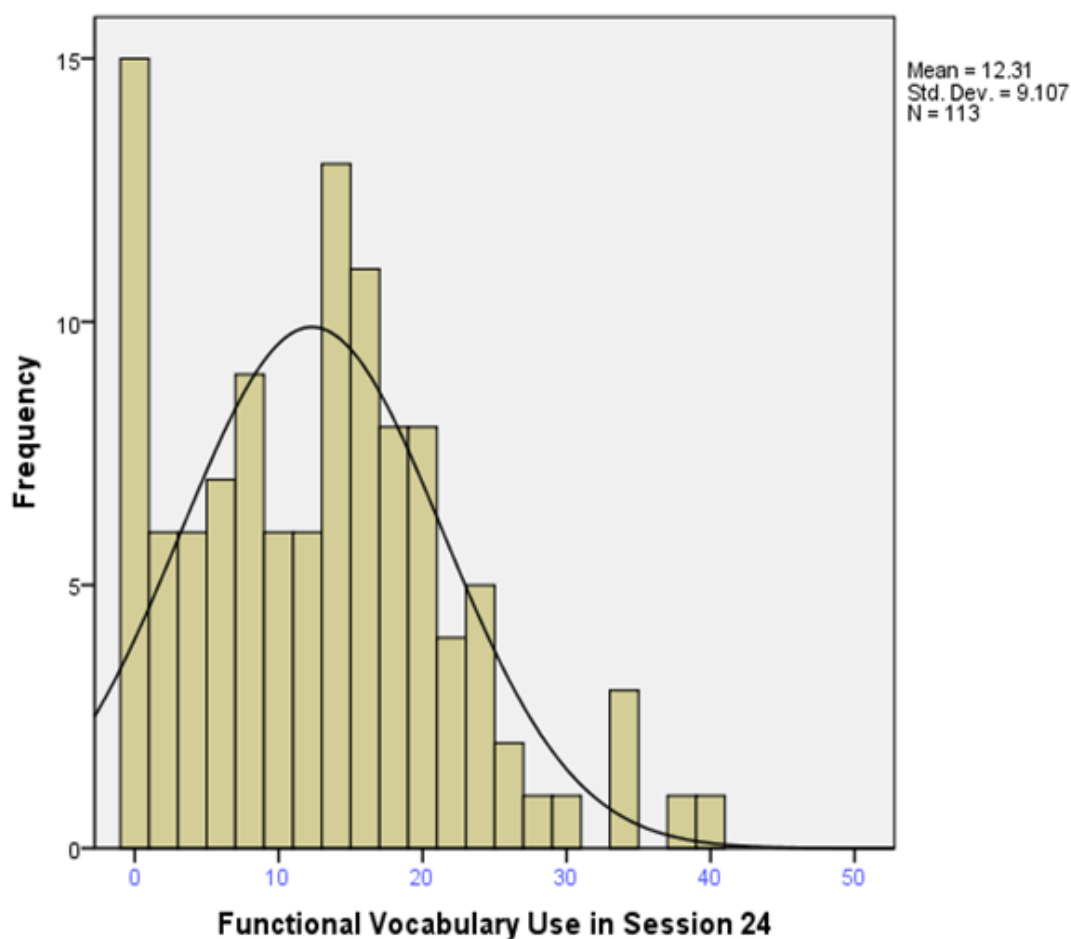


Figure 3.1 Histogram of Functional Vocabulary Use

3.2 Research Question 1

Initial pattern of parenting stress. We hypothesized that parenting stress in our sample would be elevated relative to that observed in parents of typically developing children. The mean Total Parenting Stress raw score at the baseline assessment time point was 74.54 ($SD = 20.36$). This mean value lies within the average range, between the 60th and 65th percentiles of scores reported in the PSI-SF manual. We conducted a one-sample t-test to determine whether this value differed significantly from that of the normative sample ($M = 69$). We found that the mean Total Parenting Stress raw score for our sample was significantly higher than that of the normative sample ($t = 2.89; p < .01$). We also examined the proportion of parents reporting clinically elevated parenting stress, which is specified in the PSI-SF manual as percentile ≥ 90 relative to the normative sample, or a raw score of 91 or higher (Abidin, 1995). We found that 20.4%, or 23 parents in our sample, reported clinically elevated parenting stress.

The mean Difficult Child subscale raw score at the baseline assessment time point was 27.26 ($SD = 9.43$). This mean also value lies within the average range, between the 60th and 65th percentiles of scores reported in the PSI-SF manual. We conducted a one-sample t-test to determine whether this value differed significantly from that of the normative sample ($M = 25$). We found that the mean Difficult Child subscale raw score for our sample was significantly higher than that of the normative sample ($t = 2.54; p = .01$). We also examined the proportion of parents reporting clinically elevated parenting stress related to child behavior, specified in the PSI-SF manual as percentile ≥ 90 relative to the normative sample, or a raw score of 36 or higher (Abidin, 1995). We found that 21.2%, or 24 parents in our sample, reported clinically elevated parenting stress related to child behavior. There was a great deal of overlap between parents

reporting elevated total stress and elevated stress related to child behavior, such that 19 parents demonstrated elevations on both scales.

Initial pattern of challenging behavior. Table 6 displays descriptive statistics on counts of behaviors by type, including mean, variance, range, and the proportion of the sample showing at least one instance of each behavior type. We hypothesized that less than half of the children in our sample would display behaviors of each type. Frequency distributions for behavior types were positively skewed, with the majority of children exhibiting 0 instances of aggression, self-injury, destruction, stereotyped, non-compliance, and other challenging behaviors. The exception to this pattern was disruptive behaviors, in which 58% and 52% of children exhibited one or more instances of disruptive behaviors at the baseline and session 24 time points, respectively. Ninety percent of children demonstrated at least one behavior in the baseline session. The most common behaviors included disruption, stereotyped behavior, destruction, and non-compliance. Less common behaviors included aggression, other challenging behaviors, and self-injury. Zero-order correlations for all challenging behavior counts by type are displayed in Table 7. Aggression, stereotyped, and non-compliance demonstrated statistically significant stability over time. The rate of challenging behaviors per 30 minute session was also examined. See Figure 2 for the distribution of children demonstrating various rates.

Table 3.3 *Descriptive Statistics of Counts of Challenging Behavior*

Code Type	Baseline			Session 24		
	M (SD)	Range	% ≥ 1	M (SD)	Range	% ≥ 1
Total	6.62 (8.32)	0 to 63	90%	6.29 (7.60)	0 to 40	84%
Aggression	.34 (.87)	0 to 6	19%	.50 (1.77)	0 to 16	22%
Self-Injury	.20 (.97)	0 to 7	6%	.34 (1.77)	0 to 15	8%
Destruction	1.22 (2.07)	0 to 11	44%	.89 (1.59)	0 to 10	42%
Disruption	1.94 (3.04)	0 to 17	58%	1.96 (3.39)	0 to 26	52%
Stereotyped	2.32 (5.61)	0 to 50	47%	2.10 (1.58)	0 to 37	42%
Non-Compliance	.43 (.89)	0 to 6	27%	.44 (1.12)	0 to 8	25%
Other	.17 (.57)	0 to 3	11%	.06 (.28)	0 to 2	5%

