THESIS

PARENT-CHILD INTERACTIONS AND ADAPTIVE BEHAVIOR IN CHILDREN WITH DOWN SYNDROME

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ABSTRACT

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Adaptive behavior is essential for the development of independence in individuals with developmental disabilities. Individuals with higher levels of adaptive behavior tend to require less support from caregivers than those with lower levels of adaptive behavior. The current study examined the association between parenting behavior and child adaptive behavior within the context of a parent-child interaction in dyads with and without a child diagnosis of Down syndrome (DS). Findings showed parents of children with DS engaged in significantly more directives than parents of TD children. Additionally, there was a significant negative association between parent directives at Time 1 and child adaptive behavior at Time 2 overall, whereas there was a significant positive association between parent teaching at Time 1 and child adaptive behavior at Time 2 in the DS group. Findings from this study may be useful for informing future parenting interventions.

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INTRODUCTION

Down syndrome, the most common neurogenetic disorder associated with intellectual disability (Daunhauer & Fidler, 2011; Canfield et al., 2006), is associated with lower levels of adaptive behavior relative to typically developing (TD) children (Brooks, Floyd, Robins, & Chan, 2015; Coe et al., 1999; Cuskelly, Povey, & Jobling, 2016; Green, Caplan, & Baker, 2014; van Duijn, Dijkxhorn, Scholte, & van Berckelaer-Onnes, 2010; Zhu et al., 2016). Adaptive behavior refers to skills required for daily functioning that are identified in four domains: motor skills, daily living skills, communication and sociability. Individuals who exhibit higher levels of adaptive behavior often require less support from parents and caregivers (AAIDD, 2010). Most adaptive behavior development occurs during childhood, which is a period characterized by greater exposure to parental influence than any other period (AAIDD, 2010; Spiker, Boyce, & Boyce, 2002; Zhu et al., 2016). Thus, characterizing the role of parent behavior in the development of child adaptive behavior could inform future interventions and services targeting adaptive behavior development in children with DS and could result in greater independence later in life.

Despite extensive research that characterizes developmental differences between children with DS and TD children [e.g., executive function (Amado, Serrat, & Valles-Majoral, 2016; Camp, Karmiloff-Smith, Thomas, & Farran, 2016) and social relatedness (Fidler, Most, Booth-LaForce, & Kelly, 2008)], it is unclear to what extent behavioral differences in parenting style account for individual differences in child outcomes. To date, there has been little exploration of the relationship between parent behaviors, such as teaching, directives, and intrusion, and child adaptive behavior in dyads with children with DS. Similarly, the relationship between parenting

behaviors and child adaptive behavior has not been examined longitudinally in children with DS. The current study aims to address this gap in the literature by examining the association between parent behaviors and child adaptive behavior over time, and how they may differ from associations in TD dyads.

REVIEW OF THE LITERATURE

DS Behavioral Phenotype

There are three different causes of DS, including trisomy 21 (nondisjunction), translocation, and mosaicism as the most to least common, respectively (Devlin & Morrison, 2004). DS is associated with challenges in aspects of cognitive functioning, including verbal processing and executive function (Amado, Serrat, & Valles-Majoral, 2016; Camp, Karmiloff-Smith, Thomas, & Farran, 2016; Daunhauer, Fidler, Hahn, Will, Lee, & Hepburn, 2014; Lanfranchi, Silvia, Cornoldi, & Vianello, 2004). It is also associated with relative strengths in social relatedness (Fidler, Most, Booth-LaForce, & Kelly, 2002), where many individuals with DS show competencies in forming stable and reciprocal friendships with peers (Freeman & Kasari, 2002) and express high levels of empathy by looking to distressed peers and offering comfort (Kasari, Freeman, & Bass, 2003). As social competence and communication skills contribute to aspects of adaptive behavior, it is likely that children with DS may exhibit differences in their adaptive behavior as well.

Despite the growing body of literature on behavioral outcomes in DS, most work has simply linked etiological diagnosis to these outcomes, and there has been little focus on the role of the environment as a source of variability in those outcomes. Focusing on environmental inputs may be useful because parent behavior impacts child behavior, adaptive behavior, and environmental and interpersonal interactions. More specifically, a diagnosis of DS results in delays in developmental milestones and elicits differences in parenting responsibilities, practices, and reactions compared to TD children. Although parents of children with DS report lower

stress levels than parents of children with other DD conditions (Corrice & Glidden, 2009; Hodapp, Ly, Fidler, & Ricci, 2001), they experience higher levels of stress than parents of TD children (Roach, Orsmond, & Barratt, 1999). Differing interpretations of this "Down syndrome advantage" in parental stress include attributions to child factors (Corrice & Glidden, 2009; Smith, Romski, Sevcik, Adamson, & Barker, 2014) and factors other than child characteristics (Emerson, 2003). This "Down syndrome advantage" is related to greater personal reward and greater subjective well-being associated with child rearing in parents of DS compared to parents of children with DD (Corrice & Glidden, 2009). Conversely, researchers have suggested that parental stress and distress is predicted by parental perception of severity of impairment (Smith et al., 2014) and greater child emotional and behavioral difficulties (Emerson, 2003). However, psychological distress and social disruption is also attributed to higher rates of social deprivation often experienced by families of children with disabilities (Emerson, 2003). These findings highlight the impact of child behavior and development on parent mental health and well-being, and which may have implications for parent perceptions in their interactions with their children.

Another aspect of parent experiences that has been examined in parent-child interactions involves the relationship between parent perception of child development and parent responsivity. Parent responsivity is characterized by contingent responses to child engagement that foster warmth and growth through learning (Baird, Haas, McCormick, Carruth, & Turner, 1992; Sterling & Warren, 2014). In a study examining parent responsivity in mothers of children with DS, researchers posited that when delayed development is perceived, parents may adapt to a more facilitative style to engage their child and foster increased development (Sterling & Warren, 2014). Results showed that mothers of children with DS increased their facilitative style with children as they aged, whereas the opposite was found in mothers of TD children (Sterling

& Warren, 2014). Thus, increasing facilitation subsequently modifies the way parents interact with children, which may also change how children interact with parents. This modification in parent-child interactions in these populations may impact subsequent child behavior and the development of skills, including adaptive behavior. Examining the specific nature of parent responses elicited by children (e.g., teaching, directives, or intrusions) may provide important information about the underlying mechanisms of the association between parent behavior and child outcomes, including adaptive behavior.

Adaptive Behavior

Adaptive behavior is a combination of conceptual, social, and practical skills required for daily functioning (AAIDD, 2010) that include behaviors considered to encourage or catalyze independence in naturalistic settings. This behavior is essential for the development of self-sufficiency, as stronger adaptive functioning leads to decreased dependence on parents or caregivers (AAIDD, 2010; Zhu et al., 2016). Adaptive behavior is most frequently measured in four domains, including communication, daily living skills, socialization, and motor skills (Vineland-II; Sparrow, Balla, & Cicchetti, 1984). Socialization includes prosocial behaviors, demonstrations of sensitivity, and coping abilities with social transitions experienced in play and leisure. Communication measures receptive, expressive, and written forms of communication, focusing on understanding and processing incoming communication, verbalizations, reading, and writing. Daily living skills are examined in areas salient to independent functioning, including personal (eating and hygiene), domestic (household tasks), and community (use of time, money, and electronics along with job skills) domains. Motor skills include gross and fine coordination, and are measured by physical manipulation of the environment. The current study aims to

investigate group differences in adaptive functioning in children with DS compared to TD children, and to examine these differences in the context of parent behavior after two years.

TD samples were used to establish norms for the first adaptive behavior measures (Doll, 1936; Sparrow, Balla, & Cicchetti, 1984), with subsequent research identifying group differences by comparing clinical samples to TD samples (Brooks, Floyd, Robins, & Chan, 2015; Coe et al., 1999; Cuskelly, Povey, & Jobling, 2016; Green, Caplan, & Baker, 2014; van Duijn, Dijkxhorn, Scholte, & van Berckelaer-Onnes, 2010; Zhu et al., 2016). Adaptive behavior is now used for characterization and measurement of child developmental delays when compared to TD children. For instance, in a study of adaptive behavior in Dutch children with DS compared to TD peers (van Duijn, Dijkxhoorn, Scholte, &van Berckelaer-Onnes, 2010), children with DS were found to exhibit an overall delay in adaptive behavior development compared to TD children, yet they also showed a similar growth trajectory and sequence of skill acquisition.

Whereas comparisons of children with DS to TD children have identified a slower rate of adaptive behavior acquisition for those with DS, researchers have further investigated group differences within atypical development based on mixed-etiology DD diagnoses. Strengths and weaknesses in adaptive functioning domains have been observed when children with DS are compared to children with other DD conditions, wherein children with DS demonstrate more advanced socialization skills than children with DD matched for overall developmental status (Fidler, Hepburn, & Rogers, 2006). Further investigation of the DS adaptive behavior phenotype has characterized a pattern of strengths and weaknesses in domains of socialization, daily living skills, and communication, with strengths in socialization and daily living skills compared to communication (Coe et al., 1999; Dykens, Hodapp, & Evans, 2006; Fidler et al., 2006; Griffith et al., 2010; van Duijn et al., 2010). Upon closer examination of the observed weakness in

communication, expressive communication tends to be weaker than receptive abilities in children with DS, indicating difficulties in verbal expression (Dykens et al., 2006; Marchal et al., 2016). It has been posited that children with DS might utilize their social skills more than less developed areas of functioning (daily living skills and motor skills) to compensate for weaker development of other domains (Fidler, Most, Booth-LaForce, & Kelly, 2008). Individual differences in adaptive behavior, varying by group, may inform realistic expectations of subsequent skill development in clinical populations.

Studies have also reported within-group variability in adaptive behavior based on chronological age, and have identified a need to further investigate mechanisms that may contribute to this variability. Although adaptive behavior and chronological age are positively associated, this relationship is stronger in early childhood than middle childhood in children with DS compared to TD children (Fisher, Lense, & Dykens, 2016). Researchers suggest that patterns of pronounced weakness in adaptive behavior in children with DS compared to TD children may result in later deficits in adaptive behavior (Dykens et al., 2006). For some, these deficits are improved upon through practice and experience (Dykens et al., 2006). However, the mechanisms of influence in the relationship between chronological age and adaptive behavior remain unclear (Dykens et al., 2006). In addition, despite syndrome-related profiles of adaptive behavior, there is within-group variability on this dimension. And to date, there has been little examination of the association between parenting and adaptive behavior outcomes within DS.

Parent-child Interactions

There is a paucity of information about the environmental mechanisms that influence and facilitate child development in DS. Because parent-child interactions are inherently complex,

their contributions to child development are particularly difficult to isolate (Sameroff, 2010). Moreover, because parent-child interactions are bi-directional in nature, they subsequently impact both parent and child behavior and development through learning (Lunkenheimer, Kemp, & Albrecht, 2013; Sameroff, 1975). Parents influence child behavior and subsequent child reactions then influence parents' behavior, and this process accumulates over time (Sameroff, 1975; Sameroff, 2010). Given that this bi-directional relationship is crucial in parent behavior and child social development, more information is needed regarding parental contributions to changes in child development over time in children with DS.

Parenting Behaviors. Parenting behavior is influenced by specific child characteristics, including chronological age, perceived skills, and developmental level, which suggests that different interaction styles may be observed in children with disability-related profiles (Guralnick, Hammond, Neville, & Connor, 2008; Sterling & Warren, 2014). For instance, when compared to TD dyads, parents of children with DS use more actively engaging and facilitative styles in interactions with their children (Sterling & Warren, 2014). This facilitative style remains stable for parents of children with DS, whereas it decreases with age in TD dyads (Sterling & Warren, 2014). This difference may be due to the perceived language ability of the child, where mothers of children with more advanced verbal ability are required to engage children less (Sterling & Warren, 2014). Similarly, when children's verbal abilities are perceived as weaker than expected, parents may feel the need to facilitate and engage with the child more to support language development (Sterling & Warren, 2014). The engagement of children with developmental disabilities has been found to remain stable over time based on parent scaffolding behavior and total frequency of facilitating behaviors in mother-child interactions (Guralnick et al., 2008), further supporting the importance of parent behavior in

child development. As parenting behavior may elicit child developmental outcomes in their interactions, the frequency and type of parenting behaviors are important considerations in characterizing the impact of parent-child interactions on child development of adaptive behavior.

Parenting behaviors in TD dyads vs. DS dyads. Studies of parenting in TD dyads report that parents utilize a combination of teaching, directives, and intrusions to affect or shape child behavior (Guralnick, Neville, Hammond, & Connor, 2007; Green, Caplan, & Baker, 2014; Karaaslan & Mahoney, 2013; Marfo, 1991; Spiker, Boyce, & Boyce, 2002; Sterling & Warren, 2014). These parenting behaviors are considered important contributors to child outcomes, including child participation or engagement, adaptive behavior, and social skills in both clinical and non-clinical dyads (Baird, Haas, McCormick, Carruth, & Turner, 1992; Crawley & Spiker, 1983; Green, Caplan, & Baker, 2014; Landry et al., 1994; Mahoney, Boyce, Fewell, Spiker, & Wheeden, 1998; Marfo, 1991; Spiker, Boyce, & Boyce, 2002). Yet changes in parenting, which may underlie this association between parent behaviors and child adaptive behavior, have not been clearly identified.

Parent teaching behaviors. One common strategy that parents use with young children is teaching, which can include explanations and open-ended questions (Lunkenheimer, 2013). Teaching behaviors are theorized to be adjusted based on child need such that when low child engagement is perceived, parents increase their use of teaching behavior (Vygotsky, 1978). As young children with DS have been found to be less engaged in object oriented tasks than mental age matched TD children (Ruskin, Mundy, Kasari, & Sigman, 1994), parents may facilitate activities to increase child engagement and learning.

Recent studies have underscored a need for further examination of the relationship between parent teaching behaviors and child developmental outcomes in clinical and non-clinical

populations. In an investigation of parent-child interactions in dyads with a child with DS, parent teaching behaviors were found to increase child engagement and reciprocity (Karaaslan & Mahoney, 2013). Within this pattern, an association was discovered between parent teaching, responsiveness, including contingencies, reciprocity, affect, and non-directiveness (following a child's lead), and child interactive engagement and development (Karaaslan & Mahoney, 2013). For mothers who were less responsive, or who used fewer teaching behaviors and more directives, child engagement tended to be less advanced than when teaching behaviors were utilized more frequently (Karaaslan & Mahoney, 2013). These findings indicate a positive association between teaching behaviors on child engagement and response. Although this conclusion provides insight into the importance of parent teaching behavior in dyads with a child with DS, this sample was not compared to another group, resulting in a need for further investigation of group differences. Given the small number of studies examining teaching behavior in parent-child interactions, more information is needed to understand the relationship between parent teaching on child developmental outcomes, and existing differences between developmental groups.

Parent directives. Parent directives, sometimes referred to as "controlling behavior" (Green, Caplan, & Baker, 2014; Sterling & Warren, 2014), are statements, requests or commands for specific behavior (Guralnick, Neville, Hammond, & Connor, 2007), usually utilized to complete a task. For example, a parent may request that a child "put a toy away", indicating a clear behavioral expectation. Group differences in directive utilization have been found, wherein parents of children with DS use significantly more directives than parents of TD children (Lopez, 2014; Spiker, Boyce, & Boyce, 2002; Sterling & Warren, 2014), and over time, parents of TD children tend to use fewer directives compared to parents of children with DS (Sterling &

Warren, 2014). Although directive parental behaviors have been hypothesized to be detrimental to child cognitive, social-emotional, and language outcomes in TD children, this may not be the case in children with DS (Roach, Barratt, Miller & Leavitt, 1998). In a study comparing dyads with a TD child and mental age-matched dyads involving a child with DS, maternal use of directives was negatively associated with child vocalizations in TD dyads (Roach et al., 1998). One interpretation offered for this finding was that parental directives may have limited child participation or language utilization (Roach et al., 1998) and reciprocity, such that greater parental directives are associated with decreased turn-taking due to interruptions of child vocalizations by the parent (Tannock, 1985). However, there is evidence that for children with DS, directives facilitate child engagement by increasing the frequency of parent-child interactions and directing child attention (Roach et al., 1998). In another study comparing mother-child interactions in these types of dyads, maternal use of directives was positively associated with the amount of time a child with DS spent engaged with a toy, indicating their mother helped to focus their attention (Cielinkski, 1994). The differing influence of parent behavior on child outcomes suggests that what may be a maladaptive parenting behavior in one group may not be in another.