Note: n = 113 for all codes. % ≥ 1 refers to the proportion of the sample in which one or more instances of a particular behavior type was observed

Table 3.4 *Bivariate Correlations Among Challenging Behavior Counts*

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Baseline														
1. Aggression	—													
2. Self-Injury	.19*	—												
3. Destruction	.28*	.14	—											
4. Disruption	.15	.01	.25**	—										
5. Stereotyped	.31**	-.02	-.02	.04	—									
6. Non-Compliance	.20*	-.04	.27**	.06	.45**	—								
7. Other	.36**	.30**	-.11	.06	.45**	.00	—							
Session 24														
8. Aggression	.37**	.01	.07	.06	-.08	.14	.02	—						
9. Self-Injury	-.07	.07	-.11	-.06	-.06	-.01	-.05	.01	—					
10. Destruction	.21*	-.06	.11	.23*	.03	.11	-.02	.49**	.23*	—				
11. Disruption	.05	-.08	-.02	.17	-.08	.08	.06	.19*	.01	.29**	—			
12. Stereotyped	.29**	-.05	-.07	.09	.80**	.01	.39**	-.08	.05	.02	-.11	—		
13. Non-Compliance	.12	-.02	.07	-.02	-.04	.21*	-.01	.59**	-.06	.33**	.23*	-.11	—	
14. Other	-.01	.15	.02	.03	-.01	.04	.16	.03	-.03	.04	.05	-.07	.08	—

Note. * $p < .05$, ** $p < .01$, $n = 113$

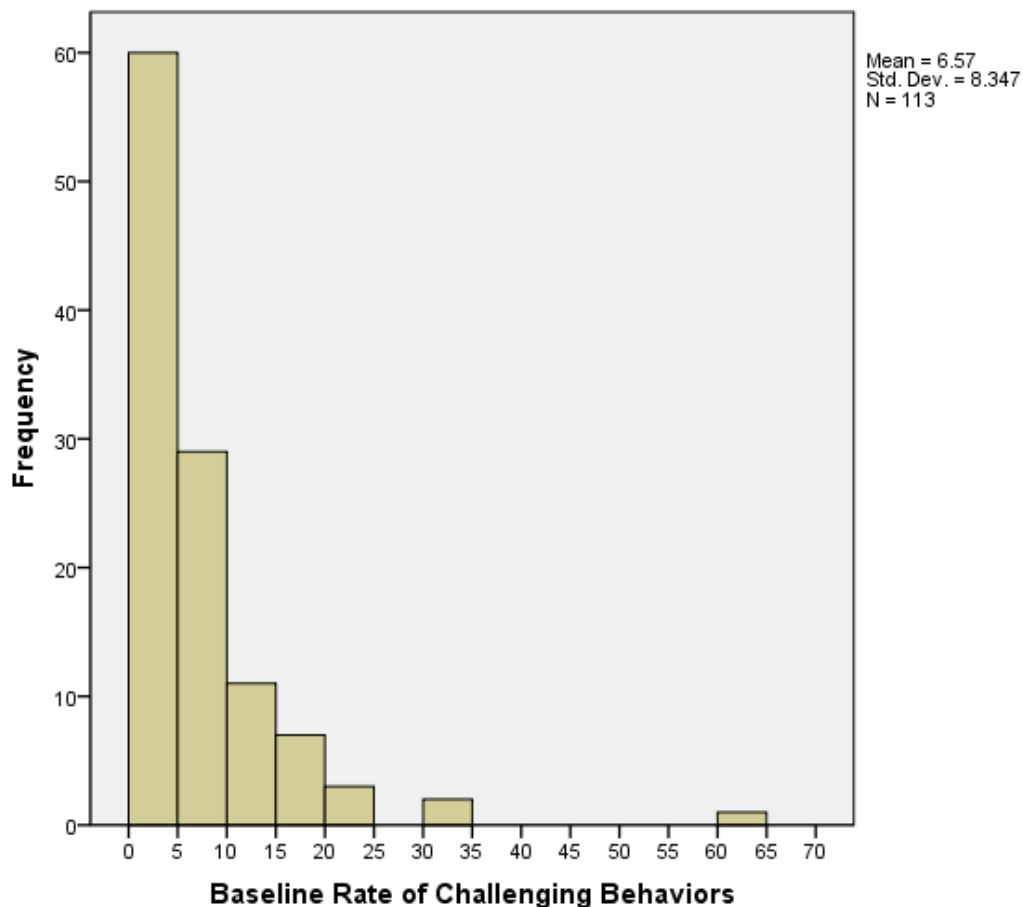


Figure 3.2 Histogram of Rate of Challenging Behaviors

Severity ratings for challenging behavior followed a similar, positively skewed pattern, with most children receiving low ratings and fewer children receiving progressively higher ratings. See Figure 3 for a histogram of the sum of severity ratings. Severity Ratings were also highly correlated with behavior counts (Table 8). Given that severity ratings and behavior counts appear to reflect largely overlapping information, only counts will be used in subsequent analyses.

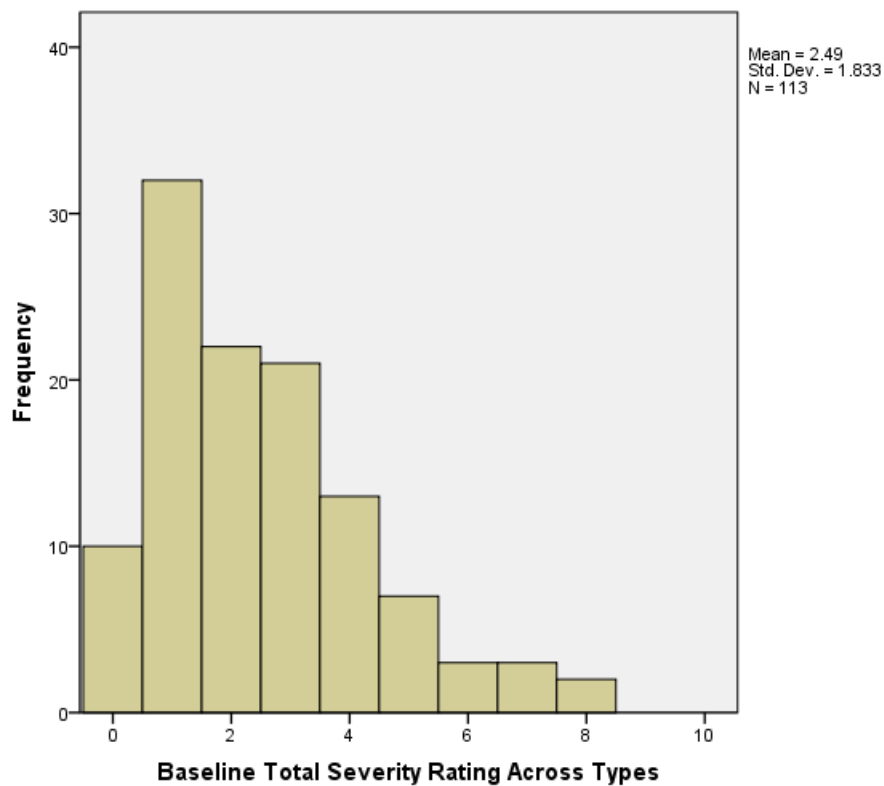


Figure 3.3 *Histogram of Sum of Severity Ratings*

Table 3.5 Bivariate Correlations Between Behavior Counts and Severity Ratings

Aggression	.88**
Self-Injury	.84**
Destruction	.85**
Disruption	.77**
Stereotyped	.58**
Non-Compliance	.88**
Other	.87**

Note. ** $p < .01$

3.3 Research Question 2

Relationship between parenting stress and observed child behavior. We hypothesized that parenting stress related to child behavior would be associated with challenging behaviors observed during the intervention. We tested this hypothesis by examining the Pearson correlation between the PSI-SF Difficult Child subscale and total count of child challenging behavior at baseline. The correlation indicated no significant relationship between parenting stress and total challenging behaviors ($r = .10, p = .27$). We further examined the Pearson correlations between the PSI-SF Difficult Child subscale and total counts of behaviors of each type in order to determine whether parenting stress was related to specific behavior types. The results of these analyses are displayed in Table 9. We found that parenting stress was not associated with any of the challenging behavior types.