Although parental over-directiveness is negatively associated with developmental outcomes in TD children (Roach et al., 1998), researchers suggest that children with DS may experience positive outcomes if parents maintain a balance between directive and reciprocal behavior, thus facilitating both successful completion of a task and social and cognitive development. Cielinski and colleagues (1995) found group differences in child outcomes by observing maternal directiveness and reciprocity during a mother-child play activity. In this study, maternal directiveness was positively associated with child participation for both children

with DS and developmentally matched TD children (Cielinski, Vaughn, Seifer, & Contreras, 1995). Interestingly, maternal directiveness was negatively associated with child social initiation, but this correlation was only statistically significant in the TD group (Cielinski et al., 1995). Child social initiation indicates a higher propensity or motivation for social engagement (Cielinski et al., 1995). These findings support group differences in the association between child participation and directiveness, as what may be more facilitative and engaging for one group is not for the other. The use of directive behaviors may be due, in part, to parents' perceptions of their children's ability levels, causing them to take a directive approach instead of an interactive approach with their child (Crawley & Spiker, 1983).

Parent intrusions. Parent intrusions occur when a parent completes a task for a child or physically takes something from a child. Intrusions have been examined both as a subset of directiveness (Baird, Haas, McCormick, Carruth, & Turner, 1992) and as a distinct phenomenon (Marfo, 1991), with findings that they can frequently occur together (Baird et al, 1992), but are not consistently related (Marfo, 1991). When examined as a subset of directiveness, researchers explain that intrusiveness and facilitation are opposing behaviors that cannot occur at the same time (Baird et al., 1992). However, Crawley and Spiker (1983) point out that because intrusiveness is identified synonymously with directiveness, thus implying a lack of parental sensitivity, measuring it separately from directives may be optimal to isolate its role in parent-child interactions and subsequent child developmental outcomes. Despite mixed findings about the relationship between directives and intrusions, Spiker, Boyce, and Boyce (2002) review that parent intrusions are a hallmark of parent-child interactions in developmentally delayed dyads. In examining intrusiveness in TD and mixed-etiology dyads, researchers found that parent intrusions were negatively related to infant participation (Baird et al., 1992) and parental

sensitivity (Crawley & Spiker, 1983). Because intrusiveness has been studied in mixed-etiology developmental groups compared to TD groups, there is a need to further investigate the impact of intrusiveness on child development in children with DS specifically. And, based on the limited scope of research that cross-sectionally compares parent intrusions to child behavior, less is known about how intrusiveness is related to the development of child adaptive behavior.

Parent Behaviors and Adaptive Behavior

Parent-child interaction dynamics can contribute to the development of adaptive behavior by fostering a learning environment that encourages communication and skill building. However, due to deficits associated with the DS phenotype in social communication and motor abilities required for interactions, interactions with parents may be more difficult or complex. This difficulty may be associated with increased parent facilitation of communication and activities to enable children with DS to successfully navigate and learn from parent-child interactions. Thus, parent behavior is related to child adaptive behavior via interpersonal communications. Therefore, a greater understanding of contributing parental or interpersonal factors to child adaptive behavior development is critical, as subsequent skills and interactions are impacted by associated abilities.

In the present study, parenting behaviors are hypothesized to be associated with the development of adaptive behavior through the scaffolding of child exposure to appropriate interactions, increasing practice of adaptive skills used in these interactions. By effectively facilitating child learning over time, parents establish expectations for child reciprocity and functioning, positively impacting adaptive behavior through social growth. In this way, parents gradually scaffold child interactive experiences while reinforcing appropriate responses and

initiations to solidify children's understanding of behavioral expectations in various situations. Thus, through exposure to new situations and experiences, children's adaptive behaviors are reinforced and continuously strengthened, resulting in increased adaptive behavior throughout childhood. More specifically, children may learn about situations because of parent directiveness and scaffolding where parents engage children with DS in experiences that would otherwise be ignored, resulting in growth in adaptive behavior and subsequent developmental functioning.

The nature of the relationship between parenting behaviors and child adaptive behaviors over time has been examined in one previous study of DD dyads, with a specific focus on parent interference and directiveness. In their study, Green, Caplan, and Baker (2014) examined parent-child interactions at age three, focusing on supportive directives and interference, and compared behavior frequencies to child adaptive behavior at age five in TD and DD dyads. Researchers found that parent interference and directiveness at child age three negatively predicted child adaptive behavior at age five in the DD group, but not the TD group. Interestingly, supportive directives (i.e., parent control that follows the child's goal) predicted higher adaptive functioning for TD children and better social skills for children with DD, whereas more interference predicted lower adaptive behavior and social skills in the DD group, but not in the TD group (Green, Caplan, & Baker, 2014). These observations suggest that developmental status may qualify the impact of supportive parent directives and intrusions on child adaptive behavior. Although these findings elucidate the relationship between parent behavior and child adaptive behavior in children with mixed-etiology DD, they also highlight a need for further research on changes in this association over time in different diagnostic groups, including DS specifically.

Although the association between parent behaviors and child adaptive behavior in TD children has been compared to children with DS, this association has not been examined over time. Studies have examined within-group changes in adaptive behavior in DS over time (Dykens et al., 2006; Fisher, Lense, & Dykens, 2016) and have compared the association of parent directives and adaptive behavior over time in TD and mixed-etiology DD groups (Green, Caplan, & Baker, 2014). However, comparative studies in TD and DS groups are predominantly cross-sectional designs, thus excluding important information about group differences in the development of parent and child behavior over time (Cielinski et al., 1995; Karaaslan & Mahoney, 2013; Roach et al., 1998; Sterling & Warren, 2014). Furthermore, although the association between adaptive behavior and parent directiveness has been examined over time (Green, Caplan, & Baker, 2014), this association has excluded distinct parent behaviors, such as teaching and intrusions.

A better understanding of the relationship between parent behavior and child adaptive behavior in children with DS compared to TD peers, which has been broadly examined in previous studies, may contribute to current knowledge of best parenting practices. Furthermore, investigating the association between distinct parenting behaviors and child adaptive behavior over time may provide insight into experiences and challenges of parenting and differences based on child diagnostic status. Specifically, as parents foster development of social skills and skills required for daily functioning during childhood, parent behavior may impact other developmental outcomes including independence skills or adaptive behavior. This relationship suggests that if parents encourage child independence, they may provide their children with strong foundational skills for independent functioning, which could have implications for quality of life for families of both TD children and those with DS based on the level of support required

from caregivers. The current study examines the relationship between parenting and child developmental outcomes and identifies areas for future research.

CURRENT STUDY

The current study will examine the association between parenting behavior and child adaptive behavior within the context of a parent-child interaction in DS and TD dyads. Although parent behavior and child developmental outcomes have been extensively examined in DD and DS (Baird et al., 1992; Crawley & Spiker, 1983; Green, Caplan, & Baker, 2014; Karaaslan & Mahoney, 2013; Landry et al., 1994; Mahoney et al., 1998; Marfo, 1991; Spiker, Boyce, & Boyce, 2002), little is known about individual associations of specific parent behaviors, including teaching, directives, and intrusions, and child adaptive behavior in DS. Additionally, there is little information regarding how these particular relationships may change over time, as children age. In examining these connections, the current study hypothesizes that group differences in parenting will emerge, such that at Time 1, parents of children with DS engage in more intervening parenting in the form of teaching, directives, and intrusions. Moreover, to identify changes in specific relationships, it is hypothesized that over time, a positive association will be observed between adaptive behavior at Time 2 and frequency of parent teaching behaviors at Time 1, whereas a negative association will be observed between adaptive behavior at Time 2 and frequency of parent intrusion and directives at Time 1. Finally, to explore the relationship between parenting behaviors and adaptive behavior, it is hypothesized that in both developmental groups, parent behaviors at Time 1 (e.g., teaching, directives, and intrusions) will significantly predict child adaptive behavior at Time 2.