Table 3.6 *Correlations between Challenging Behavior and Parenting Stress*

Aggression	.07
Self-Injury	.08
Destruction	-.17
Disruption	.08
Stereotyped	.12
Non-compliance	.11
Other	.16
Total	.10

3.4 Research Question 3

Characteristics associated with parenting stress. We hypothesized that black or African American parents would endorse higher levels of parenting stress than white parents. We tested this hypothesis using two independent samples t-tests. The first test compared means for Total Parenting Stress on the PSI-SF. The results indicated no significant difference ($t = .59, p = .56$). The second test compared means for the Difficult Child subscale of the PSI-SF. The results indicated no significant difference ($t = .41, p = .68$).

We also hypothesized that lower adaptive behavior in each domain of the VABS would be associated with higher levels of parenting stress related to child behavior. We tested this hypothesis by examining Pearson correlations between the PSI-SF Total Stress and Difficult Child subscale and the VABS domain scores. Table 10 displays the bivariate correlations. Significant negative correlations were identified for all domains of the VABS, with the exception of motor. Thus, lower child adaptive behavior, including communication, socialization, and daily living skills were all associated with higher parenting stress.

Table 3.7 *Correlations between Adaptive Behavior and Parenting Stress*

	PSI-SF Total	PSI-SF
	Stress	Difficult Child
VABS Adaptive Behavior Composite	-.33**	-.34**
VABS Communication	-.31**	-.31**
VABS Socialization	-.31**	-.33**
VABS Daily Living Skills	-.23*	-.23*
VABS Motor	-.16	-.14

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

Characteristics associated with challenging behavior. We hypothesized that children with lower adaptive behavior would exhibit more challenging behavior. We tested this hypothesis by examining Pearson correlations between the total count of challenging behaviors and the VABS domain scores. Table 11 displays the results. Significant negative correlations were identified for the Communication and Socialization domains of the VABS. The Daily Living Skills domain demonstrated a possible trend in the expected direction ($p = .06$), and the Motor domain indicated no relationship to challenging behavior. Thus, lower child communication and socialization were associated with more challenging behavior.

Table 3.8 *Correlations between Adaptive Behavior and Challenging Behavior*

VABS Adaptive Behavior Composite	-.21*
VABS Communication	-.26**
VABS Socialization	-.23*
VABS Daily Living Skills	-.18
VABS Motor	-.08

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

3.5 Research Question 4

Change in parenting stress over time. We hypothesized that total parenting stress and parenting stress related to child behavior would decrease over time, and that this pattern would not vary by language intervention type, augmented or spoken communication. We tested the first part of this hypothesis using paired samples t-tests to compare PSI-SF Total Parenting Stress and PSI-SF Difficult Child subscale scores at the pre-intervention and post-intervention time points. We found that total parenting stress did not demonstrate statistically significant change from pre-intervention to post-intervention, however there was a possible trend in the expected direction ($t = 1.74, p = .08$). Parenting stress related to child behavior remained stable ($t = .49, p = .62$).

In order to test whether change in parenting stress over time varied by intervention type, augmented or spoken communication conditions, we used repeated measures ANOVA. Mauchley's test and Levene's test indicated that the analyses for both total parenting stress and parenting stress related to child behavior met the assumptions of sphericity and homogeneity of variance ($p > .05$). Table 12 shows the means for each condition and time point and Figures 4 and Figure 5 display parenting stress at the two time points. We found no significant interaction

between time point and intervention type for total parenting stress $F(1,105)= 1.23, p = .27$.

Likewise, we found no significant interaction between time point and intervention type for parenting stress related to child behavior $F(1,105)= .37, p = .55$.

Table 3.9 Means and Variance of Parenting Stress at Pre and Post Intervention

	Total Parenting Stress		Difficult Child Subscale	
	M (SD)		M (SD)	
	Pre	Post	Pre	Post
Spoken Communication	79.0	73.95	29.05	27.95
(n = 20)	(21.52)	(19.91)	(10.60)	(9.95)
Augmented Communication	74.38	72.80	27.24	27.11
(n=87)	(20.32)	(21.16)	(9.29)	(9.34)