METHODS

Participants

Participants in the first wave of data collection were 42 children with DS and 28 TD children who participated in data collection in a larger study of development in DS. Subsets of participants completed data collection in a second wave. Demographic information is displayed in Table 1. Child chronological ages ranged from 4.9 to 9.75 years and 2.5 to 4.16 years, respectively. The TD group was matched to the DS group based on mental age to enable group comparisons. The majority of participants were recruited in Colorado and may not represent the general population. Because the majority of families included identified as white and not Hispanic or Latino, cultural differences may not be represented in current findings. In the original study, participants were recruited via flyers placed in early childhood centers and locations with resources for children with disabilities. In addition to distributed flyers, support groups and DS organizations were used for word-of-mouth dissemination of information. These methods reflect nonrandom sampling techniques and snowball sampling. Given that participants self-selected into the study, they may be systematically different from participants who opted out. Participant attrition was examined with a MANOVA to determine if participants who returned to participate in Wave 2 were systematically different from those who did not.

Table 1
Participant Demographic Information

	TD		DS	
	N	**%**	**N**	**%**
Gender				
Female	11	15.71%	16	22.86%
Male	17	24.29%	26	37.14%
Race				
American Indian/Alaskan Native	0	0.00%	1	1.43%
Asian	1	1.43%	0	0.00%
Black or African American	0	0.00%	1	1.43%
White	24	34.29%	34	48.57%
More than one race	3	4.29%	4	5.71%
Ethnicity				
Hispanic or Latino	1	1.43%	2	2.86%
Not Hispanic or Latino	26	37.14%	35	50.00%
Unknown or Not Reported	1	1.43%	0	0.00%
Mother's Ethnicity				
Hispanic or Latino	1		3	
Not Hispanic or Latino	25		32	
Unknown or Not Reported	2		7	
Mother's Education				
Some High School	1		1	
High School Graduate	0		2	
1-3 Years College	3		7	
College Graduate	7		15	
Some Graduate Training	12		7	
Professional Degree	4		5	
Unknown or Not Reported	1		5	

	TD			DS		
	***M*(SD)**	**Min**	**Max**	**M(SD)**	**Min**	**Max**
CA in Months	38.71(5.45)	30	50	89.35(17.11)	59	117
MA in Months	49.89(6.78)	35	62	48.44(9.86)	33	81
Vineland Composite Standard Score	108.73(12.58)	84	131	67.29(13.44)	25	86

Procedures

For the original larger study, participants were recruited via phone by graduate research assistants and asked to come into a child development laboratory setting. In the first visit, the experimenter described the purpose of the study and explained that there were no foreseeable risks or benefits from participation. Participants signed a consent form if they chose to proceed

with the study. After parental consent was given, child assent was also obtained. Participants were compensated $30 for their time. During the laboratory visit, the child was seated with the examiner while the parent watched from behind a one-way mirror. Parents completed questionnaires during this time. Parents were seated with their child only during the Parent-Child Challenge Task (PCCT), which lasted five minutes and was videotaped. Participants returned two years later to complete the same activities. Videos for this study were coded using Noldus Observer XT software by the author and one other graduate student, who were required to study a coding manual.. Inter-rater reliability was calculated with percent agreement to code reliability and consistency, with 30% of the sample used to establish 70% agreement (Lunkenheimer et al., 2013).

Measures

Parent-Child Challenge Task (PCCT). Participants engaged in the PCCT (Lunkenheimer et al., 2013) by completing three castle puzzles of varying difficulty. The puzzles required manipulation of seven blocks to configure castles to match pictures. Participants were instructed to play together like they do at home. The five-minute interactions during the PCCT were recorded with Noldus Observer XT.

Parent behaviors. The coding system used to code behaviors during the PCCT was a modified version of Lunkenheimer's Dyadic Interaction Coding System (DICS) (Lunkenheimer, 2009), adapted from the Relationship Process Code (RPC; Dishion et al, 2008; Jabson, Dishion, Gardner, & Burton, 2004) and the Michigan Longitudinal Study (Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011). The RPC was a third-generation coding scheme originating from the Family Process Code (FPC; Dishion, Gardner, Patterson, Reid, Spyrou, &

Thibodeaux, 1983), and has been extensively used in previous research. The FPC was designed to examine interactions between typically developing family members and in friendships in real time, examining the duration of both verbal and nonverbal actions and affect (Dishion et al, 1983). The DICS incorporates both action and affect to better understand relationship dynamics within families. For the purposes of examining interactions between parents and children with DS, only parent and child behavior are included, as the original DCIS was designed for typically developing dyads. Specifically, behaviors of DICS included in current study are parent teaching, directives, and intrusions.

Directive behaviors. Directives were coded when a parent made a clear command, typically presented in a firm tone. Directives include both "do" and "don't" commands, including statements like "I want", "You do it", or "Please do". Harsh or critical statements were coded as Parent Correction.

Teaching behaviors. Teaching behaviors were coded when parents explained something or asked a question to facilitate the activity (Lunkenheimer, 2013). Questions were open-ended and presented in a soft, conversational tone. Examples include "What goes next?", or "Where does the green block go?".

Intrusion. Intrusive behaviors included parents physically removing blocks from the child's hand, turning a block, or completing a task for a child.

Adaptive behavior (VABS-II). The Vineland Adaptive Behavior Scales (VABS-II; Sparrow, Balla, & Cicchetti, 1984), a revision of the Vineland Social Maturity Scale (Doll, 1965), measures personal and social sufficiency through overall adaptive behavior and domains including communication, daily living skills, socialization, and motor skills. Interviewers ask parents questions about their child's functioning in a semi-structured interview, where age-

appropriate questions are asked in the order presented. Time required for this assessment and child age are positively associated, where more questions are asked for older children than for younger children due to scaffolding of items. There are 383 items, including "Identifies one or more alphabet letters as letters and distinguishes them from numbers.", "Prints or writes own first and last name from memory", and "Reads and understands material of at least second-grade level". Answers are scored on a scale from 0-2, with 0 being never/seldom performed or never performed without help or reminders, 1 being performs sometimes or partially without help or reminders, and 2 being the individual usually or habitually performs the activity without help. Answer options also include DK (don't know) and N/O (No opportunity). A total raw score is converted to standard scores ($\mu = 100$, $\partial = 15$) for each domain and for the composite adaptive behavior score, and reflects overall functioning in addition to total domain scores, with higher scores indicating higher adaptive functioning. Composite scores based on domain standard scores (sum of domain scores) were utilized to compare changes in adaptive functioning from Time 1 to Time 2.

The VABS-II was standardized and published in 2005 using a sample of 3,000 individuals, with 200 per age group of less than 1 through 18 years old. For the Survey form, internal consistency estimates fall between 0.83 to 0.90 for domains, with internal consistency for the composite score at 0.94. Test-Retest domain means fall between 0.81 and 0.86, with the composite score being 0.88, and interrater reliability being 0.74. Construct validity was established with "developmental progressions of raw scores with age" (Sparrow, Balla, & Cicchetti, 1984), and concurrent validity was established through correlations between the VABS-II and similar adaptive behavior scales, including the Vineland Social Maturity Scale, Adaptive Behavior Inventory for Children, and the AAMD Adaptive Behavior Scale. Similarly,

correlations are observed between the VABS-II and intelligence and vocabulary tests (K-ABC and PPVT-R) (Sparrow, Balla, & Cicchetti, 1984).

Parent Measures

Parents provided information regarding demographics including parent age, gender, employment, socioeconomic status, marital status, and education. However, detailed information about how parents function alone and with their children is an important consideration in the impact of parent behavior on child development. Given the importance of parent behavior in parent-child interactions, it draws into question the quality of contributions of parent mental health to child development. The absence of this information is a limitation of the present study and should be considered in future studies examining parent influence on child developmental outcomes.