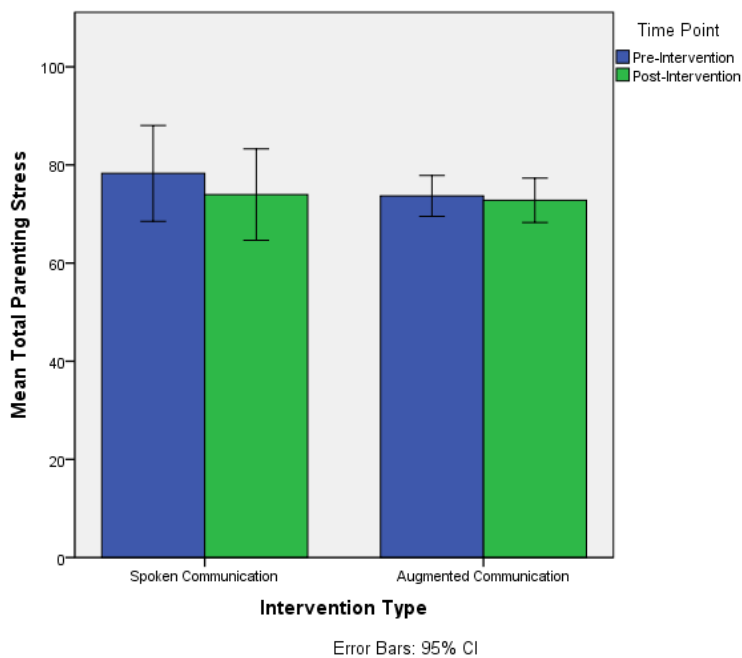


Figure 3.4 Mean Total Parenting Stress at Pre and Post Intervention

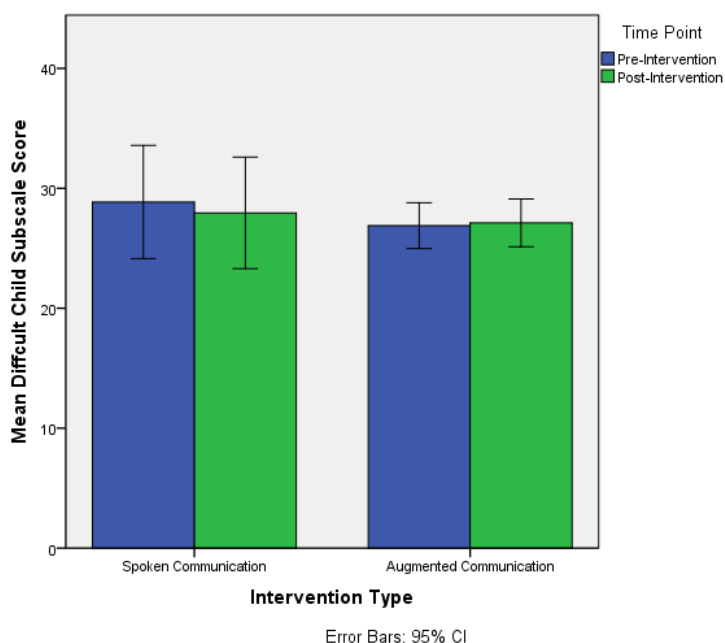


Figure 3.5 Mean Difficult Child Subscale at Pre and Post Intervention

Change in challenging behavior over time. We hypothesized that challenging behavior would decrease over time, and this pattern would not vary by language intervention type. We tested the first part of this hypothesis using a paired samples t-test to compare challenging behavior at the baseline and 24th intervention sessions. We found that total challenging behavior did not demonstrate statistically significant change from the baseline to the 24th intervention session ($t = .41, p = .68$). We further examined changes in behaviors of each type in order to determine whether specific types may have increased or decreased over time. No statistically significant changes were observed in any of the behavior types. The category of other challenging behaviors demonstrated a possible trend in the expected direction ($t = 1.92, p = .06$).

In order to test whether change in challenging behavior over time varied by intervention type, augmented or spoken communication conditions, we used repeated measures ANOVA. Mauchley's test and Levene's test indicated that the analysis met the assumptions of sphericity and homogeneity of variance ($p > .05$). Table 13 shows the means for each condition and time

point and Figure 6 displays challenging behavior at the two time points. We found no significant interaction between time point and intervention type for total challenging behavior $F(1,105) = .21, p = .65$.

Table 3.10 Means and Variance of Challenging Behavior at Baseline and Session 24
Total Challenging Behavior

	M (SD)	
	Baseline	Session 24
Spoken Communication (n = 20)	6.48 (5.56)	5.38 (5.13)
Augmented Communication (n=87)	6.65 (8.85)	6.50 (8.07)

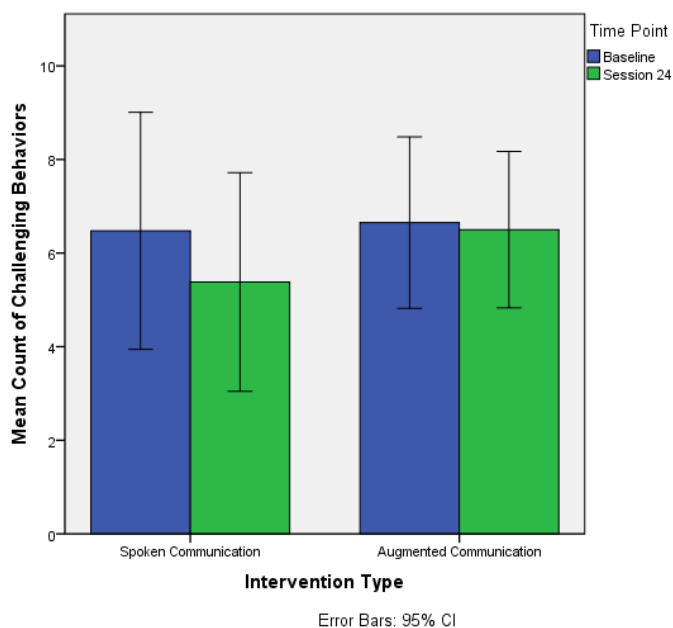


Figure 3.6 Mean Count of Challenging Behavior at Baseline and Session 24

3.6 Research Question 5

Role of vocabulary gains in parenting stress over time. We hypothesized that vocabulary gains would moderate the relationship between pre-intervention and post-intervention parenting stress related to child behavior. Specifically, we hypothesized that larger vocabulary gains over the course of intervention would be associated with greater decreases in parenting stress related to child behavior. In order to test this hypothesis, we conducted a hierarchical regression analysis with the post-intervention PSI-SF Difficult Child subscale as our dependent variable and pre-intervention PSI-SF Difficult Child subscale and Functional Vocabulary Use in session 24 as independent variables. Before proceeding with the analysis, we examined our data for violations of the assumptions of multiple regression. All variance inflation factor values were low, $VIF < 2$, indicating that multicollinearity did not strongly influence the analyses. Figure 7 displays the standardized residual plot. Its appearance indicates that the data did not violate the assumption of homoscedasticity, and that a linear model is appropriate for the data. The results of the Durbin Watson test indicates that the residuals were not highly correlated with one another, $Durbin\ Watson = 1.22$. Figure 8 displays the pp plot. The appearance of the pp plot indicates that residuals were normally distributed.

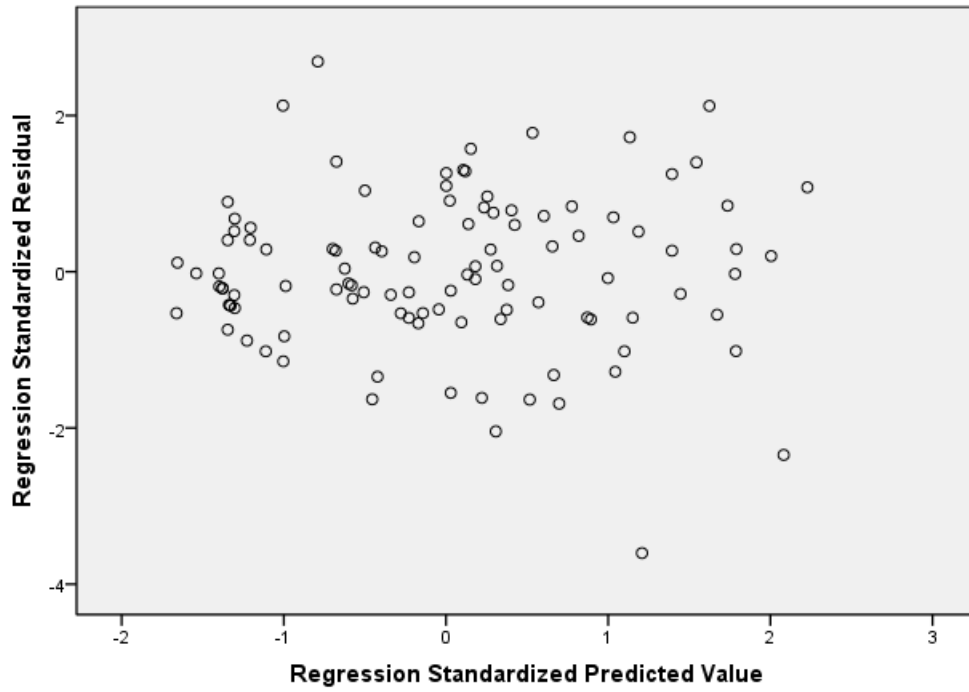


Figure 3.7 Standardized Residual Plot for Post Intervention Parenting Stress

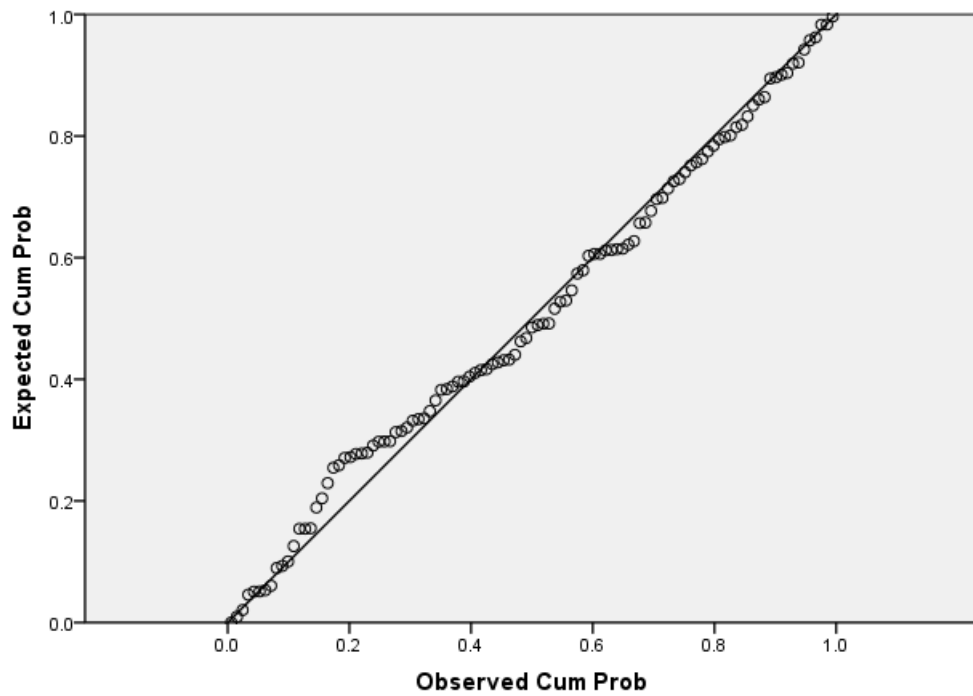


Figure 3.8 PP Plot for Post Intervention Parenting Stress

In order to reduce collinearity between the main effects and the interaction term, pre-intervention Difficult Child subscale scores and Functional Vocabulary Use were centered by subtracting sample means from each score. The interaction term was created by multiplying centered pre-intervention Difficult Child subscale scores and Functional Vocabulary Use. We entered the variables in our hierarchical regression analysis in three blocks. In block 1, we entered centered pre-intervention Difficult Child subscale score as a predictor. In block 2, we entered centered Functional Vocabulary Use as a predictor. In block 3, we entered the two-way interaction term for pre-intervention Difficult Child subscale score-Functional Vocabulary Use.

Entry of block 1. Table 14 displays the results of our hierarchical regression analysis. When we entered pre-intervention parenting stress into the model, the resulting regression equation accounted for a significant amount of variance in post-intervention parenting stress, $R^2 = .59$, $F(1, 105) = 149.60$, $p < .01$. Parenting stressing related to child behavior before intervention was strongly related to parenting stress related to child behavior after intervention ($\beta = .77$, $t = 12.23$, $p < .01$), such that pre-intervention parenting stress accounted for 59% of the variance in post-intervention parenting stress.

Entry of block 2. When we entered Functional Vocabulary Use into the model in the next block, the variable did not account for a significant increase in explained variance above pre-intervention parenting stress related to child behavior ($\Delta R^2 < .01$, $\Delta F(1, 104) = .27$, $p = .61$). Results indicated that Functional Vocabulary Use was not significantly associated with post-intervention parenting stress related to child behavior after the inclusion of pre-intervention parenting stress related to child behavior ($\beta = -.03$, $t = -.51$, $p = .61$).

Entry of block 3. When we entered the interaction between pre-intervention parenting stress related to child behavior and Functional Vocabulary Use into the model in the next block, the

variable did not account for a significant increase in explained variance above pre-intervention parenting stress related to child behavior and Functional Vocabulary Use ($\Delta R^2 < .01$, $\Delta F(1, 103) = .46$, $p = .50$). Thus, our analysis disconfirmed the hypothesis that Functional Vocabulary Use moderated the relationship between pre and post-intervention parenting stress related to child behavior ($\beta = -.04$, $t = -.68$, $p = .50$). The entire model accounted for 59% of variance in parenting stress, $R^2 = .59$, $F(1, 103) = 49.58$, $p < .01$ with both Functional Vocabulary Use and the interaction term not contributing significantly to the model in the final step ($p > .05$).

Table 3.11 Hierarchical Regression of Post-Intervention Parenting Stress on Pre-Intervention Parenting Stress and Functional Vocabulary Use

Predictor	<i>B</i>	<i>SE</i>	β	<i>R</i>	<i>R</i> ²	ΔR^2
Entry of Block 1				0.77	0.59**	
Pre-Intervention PSI-SF DC	0.76	0.06	0.77**			
Entry of Block 2				0.77	0.59**	<0.01
Pre-Intervention PSI-SF DC	0.76	0.06	0.76**			
Functional Vocabulary	-0.03	0.06	-0.03			
Entry of Block 3				0.77	0.59**	< 0.01
Pre-Intervention PSI-SF DC	0.75	0.06	0.76**			
Functional Vocabulary	-0.04	0.07	-0.04			
Pre-Intervention PSI-SF DC X Functional Vocabulary	-0.01	0.01	-0.04			

Note. * $p < .05$. ** $p < .01$

4 DISCUSSION

The purpose of this study was to investigate parenting stress and challenging behavior over time in a sample of 113 toddlers with significant developmental delays who participated in parent-coached language interventions. We further examined the relationships between parenting stress and challenging behavior and additional factors relevant to our studies and to the developmental disabilities literature broadly. These factors included parent and child characteristics and language intervention type and outcome.

The results indicate that some of our initial hypotheses were supported, whereas others were not. In support of our hypotheses, parents in our sample reported elevated levels of parenting stress and many children were observed engaging in a variety of behaviors consistent in form with traditionally recognized challenging behaviors. Also, higher parenting stress and more challenging behaviors were both associated with lower adaptive behavior. Finally, in agreement with our hypotheses, neither change in parenting stress nor challenging behavior varied depending on which intervention type, augmented or spoken communication, the parent-child dyad received. Our hypothesis that parenting stress would be associated with challenging behavior was not supported. Our hypothesis that black or African-American parents would report higher parenting stress was also not supported. Additionally, neither parenting stress nor challenging behavior changed significantly from the pre to post-intervention time points. Finally, change in parenting stress over time did not vary according to child vocabulary gains.

4.1 Research Question 1

Initial pattern of parenting stress. Consistent with our hypothesis, we found that overall parenting stress and parenting stress related to child behavior were elevated in our sample relative to the normative sample. At the same time, the mean values for both overall parenting

stress and parenting stress related to child behavior were within the average range, indicating that most parents reported relatively typical stress levels. This finding is consistent with values reported by Smith et al. (2011), in which the authors examined parenting stress in the portion of the present sample that participated in the earlier of the two invention studies (62 of the 113 parent-child dyads included in the present study). The finding of average mean parenting stress is an encouraging sign, and may relate to the current availability of community-based support for raising a child with a disability or changing attitudes toward disability in general. It may also be the result of characteristics of our sample. Specifically, our sample consisted of a majority of families from middle to high socio-economic backgrounds, as indicated by the fact that 75% of parents reported having a college degree. Parents of higher socio-economic backgrounds likely have better access to resources that assist them in caring for children with disabilities, which may ameliorate parenting stress.