Control Measures

Mental age. The Leiter International Performance Scale-Revised (Roid & Miller, 1997) measured child non-verbal intelligence. From the Leiter-R, four subtests were administered to measure child mental age, identified as a Brief-IQ, including Figure Ground, Form Completion, Sequential Order, and Repeated Patterns. The Leiter-R was normed with a sample of 2,000 participants with chronological ages 2.0 to 20.11, showing high test-retest reliability ranging from 0.80s to 0.90s (Roid & Miller, 1997). This measure has established adequate concurrent validity with the WISC-III Full Scale and Performance IQs (Roid & Miller, 1997).

Matching on nonverbal mental age was utilized in this study, as it has been extensively utilized as a matching mechanism to compare children with developmental disabilities to TD

peers (see Spiker, Boyce, & Boyce, 2002 for review). Matching on nonverbal mental age provides a more interpretable analysis of group differences compared to matching on chronological age, as children with DS tend to exhibit lower verbal mental abilities compared to TD peers (Daunhauer, Fidler, Hahn, Will, Lee, & Hepburn, 2014; Dykens et al., 2006), and when compared to TD individuals of the same chronological age, individuals with developmental delays present with deficiencies beyond what might be expected of their developmental level (Caplan, Neece, & Baker, 2016).

However, due to the significant difference in chronological age between developmental group ($F(49.62)=33.19$, $p<.001$), it must be noted that children in the DS group have had longer relationship histories with their parents. This may result in a limitation of the study design where the effects of chronological age cannot be controlled for. To identify any associations between chronological age and parent behaviors, three different linear regressions are presented in the Results section, with chronological age as the explanatory variable and frequency of parent behaviors as response variables. The association between child chronological age and adaptive behavior will also be examined in the Results section as well.

ANALYSIS PLAN

Hypothesis 1

At Time 1, parents of children with DS will engage in more intervening parenting in the form of teaching, directives, and intrusions. **Analysis:** A multivariate ANOVA (MANOVA) was performed to analyze mean group differences in teaching, directives, and intrusions. Power analyses using GPower 3 (Faul, Erdfelder, Lang, & Buchner, 2007), indicated adequate power to detect large effects (*1-ß*=0.99), moderate effects (*1-ß*=0.94), and inadequate power to detect small effects (*1-ß*=0.56).

Hypothesis 2

From Time 1 to Time 2, a positive association will be observed between change in adaptive behavior and frequency of parent teaching behaviors at Time 1, whereas a negative association will be observed between change in adaptive behavior and frequency of parent intrusion and directives at Time 1. **Analysis:** To test this hypothesis, Spearman Rank correlations were employed to determine the strength and direction of associations between each parenting behavior and the change in adaptive behavior. Power analyses indicate adequate power to detect large effects (*1-ß*=0.90) and inadequate power to detect moderate (*1-ß*=0.50) and small effects (*1-ß*=0.13).

Hypothesis 3

In both developmental groups, parent teaching, directives, and intrusions at Time 1 will show a significant association with child adaptive behavior at Time 2. **Analysis:** We expect this

difference in the predictive quality of parent behaviors based on past research finding that directives and intrusions negatively predicted adaptive behavior in children with DD (Green, Caplan, & Baker, 2014). To test this hypothesis, Spearman Rank correlations were conducted to explore relationships between different parenting behavior frequencies at Time 1 and child adaptive behavior composite standard scores at Time 2.

RESULTS

Attrition. A MANOVA was conducted with the entire sample (TD and DS together) to examine whether there were systematic differences between participants who returned for Time 2 and those who did not. In the larger study from which participants were drawn, there were 95 total participants (DS=54, TD=41). In the current study, there were 70 participants enrolled at Time 1 (DS = 42, TD = 28) and at 34 participants enrolled at Time 2 (DS = 11, TD =23). However, the number of participants at Time 1 who were included in the current study is lower than the total number of participants at Time 1 in the original study because of mental age matching and limitations in the number of returned participants who provided data about adaptive behavior on the Vineland-II. Specifically, participants whose mental ages were outliers and participants who did not provide data for adaptive behavior at Time 2 were not included in the current study.

Participants who returned for Time 2 were compared to those who did not return based on child and parent variables. Child variables included gender, race, ethnicity, whether they were born prematurely, if they had significant illnesses or head injuries, hearing tests and cochlear implants, if they were taking medications or vitamins, whether parents had concerns about speech, whether they were receiving services including OT and physical therapy, and how the child spent their time during the day (i.e., if they went to preschool or another program). Parent variables included mother and father age, ethnicity, employment outside the home, and highest level of education.

Significantly more TD children returned two years later than children with DS, $F(24,43)=11.73$ $p<.001$. The same child and parent variables were examined to examine group

differences in participants who returned for Time 2 and those who did not within each group. Of the children with DS included in the study, those who returned for Time 2 (N=11) were significantly younger at Time 1 than those who did not return (N=31), $F(1,25)=14.16$, $p=0.001$, $\eta_p^2 = .44$, and there was no significant difference in nonverbal mental age, $F(1,25)=2.77$, $p=0.11$, $\eta_p^2 = .14$. Of the TD children included in the study, significantly fewer children who returned at Time 2 (N=23) had received speech therapy compared to those who did not return for Time 2 (N=5), $F(1,5)=4.80$, $p<.05$, $\eta_p^2 = .13$, and there was no significant difference in nonverbal mental age, $F(1,5)=2.66$, $p=0.12$, $\eta_p^2 = .15$.

Of the parent variables examined, a significant difference in maternal chronological age was found between those who returned for Time 2 and those who did not. Interestingly, mothers of TD participants who returned for Time 2 (N=23) were significantly older than those who did not (N=5), with respective means of 38.20 (SD=3.86) and 32.25 (SD=1.50), $F(1,5)=8.83$, $p<.01$, $\eta_p^2 = .26$. Mothers of children with DS who returned for Time 2 (N=11) were approximately 3.5 years younger than those who did not return (N=31), but this difference was not statistically significant, $F(1,25)=3.82$, $p=.06$, $\eta_p^2 = .10$.

Thus, between- and within-group analyses revealed important differences in chronological age, utilization of speech therapy, and mother's age among those who did versus did not return for the second wave of data collection. Interestingly, more TD children returned two years later than did children with DS. In the TD group, those who returned utilized speech therapy less and had older mothers compared to their peers who did not return. In the DS group, returning participants were significantly younger, and fewer had useful speech by the age of 2 compared to their peers who did not return. In other words, TD children who did not return utilized speech therapy more and had younger mothers, whereas their peers with DS who did not

return were older and more advanced in their speech acquisition by the age of 2. These findings suggest that developmental status may play a role in observed differences in participants who returned and those who did not.

Adaptive Behavior and Chronological Age. Child participant chronological age ranged from 30 months to 133 months, with a mean of 73.57 months (*SD=27.19)*. Children in the DS group were significantly older than children in the TD group at both Time 1, $t(62.29)=18.77$, $p<.001$, $\eta_p^2 = .78$ (N=42 and N=28, respectively), and Time 2, $t(35.30)=12.11$, $p<.00$, $\eta_p^2 = .74$ (N=18 and N=14, respectively). At Time 2, chronological age ranged from 54 months to 135 months, with a mean of 82.02 (*SD*=22.62). In the DS group (N=42), Pearson's correlations showed that chronological age was significantly positively associated with adaptive behavior composite standard scores at Time 1, $r(40)=0.52$, $p<.05$, such that older participants showed higher composite standard scores for the Vineland-II composite. Chronological age was not a significant correlate of parent behaviors at Time 1 in either group, $p>.05$ (DS=42, TD=28), and chronological age was not significantly associated with adaptive behavior composite standard scores in the TD group (N=28, $p>.05$).

Hypothesis 1: Parent Behavior

While the majority of research questions in this study were focused on longitudinal findings, Hypothesis 1 involved data that were collected only at Time 1. The subsample of participants who were enrolled in Time 1 included 42 children with DS and 28 TD children who were matched on developmental age (*M*=48.44, *SD*=9.86, and *M*=49.89, *SD*=6.78, respectively), $t(67)=-.68$, $p=.5$). A multivariate ANOVA (MANOVA) was conducted to test the first hypothesis that predicted that parents of children with DS would engage in more teaching, directives, and intrusions at Time 1. There was a significant interaction found between group

and parental directives ($F(3,66)=4.92$, $p<0.01$, $\eta_p^2 = .90$), wherein the frequency of parental directives was significantly higher in the DS group, $F(1,68) =12.31$, $p<.001$, $\eta_p^2 = .15$. Although there were no significant differences in teaching behaviors $F(1,68)=2.34$, $p=0.13$, $\eta_p^2 = .03$, the group difference in parent intrusions approached significance, $F(1,68)=3.57$, $p=0.06$, $\eta_p^2 = .05$, wherein parents of TD children engaged in more intrusions than parents of children with DS. Interestingly, there was a significant positive association between parent teaching and directive behaviors at Time 1 in the TD group (N=28), $r(26)=0.451$, $p<.05$, such that parents of TD children who engaged in more teaching behaviors also engaged in more directive behaviors. Table 2 shows mean frequency of parenting behaviors. These findings partially support the first hypothesis, as group differences were observed for directives, but not other parenting behaviors.

Table 2
Mean and Standard Deviation of Parenting Behavior Frequency at Time 1

	TD (N=28)		DS (N=41)			
	M	*SD*	*M*	*SD*	*F*	*df*
Behaviors						
Total[n]	39.89	15.65	52.60	15.31	11.36***	1
Teaching[n]	25.93	11.32	30.10	11.05	2.34	1
Directive[n]	11.43	6.67	18.62	9.37	12.31**	1
Intrusion[n]	3.88	3.12	2.34	2.59	3.57	1

Note. * = $p \leq .05$, ** = $p \leq .01$, *** =. $p \leq .001$ [n]Total number during 5-minute interaction.

Hypothesis 2: Change in Adaptive Behavior

Parents of 20 children (8 TD, 12 DS) provided adaptive behavior reports at both time points. For the TD group, mean adaptive behavior remained the same (107.38 at Time 1 and 106.88 at Time 2) whereas mean adaptive behavior increased approximately 4 standard score points in the DS group (65.33 at Time 1 to 69.42 at Time 2). Chronological age ranged from 36 to 91 months, with mean ages of 76.25 and 41.5 months in the DS and TD groups, respectively.

Spearman Rank correlations were conducted to examine the association between parent behaviors at Time 1 and change in child adaptive behavior from Time 1 to Time 2 in both groups (M=2.25, SD=16.90). Change in adaptive behavior was calculated by subtracting the Vineland-II composite standard score at Time 1 from the same score at Time 2. The associations between parent teaching ($r_s(18)$= 0.38, p= 0.10), directives ($r_s(18)$=0.06, p= 0.81), and intrusions ($r_s(18)$=0.20, p= 0.41) and change in adaptive behavior from Time 1 to Time 2 were not significant for the whole sample. Additionally, directives and intrusions were significantly positively associated ($r_s(18)$=0.65, $p < 0.01$) across the whole sample.

Table 3
Parent Behaviors at Time 1 and Change in Child Adaptive Behavior: Correlations and Descriptive Statistics

	N=20, *df*=18			
	1	*2*	*3*	*4*
1. Adaptive Behavior Change				
2. Teaching[n]	0.38			
3. Directive[n]	0.06	0.22		
4. Intrusion[n]	0.20	0.32	0.65**	
M	2.25	29.0	17.45	2.90
SD	16.90	10.88	9.72	16.90

Note. ** = $p \leq .01$, [n]Total number during 5-minute interaction.

Hypothesis 3: Parent Behaviors and Child Adaptive Behavior

Spearman Rank correlations were performed to further examine the relationship between parent behavior and child adaptive behavior over time in 29 parent-child pairs, with 17 in the DS group and 12 in the TD group. Of participants included in this analysis, chronological age ranged from 36 to 91 months, with mean ages of 76.25 and 43.3 months in the DS and TD groups, respectively. The third hypothesis predicted that in both developmental groups, parent teaching, directives, and intrusions at Time 1 would significantly predict child adaptive behavior at Time 2. This analysis differs from that of the second hypothesis in examining the relationship

between parent behaviors at Time 1 and Vineland –II composite standard scores of adaptive behavior at Time 2, and does not include change in adaptive behavior scores from Time 1 to Time 2. In the whole sample, only parent directives at Time 1 was significantly associated with child adaptive behavior later, such that more directives at Time 1 was negative associated with adaptive behavior composite standard scores at Time 2, $p<.05$. Interestingly, directives were significantly associated with intrusions in the entire sample, $p<.01$. There were no significant associations between parent behaviors and child adaptive behavior in the TD group, *p's* >.05. In the DS group, there was a significant positive association between teaching behaviors at Time 1 and child adaptive behavior at Time 2, $r(15)=0.61$, $p<.05$. Table 4 displays relationships between parent behaviors at Time 1 and child adaptive behavior at Time 2.

Table 4
Parent Behaviors at Time 1 and Child Adaptive Behavior at Time 2: Correlations

Overall			
	N=29, *df*=27		
	1	*2*	*3*
1. Adaptive Behavior			
2. Teaching[n]	-0.21		
3. Directive[n]	-0.50*	0.22	
4. Intrusion[n]	-0.40	0.32	0.65**
DS Group			
	N=17, *df*=15		
1. Adaptive Behavior			
2. Teaching[n]	0.61*		
3. Directive[n]	-0.20	-0.35	
4. Intrusion[n]	0.44	-0.02	0.34
TD Group			
	N=12, *df*=10		
1. Adaptive Behavior			
2. Teaching[n]	-0.32		
3. Directive[n]	0.54	0.34	
4. Intrusion[n]	-0.23	0.02	0.30

Note. * = $p \leq .05$, ** = $p \leq .01$, [n]Total number during 5 minute interaction.

Table 5

Descriptive Statistics of Parent Behaviors at Time 1 and Child Adaptive Behavior at Time 2

	N=29	
	M	*SD*
Adaptive Behavior	83.83	21.25
Teaching[n]	29.00	17.45
Directive[n]	17.45	9.72
Intrusion[n]	2.90	2.81

Note. [n]Total number during 5 minute interaction.

DISCUSSION

The current study examined group differences in parenting behaviors and their associations with child adaptive behavior over two years in children with DS and mental age-matched TD peers. Results from the current study build upon previous research on parent behaviors and child adaptive behavior in both TD children and those with DS. Major findings include group differences in parent behaviors at Time 1, with parents engaging in varying frequencies of teaching, directives, and intrusions based on the diagnostic status of their child. Specifically, the frequency of directives was significantly higher in the DS group and between-group differences in intrusions approached statistical significance, with higher levels in the TD group. Additionally, preliminary analyses with a modest-sized subsample of dyads suggested a lack of association between parent behaviors at Time 1 and average change in adaptive behavior from Time 1 to Time 2. Finally, parent directives at Time 1 were significantly negatively associated with Time 2 child adaptive behavior later, and Time 1 frequency of directives was significantly associated with Time 1 frequency of teaching in the entire sample. In the DS group, there was a significant positive association between teaching behaviors at Time 1 and child adaptive behavior at Time 2. Findings from this project provide useful preliminary conclusions about the early development of adaptive behavior and suggest a need for further detailed investigation into the relationship between parent behavior and child adaptive behavior in both TD dyads and those with DS.

Group Differences in Parenting Behavior

One important question addressed in this study related to parenting behaviors examined group differences in parent teaching, directives, and intrusions in TD and DS groups. Current findings partially supported the first hypothesis of the study, predicting that higher frequencies of all three parent behaviors would be observed in the DS group. Significant between group differences were observed for the frequency of various parent behaviors, with parents of children with DS exhibiting more directives than parents of TD children. Additionally, a significant positive association between parent teaching and directives was observed in the TD group.