Nonetheless, mean overall parenting stress and parenting stress related to child behavior in our sample were both significantly elevated relative to the normative sample. In our sample, approximately double the proportion of parents in the normative sample reported clinically elevated overall parenting stress and parenting stress related to child behavior. These findings are consistent with literature indicating that parents of children with disabilities report higher levels of parenting stress compared to parents of typically developing children (Beckman, 1991; Innocenti & Huh, 1992). They are also concerning because higher parenting stress is associated with a variety of undesirable outcomes that affect both parents and children, including poor parent physical health, parent depression, marital discord, less effective parenting practices, child abuse and neglect, and child psychopathology and behavioral problems (Briggs-Gowan, Carter, Skuban, & Horwitz, 2001; Coldwell, Pike, & Dunn, 2006; Crnic, Gaze, & Hoffman, 2005;

Eisenhower, Baker, & Blancher, 2009; Hastings, Daley, Burns, & Beck, 2006; Kersh, Hedvat, Hauser-Cram, & Warfield, 2006). In the context of transactional models of disability and stress, such as McCubbin and Figley's (1983) double ABCX model, our finding suggests that a unique and dynamic combination of factors including family resources, family perceptions regarding the child, and societal influences on the family contributed to bring about clinically elevated parenting stress among a subset of parents in our sample.

Initial pattern of child challenging behavior. Consistent with our hypothesis, we observed all of the types of challenging behavior delineated by researchers in the field of developmental disabilities in varying numbers of children from our sample. This finding is in line with research demonstrating that a significant proportion of children with or at risk for developmental disabilities do exhibit aggressive, self-injurious, or stereotyped behaviors in infancy and early childhood (Berkson, 2002; Kroeker et al., 2002; Schneider et al., 1996). Behavior types observed in our sample also varied in the proportion of children exhibiting them, with disruptive behaviors being most common and self-injurious behaviors being least common. This pattern is also consistent with the literature describing the prevalence of various types of challenging behaviors in people with developmental disabilities (Matson, 2012).

Of course, many of these behaviors are a normal part of development for all children, both atypically and typically developing. Thus, it is difficult to disentangle normal toddler behavior from behavior of the persistence and social impact that normally characterizes challenging behavior in older children and adults. Nonetheless, the behaviors observed are concerning in that research suggests that early challenging behaviors may persist over time for some children (Green, O'Reilly, Itchon, & Sigafos, 2005; Schneider et al., 1996). Persistent challenging behavior may result in injuries, placement in a more restrictive environments, increased

caregiver stress and social isolation, interruptions in education, and increased use of costly medical and psychiatric services (Holden & Gitlesen, 2006)

4.2 Research Question 2

Relationship between parenting stress and child behavior. Inconsistent with our hypothesis, we found no association between parenting stress related to child behavior and observed challenging behavior. This is surprising, considering past studies that indicate a strong relationship between parenting stress and challenging behavior (Poehlmann, Clements, Abbeduto, & Farsad, 2005; Richman, Belmont, Kim, Slavin, & Hayner, 2009; Tomanik, Harris, & Hawkins, 2004; Walsh, Mulder, & Tudor, 2013).

There are three possible explanations for the absence of a relationship between parenting stress and challenging behavior. First, parenting stress and challenging behavior may actually not be related in our sample. This might be explained by the fact that our sample differs from the vast majority of other studies that have identified such a relationship in that the children were toddlers and not preschool or school-age children (mean age = 30 months). Factors other than child behavior may be more important in determining parenting stress at this stage, such as child medical status, parent adjustment to the diagnosis, access to and satisfaction with early intervention services, or issues related to transition to preschool.

Secondly, the relationship between observed behavior and parenting stress may be obscured by the fact that challenging behavior is confounded with typical toddler behavior for our sample. In this sense, the behaviors we observed and coded for this study are actually a combination of challenging behavior and typical toddler behavior inextricably mixed together. Thus, it is possible parent perceptions about the degree to which a child's misbehavior is developmentally normal and temporary may mediate the relationship between child behavior and parenting stress.

Additionally, many behaviors, including aggression, destruction of objects, and tantrums often cause less harm and are easier for adults to manage in younger, physically smaller children.

These reasons would explain why the types of behaviors we coded would have less of an effect on parenting stress among toddlers with developmental delays compared to school-age children.

Finally, we may have found no relationship between parenting stress and observed child behavior because our sample of each child's behavior was a poor reflection of his or her typical behavior. A thirty-minute sample of behavior may be too short for an observer to have an accurate representation of the child's day-to-day behavior. It may also suggest that our intervention entailed an unusual situation for the child, and thus elicited behavior that differed from his or her typical behavior. For example, some children may be unused to being required to engage with books for 10 minutes, and this may have been particularly challenging for them. Parent behavior in the context of the intervention may also have been unusual, and influenced child behavior in turn. Many of the other studies that identified a relationship between observed child behavior and parent report measures used standardized observation schedules, in which adults behaved in accordance with very specific instructions (Wakschlag, Briggs-Gowan, et al., 2008; Wakschlag, Hill, et al., 2008). Our intervention session allowed adults to behave more flexibly and make many of their own judgments about how to press children for responses and when to prompt them. Due to this, variability among parents' intervention styles may also have confounded our ability to capture typical child behavior, especially in the baseline session, prior to parent coaching by study staff.

4.3 Research Question 3

Characteristics associated with parenting stress. Inconsistent with our hypothesis, we found no significant differences in parenting stress between parents who identified as white and

those who identified as black or African-American. This finding diverges from other literature, which suggests that black or African-American parents report higher levels of parenting stress (Cardoso, Padilla, & Sampson, 2010; Franco, Pottick, & Huang, 2010; Pinderhughes, Dodge, Bates, Pettit, & Zelli, 2000; Raphael, Zhang, Liu, & Giardino, 2010; Yu & Singh, 2012).

However, other studies have reported varying results in terms of whether differences remain when socio-economic status (SES) is controlled for. A follow-up two-sample t-test comparing educational achievement, a proxy for SES, among white and black or African-American parents in our sample revealed no significant difference between groups ($t = 1.74, p = .10$). Thus, our findings with regard to parenting stress levels among parents of different racial backgrounds may indicate that these differences are at least partly explained by SES, since we did not find differences between groups of parents of similar SES. Alternatively, it is possible that our sample is unique in some other respect that affected the relationship between parent race and reported stress levels. For example, the experience of having a young child with a disability may be more influential in determining parenting stress levels.

Consistent with our hypotheses, we found that lower adaptive behavior in the domains of daily living skills, socialization, and communication were all associated with higher parenting stress. This finding was expected in light of past studies indicating a relationship between adaptive behavior and parenting stress (Hodapp et al., 2003; Tomanik et al., 2004). Lower adaptive behavior may relate to higher parenting stress due to increased parenting demands faced by parents of children with lower adaptive behavior. These increased parenting demands could involve both direct care for the child and interactions with the broader social context in order to procure appropriate supports and interventions. Lower child adaptive behavior might also influence parenting stress by increasing the salience of the child's developmental delays and

leading to greater concern about other issues that are often important sources of anxiety for families of children with disabilities, such as stigma or the financial security of the child's future (Hall et al., 2012). High levels of parenting stress could also relate to general negativity, which might lead a parent to evaluate their child's adaptive behavior as being less advanced. Finally, as suggested by Baker et al. (2003), it is also possible that other factors such as child temperament or challenging behavior drive the apparent relationship between adaptive behavior and parenting stress. However, the fact that we found no relationship between observed behavior and parenting stress may suggest this explanation is less likely to apply to our sample.

We did not find a relationship between motor skills and parenting stress. This suggests that the motor domain may be at least somewhat independent of other domains of adaptive behavior for children in our sample. It should be noted that a number of children in our study had disabilities that principally affected motor, such as a cerebral palsy, and may have relatively spared other domains. This finding may also be understood to highlight the importance of the ways in which adaptive behavior affects parenting stress through its influence on the quality of parent-child interaction. It seems probable the domains of social behavior and communication, in particular are more important in determining the parent's experience of rewarding interaction with their child compared to motor skills.

Characteristics associated with challenging behavior. Consistent with our hypotheses, we found that both lower communication and socialization skills were related to more challenging behavior observed during the intervention. This finding is consistent with previous research indicating that children with more severe impairments are more likely to demonstrate challenging behavior than children with less severe impairments (Holden & Gitlesen, 2006; Rojahn et al., 2004). This finding also supports the idea conveyed in Emerson's (2001) model

that people with developmental disabilities engage in challenging behaviors partially due to deficits in skills that would allow them to satisfy needs in socially appropriate ways. Explained in a slightly different way by Carr and Durand (1985), challenging behaviors are communicative acts, or requests for socially-mediated reinforcement.

Alternatively, more severe delays in communication and socialization may relate to challenging behavior by increasing the amount of frustration a child experiences, especially in the context of an intervention. This frustration could cause a child to lash out, and throw an object for example, in order to regulate internal experiences, or ease frustration, without the child consciously attempting to change anything in the external environment. This explanation might be particularly well-suited to our finding of the socialization and communication domains being related to challenging behavior, because the nature of our interventions may have placed particular stress on children with more severe deficits in these areas.

Finally, the relationships between socialization, communication, and challenging behavior may indicate a neurobiological basis that underlies the constellation of symptoms observed in autism spectrum disorder, or ASD (APA, 2000, 2013). Although our study did not specifically investigate autism-related symptoms, parents of 24 children reported that their child had been diagnosed with an ASD (13 autism, and 11 pervasive developmental disorder-not otherwise specified) at follow-up appointments for our study, indicating that a sizable portion of our sample probably exhibited the profile for autism spectrum disorder (Romski et al., 2009). Stereotyped and repetitive behaviors, in particular, are included in the diagnostic criteria for ASD, though research also suggests that other types of challenging behavior are more common among people with ASD compared to people with other disabilities (Fodstad et al., 2012b). This explanation does not preclude the more behavior-based ones provided above, but merely

suggests that the prevalence of a profile including deficits in communication and social behavior, and the presence of challenging behavior may point to a common neurobiological basis for these three symptoms.

Neither motor skills nor daily living skills were related to challenging behavior. Severe motor impairments in our sample may have precluded certain types of challenging behavior for some children in our sample. Research suggests that only self-injurious behaviors are associated with more severe motor impairments, and these behaviors were relatively rare in our observations (E Emerson et al., 2001; Lundqvist, 2013). It is interesting to note that lower daily living skills are associated with higher parenting stress, but only exhibited a possible trend with challenging behavior. This finding could be because the content of Daily Living Skills domain on the VABS includes items that are of greater concern to parents than children, for example, awareness of basic safety.

4.4 Research question 4

Change in parenting stress over time. Our hypothesis that parenting stress would decrease over time was not supported. We investigated both change in overall parenting stress and change in parenting stress related to children behavior. Change in overall parenting stress demonstrated a trend in the expected direction, but this finding must be interpreted with caution. It might suggest a small effect of time on parenting stress, with parenting stress decreasing pre to post-intervention. A larger sample size may have been necessary to detect this effect. Any observed change in parenting stress might relate to either the effects of intervention or other changes over time, such as children getting older.

Generally, the fact that we did not observe significant effects of time on overall parenting stress or parenting stress related to child behavior indicates that these likely remained stable.

This finding is less surprising in light of the fact that most parents reported average range or lower parenting stress levels at the beginning of intervention. We would not necessarily expect parenting stress to decrease among parents reporting relatively normal amounts of stress. An extension of the present study might specifically examine the trajectory of parenting stress over time in parents who reported clinical elevations at baseline. It is also possible that the contributions of various topics related to parenting stress changed over time in ways that could not be captured by the PSI-SF. For example, concern about child language development might have decreased while concern regarding the child's transition to preschool increased. In support of this, Smith et al. (2011) examined of parent perceptions of child language development from the first of our two studies (62 of the 113 children included in this study), and found that parents generally viewed their children as being more successful in communicating follow intervention.

It is worth noting that parenting stress did not appear to increase over time, indicating that a language intervention including parent coaching and ultimately parent implementation was not perceived as seriously burdensome. This is consistent with past research exploring the acceptability of parent-implemented interventions for families of children with developmental delays (Venker, McDuffie, Weismer, & Abbeduto, 2012). Additionally, consistent with our hypotheses, change in parenting stress over time did not vary by intervention type, augmented or spoken communication. This suggests that the addition of a speech generating device, or SGD, to an intervention was not particularly stressful for parents either. This is important to emphasize, considering that some early intervention providers might hesitate in using SGDs out of concerns that either the technical demands are too high for families or the introduction of an SGD will be in some way distressing to families (Ronski et al., 2010; Ronski & Sevcik, 2005).

Change in challenging behavior over time. Inconsistent with our hypothesis, we observed no significant changes in challenging behavior from the baseline to 24th session. This finding suggests that an intervention broadly targeted at improving communication skills may not have an effect on challenging behavior. This finding supports research on the importance of functional behavior analysis (FBA) preceding interventions for challenging behavior. Interventions for challenging behavior are much less effective when they are not informed by data-driven hypotheses about how the behavior is maintained (Ægisdóttir et al., 2006). Thus, it makes sense that an intervention that addressed language not challenging behavior, much less one incorporating an FBA, would be unlikely to have an effect on challenging behavior.

Our ability to evaluate change in challenging behavior over time is also complicated by the fact that children of the young age of our sample are changing rapidly. Limited information is available about the expected trajectory of behaviors over time, especially including the toddler years. Berkson (2002) found that the frequency of self-injurious behavior (head hitting or heading banging) peaked at age three in a sample of 39 children with developmental delays. Her study might suggest that one would expect such behaviors to have increased during the period we observed in our sample, given that children were an average age of 31 months at baseline and 36 months at session 24. However, the relative dearth of information on expected trajectories of challenging behaviors among young children with developmental delays precludes any conclusions on this point.