The observed group differences in frequency of directives echoes other previous findings, as several studies have reported that parents of children with DS tend to employ directive parenting methods more often than parents of TD children (Spiker, Boyce, & Boyce, 2002; Sterling & Warren, 2014). Interestingly, this group difference in directives was previously established as potentially detrimental to child social development, wherein parents who gave more directives were thought to provide fewer opportunities for social interaction or child-led social engagement (Cielinski et al., 1995), thus encouraging children to depend on parents to initiate social interactions. Although children with DS tend to exhibit relative strengths in socialization (Coe et al., 1999; Dykens, Hodapp, & Evans, 2006; Fidler et al., 2006; Griffith et al., 2010; van Duijn et al., 2010), parents engaging in behaviors that may inhibit reciprocity in parent-child interactions may limit the quality of social learning experiences for their child and may negatively impact future interactions.

Because directives are parent-led interactions and inherently less reciprocal in nature, future studies should examine the impact of parent directives on subsequent parent-child interactions in both DS and TD groups. More specifically, the positive association between

parent teaching and directives in the TD group suggests that there may be a balance of child-led and parent-led behaviors, which may encourage or discourage reciprocity and social initiation opportunities for TD children. However, this association was not apparent in the DS group, suggesting that directive parent-child interactions in the DS group may limit subsequent child-led interactions. Future research should examine contingencies in parent-child interactions.

The significant positive association found in the current study between parent teaching and directives has been demonstrated by some previous studies (Lunkenheimer, Kemp, & Albrecht, 2016), but not all (Cielinski et al., 1995; Crawley & Spiker, 1983; Sterling & Warren, 2014), suggesting a need for further investigation of this relationship. This association is supported by one previous that examined of mother-child interactions and behavioral regulation in TD children (Lunkenheimer, Kemp, & Albrecht, 2016). However, previous studies have reported an inverse relationship between parent teaching and directive behaviors (Cielinski et al., 1995; Crawley & Spiker, 1983; Sterling & Warren, 2014), indicating differences in parent behaviors. However, this discrepancy may be a function of study design and the developmental group examined. Group differences in frequency of parenting behaviors and the association between parent teaching and directives suggest a need for further investigation of underlying mechanisms of parent behaviors in these groups and more detailed examination of the impact that these associations may have on the early development of adaptive behavior.

Parent Behavior and Change in Adaptive Behavior

Another issue examined in the current study involved characterizing the association between parent behaviors at Time 1 and change in child adaptive behavior over two years. Parent behaviors at Time 1 were not found to significantly predict change in child adaptive

behavior over time. In further examining intra-group patterns, no statistically significant associations were found between parent behaviors at Time 1 and change in adaptive behavior in either group, *p's*>.05. These results did not support the second hypothesis, wherein significant relationships between parent behavior at Time 1 and change in child adaptive behavior were predicted. The lack of association between parent behaviors at Time 1 and change in adaptive behavior may be attributed to a small sample size with a higher likelihood of committing Type II error. Thus, only preliminary conclusions can be drawn from this analysis.

Interestingly, the direction of nonsignificant associations between parenting behaviors and change in child adaptive behavior partially supported the hypothesis and may differ based on child diagnostic status. While non-significant findings are approached with a tremendous sense of caution, it is notable that the association between change in adaptive behavior and teaching was positive, reflecting the direction that was predicted. Conversely, teaching and directives also had nonsignificant positive associations with change in adaptive behavior scores overall. However, in the TD group, the association between change in adaptive behavior and intrusions and directives occurred in a positive direction while the association with teaching occurred in a negative direction, contrary to what was predicted. Further, in the DS group, the association between change in adaptive behavior and teaching and intrusions was positive, but the association with directives occurred in a negative direction. Overall, the direction of these associations appears to differ based on developmental status.

The nonsignificant positive association between parent directives and intrusions and change in adaptive behavior contradicts previous research in DD dyads, suggesting a need for further investigation (Green, Caplan, & Baker, 2014). More specifically, researchers have found a negative association between parent directives and intrusions and adaptive behavior later,

whereas preliminary findings in the current study suggest the opposite. Although Green, Caplan, and Baker (2014) focused on DD dyads, the directions of associations in the current study diverging from previous research suggests the relationships may vary by diagnostic status (i.e., DD, DS, and TD). Because of this discrepancy in preliminary findings, further investigation is needed to understand the role of diagnostic status (i.e., DS versus DD) in the association between parent behavior and subsequent change in adaptive behavior.

Additionally, previous findings suggest chronological age is an important consideration in exploring the associations between parenting behavior and change in adaptive behavior, as it may partially account for the observed slight positive change in adaptive behavior from Time 1 to Time 2 (Fisher, Lense, & Dykens, 2016). The overall mean difference in adaptive behavior was 2.25 composite standard score points, and reflected different trends based on group, as the TD group decreased 0.50 mean points and the DS group increased 4.08 mean points. Although this group difference was not significant, $t(18)=0.58$, $p=.57$, it could suggest varying trends in adaptive behavior development when accounting for chronological age. The contribution of chronological age to observed group differences of parenting and change in adaptive behavior is supported by previous research finding the relationship between child adaptive age and chronological age is weaker in middle childhood than early childhood in children with DS (Fisher, Lense, & Dykens, 2016). Previous research also suggests that observed changes in adaptive behavior in the DS group could be a function of the interaction between chronological age and adaptive age, and should be explored further (Dykens, Evans, & Hodapp, 1994).

Parent Behavior at Time 1 and Child Adaptive Behavior at Time 2

Finally, findings for the third hypothesis revealed a significant association between parent behaviors at Time 1 and adaptive behavior at Time 2 overall, and another significant association in one diagnostic group. Specifically, parent directives were significantly negatively associated with child adaptive behavior in the whole sample, and in the DS group parent teaching behaviors were significantly positively associated with child adaptive behavior at Time 2. It was hypothesized that significant associations would be observed between parent behavior at Time 1 and child adaptive behavior at Time 2 in both groups, however, these results suggest specific associations between parent behaviors at Time 1 and child adaptive behavior at Time 2 may depend on diagnostic status. This finding is evidenced by the association between parent teaching and child adaptive behavior in the DS group in addition to the overall association of parent directives and child adaptive behavior.

Additionally, the positive association between parent teaching at Time 1 and child adaptive behavior at Time 2 may be attributed to child behavior eliciting parent behavior. Specifically, for children with DS, parents may perceive a lack of focus or engagement in a task and subsequently facilitate child participation via teaching behaviors. Although the current study did not examine contingencies in parent and child behavior, future studies should examine how child behavior may elicit parenting styles and parent behavior.

Interestingly, the significant positive association between parent directives and intrusions in the whole sample suggests these behaviors may be categorized similarly by parents, which could explain their co-occurrence. Although teaching behaviors are considered "child-led" parenting behaviors (Lunkenheimer, 2013), both directives and intrusions are considered "parent-led" behaviors that may elicit fewer responses from children, which may impact

subsequent parent behaviors (Guralnick, Neville, Hammond, & Connor, 2007; Green, Caplan, & Baker, 2014; Karaaslan & Mahoney, 2013; Marfo, 1991; Spiker, Boyce, & Boyce, 2002; Sterling & Warren, 2014; Vygotsky, 1978). Current findings show that parents who engaged in more directives also engaged in more intrusions, suggesting those parents may exhibit preferences for these parenting techniques. Additionally, because both directives and intrusions have been categorized as "parent-led" behaviors, parents who preferred to engage in these behaviors may subsequently be more likely to engage in this style of parenting, as they may be conceptualized similarly by parents. This observed co-occurrence of directives and intrusions and shared characteristics of these parent behaviors supports previous research on parent behaviors and parenting style (Baird et al, 1992; Marfo, 1991).