Challenging behavior did not increase over time. This point is interesting in consideration of the intervention itself and the ways in which adult behavior may have differed at the baseline and session 24 time points. Anecdotal observations of the videos coded suggested that many parents placed higher demands on children during session 24. For example, parents more often

briefly withheld desired items rather than anticipating the child's wants in order to encourage the child to request items either vocally or using the SGD. One might expect that higher demands would evoke more challenging behavior, at least at first. It is possible that intervention enabled children to rise to higher demands without increasing frustration and challenging behavior. A possible extension of this study could examine challenging behavior in the first few intervention sessions to see whether the introduction of the intervention is associated with a spike in challenging behavior, followed up by a decrease to baseline levels as children learn how to cope with the changed contingencies for reinforcement.

Consistent with our hypotheses, change in challenging behavior over time did not vary by intervention type, augmented or spoken communication. This finding suggests that the addition of an SGD to a language intervention did not have an effect on children's challenging behaviors. This finding might be viewed as contrary to the suggestion that augmented interventions can reduce child frustration by allowing children who do not have intelligible speech to communicate. An extension of this study might examine the influence of intervention type on challenging behavior among groups of children who did or did not develop oral speech to varying degrees over the course of the study. It is possible that SGDs only have an effect on challenging behavior among children with the most severe language delays because other children were able to communicate successfully using speech by the post-intervention time point.

4.5 Research Question 5

The role of vocabulary gains in parenting stress over time. Inconsistent with our hypothesis, we found that vocabulary gains did not moderate the relationship between and pre and post-intervention parenting stress related to child behavior. Put another way, change in parenting stress did not vary at different levels of possible intervention-related benefit. This

finding is less surprising in light of the fact that parenting stress related to child behavior did not change significantly overall from pre to post-intervention, though investigations of what particular circumstances are related to pre-post changes in parenting stress among subgroups of our sample might still yield information relevant to supporting families of children with disabilities.

It is possible that our measure of potential benefit from intervention, the number of spoken or augmented words the child produced independently in session 24, did not fully capture the outcome that was most salient to parents. Parents might, for example, be more affected by changes in the quality of reciprocal parent-child interaction that could be related to intervention. Alternatively, the number of new vocabulary words may vary in parent reactions depending on the child's baseline skills. Parents of children with more severe initial communication deficits might be more affected by the experience of participating in the study, even if their child gained relatively few vocabulary words compared to other participants.

4.6 General Discussion and Limitations

This study adds to the literature on both parenting stress and challenging behavior in several ways: First our sample is particularly young compared to most of the extant literature on challenging behavior. Examinations of challenging behavior at this early age may contribute to deeper understanding of the trajectory of both normal misbehavior in toddlers and more serious behavior problems that tend to persist or worsen over time. Secondly, this study investigated possible effects of language interventions that targeted communication broadly on challenging behavior. Although many practitioners who implement language interventions acknowledge that improving a child's ability to communicate could have a positive impact on emotional and behavioral regulation, challenging behavior is not often specifically measured as a possible

outcome. We sought to begin to fill this gap by providing one example of an examination pre and post-intervention challenging behavior in a sample of children with developmental delays.

There are several limitations to this study. First, because it was originally designed as a comparison of language interventions for children with developmental delays, it included neither a typically developing control group nor a control group with developmental delays. This limits the conclusions we are able to draw with regard to possible differences in the behaviors we coded between typically and atypically developing children. In addition, it is difficult to disentangle age-related change in challenging behavior from intervention-related ones among children with developmental delays. Secondly, we did not have a parent report measure of challenging behavior. Such a measure would have been helpful in providing a more complete picture of the child's behavior in day-to-day life. Finally, due to the limited SES range of parents in our sample, we cannot generalize our findings regarding to parenting stress beyond middle to high SES families.

In conclusion, our study indicated that parenting stress was elevated among parents of toddlers with developmental delays. This finding highlights the need for the availability of community supports to ensure that the needs of families are met prior to children entering school. This study also suggests a more complex picture of the relationships between parenting stress, child challenging behavior, and child adaptive behavior than described in previous literature. Our findings may indicate that child adaptive behavior has a stronger influence on parenting stress among parents of toddlers. As children age, this pattern may shift, and challenging behavior may become more important in determining parenting stress. This change could be driven by the fact that toddler challenging behavior is more easily managed and likely to be perceived by parents as normal and temporary. Longitudinal research is needed to determine the

parameters of temporary and persistent behavior problems among toddlers with developmental delays in order to allow to early intervention to mitigate the long-term effects of challenging behavior on quality of life among people with developmental disabilities. Finally, this study indicated that an intervention aimed at improving general communication skills was not associated with changes in parenting stress or challenging behavior. This finding, combined with research on the importance of FBA in challenging behavior interventions, suggests that the addition of a component specifically designed to address behavior problems of concern to parents to language interventions for toddlers may be helpful to some families.

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APPENDICES

Appendix A

<i>Comparison of Intervention Target Vocabulary, Mode, Strategies, and Parent Coaching.</i>				
Component	SC	AC-I	AC-O	AC-I/O
Target Vocabulary	I/P and child use speech to communicate	I/P uses the speech-generating device to provide comm. input to child	Child uses the speech-generating device to communicate	I/P uses the speech-generating device to provide comm. input; the child uses speech-generating device to communicate
Mode	Individualized vocabulary of spoken words	Individualized vocabulary of visual-graphic symbols + words	Individualized vocabulary of visual-graphic symbols + words	Individualized vocabulary of visual-graphic symbols + words
Strategies	I/P encourages and prompts the child to produce spoken words	I/P provides vocabulary models to child using the device; Symbols are positioned in the environment to mark referents	I/P encourages and prompts the child to produce communication using the device	I/P provides vocabulary models to child by using the device; Symbols are positioned in the environment to mark referents; I/P encourages and prompts the child to produce communication using the device
Parent Coaching	I provides resource and coaching for P	I provides resource and coaching for P	I provides resource and coaching for P	I provides resource and coaching for P
<p><i>Note.</i> SC: Spoken Communication; AC-I: Augmented Communication-Input; AC-O: Augmented Communication-Output; AC-I/O: Augmented Communication-Input/ Output; I: Interventionist; P: Parent; I/P: Interventionist or Parent.</p>				

Appendix B

Code	Definition	Examples
Aggressive	Deliberate physical act directed at another person which injures or causes pain, or has the potential to do either of these things.	Hitting, biting, kicking, pinching, pushing, or scratching directed at others
Self-Injurious	Deliberate physical act directed at oneself which injures or causes pain, or has the potential to do either of these things.	Hitting, biting, pinching, skin-picking, scratching, or head-banging directed at self
Destructive	Deliberate physical act directed at an object which damages or destroys it, or has the potential to do either of these things.	Throwing, kicking, or flipping objects; striking objects on a surface
Disruptive	Behavior that highly likely to interfere with normal activities	Tantrums, screaming, running away, climbing on furniture
Non-compliant	Persistent refusal to engage with activities or adults or to obey understood instructions or expectations	Refusal to give up a toy; dropping to floor and refusing to get up
Stereotyped or Repetitive	Repetitive, non-functional vocalizations or movements.	Stereotypies, such as hand-flapping, finger-flapping, or repetitive hopping; mouthing objects
Other	Other socially unacceptable behaviors that either put the child or others at risk of harm or are likely to seriously limit the ability of the child to engage in activities	