Overall, these findings suggest that in both diagnostic groups, type of parenting matters for child development and practice of adaptive behavior, and are in line with previous research highlighting this importance (Green, Caplan, & Baker, 2014). For the entire sample, parent-led interactions (i.e., directives) were negatively associated with child adaptive behavior. As previously established, parent-led interactions may negatively impact child adaptive behavior later by providing children with fewer opportunities to initiate an activity or engage in reciprocal problem-solving. Thus, directives may subsequently discourage child responsivity and limit reciprocal interactions with others and with their environments, which could explain the observed negative association with adaptive behavior. Conversely, for children with DS, parent teaching behaviors appear to have a strong positive impact on child adaptive behavior. As parent teaching is considered a child-led interaction that encourages child participation and engagement (Karaaslan & Mahoney, 2013; Ruskin et al., 1994), parents inviting responses and reciprocity from their children may provide children with space to practice engaging with their

environments, thus encouraging independence, or higher adaptive behavior scores. In both diagnostic groups, types of parenting behaviors had different relationships with child adaptive behavior later, highlighting the importance of parenting in child development of adaptive behavior and skills related to independence. Future studies should examine child exploration of their environments based on parenting behaviors to further understand mechanisms underlying child development of adaptive behavior.

Limitations and Future Directions

The current study included several limitations that may have impacted findings, including family and individual variables, having two data collection time points, sample size, and controlling for effects of chronological age.

Family dynamics. The current study did not account for detailed family dynamics, including patterns of interactions within entire families (Guralnick, 1998) and family cohesion (Shonkoff, Hauser-Cram, Krauss, & Upshur, 1992), which have been found to predict child developmental trajectories and behavior problems, respectively. This exclusion represents a limitation in study design, wherein observations were restricted to the five-minute PCCT task with one parent in a lab setting. This limitation results in narrowed findings and generalizability to interactions isolated to one parent and one child outside of the family context. Current findings are based on five minutes of interactions between one parent and one child and may not be generalizable to interactions with other family members. Additionally, family size and birth order of children may be important variables to consider in both parent and child experiences and interactions, as the current study did not control for these aspects that may impact parent and child behavior. Future research should consider family context as an important contributor to

child development and should attempt to capture aspects of child-family interactions, focusing on family cohesion, interactions actively including the child of interest, and interactions that do not actively include the child of interest.

Coding scheme. The coding scheme utilized in the current study excluded parent and child affect, which could have provided more detailed information about the mechanisms underlying parent-child interactions and their relationship with child adaptive behavior. Although the direction of these potential associations are unknown, affect may be associated with subsequent parent or child behavior, which may also be associated with child developmental outcomes, including adaptive behavior.

Two time points. Findings in this study are based on data collected at two time points, two years apart. Although these time points allowed for the comparison of parent behavior and adaptive behavior across two years, they also limit conclusions that may be drawn. Namely, two time points allow conclusions based on change between them, but limit information about change that occurred between them or beyond them. Having at least three data collection time points could have provided more insight into growth patterns of child adaptive behavior and changes in parenting behaviors. Additionally, having more time points could have enabled more sophisticated statistical analysis, such as SEM, that could have provided more robust data and conclusions about the complex mechanisms underlying parent-child interactions and diagnostic status.

Sample size/attrition. Lower sample sizes (i.e., below 30) may have caused Type II error in data analysis, wherein significant differences could have been missed. Limitations in the dataset were highlighted in the second hypothesis, with only 20 participants' data provided. As the second hypothesis yielded no significant results, it is likely that Type II error occurred.

Given that a subset of the overall population is diagnosed with DS, the smaller number of participants in the current study with DS may not have been avoided. However, recruitment of a greater number of participants in future studies may provide more opportunities to identify and examine significant differences when they exist.

Lack of control of CA effects. Although matching groups on mental age served to control for developmental differences inherent to chronological age, effects of chronological age were not wholly accounted for. Specifically, children who are older tend to have more past experiences with parents, which may provide them with more learning experiences and practice of adaptive behaviors. The current study found that in the DS group, chronological age was positively associated with adaptive behavior at Time 1, suggesting that older children exhibited higher levels of adaptive behavior. This finding reflects the observed age difference, as children in the DS group were significantly older than the TD group. However, this difference also reflects a lack of control over covariates associated with chronological age, including time to practice skills and more varied experiences with different environments. Although children with DS are considered to exhibit lower levels of adaptive behavior overall, the current study did not control for child exposure to situations in which they could utilize adaptive behavior and function independently. Additionally, child chronological age reflects length of time parents have practiced and honed parenting skills, suggesting that parents' experiences during their children's lives may impact their behavior, their interactions with their children, and potentially child developmental outcomes.

Standard scores. The current study examined composite standard scores, which included all four domains included in the Vineland II (CITE). More detailed information about the relationship between parent behaviors and child adaptive behavior may be provided by

examining specific domains of adaptive behavior instead of overall adaptive behavior. Specifically, by exploring the relationships between distinct parenting behaviors and specific domains of adaptive behavior, including daily living skills, future studies may craft better interventions that target areas of growth.

Misclassification of diagnostic status. Of the TD children included in the current study, one reported receiving speech therapy. Given that speech therapy is not a common experience for TD children, it is possible that this participant was incorrectly categorized as TD. This may have skewed findings, where the TD group may have been identified as more similar to the DS group than it was. This might have resulted in nonsignificant group differences when they otherwise existed.

Nature of the PCCT. The length and nature of what children are asked to do in the Parent-Child Challenge Task may be important considerations in generalizability of current findings. Specifically, the PCCT is a five-minute task with a goal to complete three difficulty levels. Based on the inherent stress imposed by the time limit to reach this goal, parents may interact with their children differently than they would if they did not feel stressed or if there was not a time limit. If there were differences between how parents typically interact with their children and how parents interacted with their children during the PCCT, current findings cannot be generalized to parent-child interactions outside of activities that have similar qualities to the PCCT.

Cultural Representativeness. Importantly, participants in the current study were not representative of a diverse sample with multiple cultural considerations. This homogeneity limits conclusions that can be drawn about other cultures. For example, the use of different parenting behaviors may differ based on culture, where in one culture, teaching and more child-

centered behaviors may be typical, whereas in another culture, directives and parent-centric behaviors may be more normalized. Given the limitations of the current dataset, cultural implications of individuals from other ethnic backgrounds are not considered, thus limiting the application of current findings to diverse cultures. Future studies should aim to include a more diverse sample of participants, which could provide insights into cultural differences in parenting behaviors and their relationships to child developmental outcomes.

Conclusions and Implications

Social Development Theory suggests parents model and shape child development and learning, serving as both caretaker and teacher (Vygotsky, 1978). In pursuit of encouraging independence, parent behavior orients children to the world around them, and acts as part of the environmental input children process and learn from.

Building on previous research establishing that parents indirectly impact child adaptive behavior via family environment and learning experiences over time (Hauser-Cram, Warfield, Shonkoff, Krauss, Upshur, & Sayer, 1999; Shonkof, Hauser-Cram, Krauss, Upshur, & Sameroff, 1992), the current study supports the finding that parent behavior during a problem-solving task is associated with their child's adaptive behavior later on. Specifically, the current study found a negative association between parent directives and child adaptive behavior regardless of diagnostic status, there was a positive association between parent teaching and child adaptive behavior two years later in the DS group. Similarly, group differences were found in frequency of parent behaviors, suggesting parents of children with DS interact differently with their children than parents of TD children.

Diagnostic status plays an important role in child development and acquisition of skills and may also impact how parents interact with their children. Although the direction of these relationships is undefined, based on the aforementioned group differences in parent behaviors, the current study established objective differences in how parents interact with their children, which may be a function of parent experiences or of child diagnostic status. Current findings also identified connections between parent behaviors, child adaptive behavior, and diagnostic status, suggesting parenting techniques are not considered equal among different developmental groups. Importantly, differences in parent behavior were found to be positively and negatively associated with child adaptive behavior later on, depending on child diagnostic status. Thus, parents' behaviors in small interactions are found to impact child independence later on based on how they encourage child participation and problem-solving.

Future research should consider the cycle of interactions between parent behavior, child adaptive behavior, and diagnostic status, as these complex relationships may provide insight into the joys and struggles of parenting, and how they differ based on child diagnostic status. Additionally, current and future research could inform best practices in parenting, the impact of child diagnostic status on parents, and it could illuminate preventative measures to bolster adaptive behavior—and thus, independence from caretakers—in the DS population. Finally, the role of child adaptive behavior in family life should be examined, as independence of children from parents may subsequently impact parent interactions with children and could play important roles in quality of life at home and in diverse environments for this at-risk population.

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