THESIS

PARENTING STATEGIES AND CHILD BEHAVIOR IN CHILDREN WITH DOWN SYNDROME

Submitted by

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ABSTRACT

PARENTING STATEGIES AND CHILD BEHAVIOR IN TYPICALLY-DEVELOPING CHILDREN AND CHILDREN WITH DOWN SYNDROME

This study examined parent-child interactions in Down syndrome in the context of a collaborative puzzle task. Variables of interest included the parent dimensions of teaching and directives, and the child behaviors of compliance, persistence, and social engagement during a five-minute interaction. Based on previous research in the field of parenting and developmental disabilities, it was hypothesized that parents of children with Down syndrome would exhibit significantly more directive behavior than parents of typically developing children, and that the use of directives would be associated with higher levels of compliance and task persistence in children with Down syndrome. It was also hypothesized that children with Down syndrome would engage in higher levels of off-task behavior, such as social engagement with a parent, based on evidence of the over-use of social behaviors during challenging tasks in this population. Children with Down syndrome (N = 20) and mental-age matched typically developing children (N = 13), and their parents, were recorded during a five-minute problem-solving task. Parent and child behaviors were captured utilizing a modified version of Lunkenheimer's (2009) Dyadic Interaction Coding System. Results indicated that parents of children with Down syndrome demonstrated both significantly higher levels of directive behaviors and teaching behaviors in comparison to parents with typically developing children. Contrary to previous research, children with Down syndrome in this study were found to be significantly more compliant than their typically developing peers, and no significant differences emerged between the groups in terms

of off-task, socially-related behavior. Additionally, this study examined the reciprocal nature of parent-child interactions using state lag sequential analyses. Results from these analyses demonstrated a higher probability of directive parenting behavior following child social engagement in the Down syndrome group as compared to the typically-developing group. Conversely, the lag sequential analyses demonstrated a higher probability of teaching parent behavior following social engagement in the typically-developing group as compared to the Down syndrome group. The likelihood for both teaching and directive parenting behavior following child noncompliance was also higher in the Down syndrome group as compared to the typically-developing group. The findings from this study demonstrate consistency with previous work that parents of children with Down syndrome are more directive than parents of typically developing children, and highlights the differing patterns of parenting behavior in both typically and atypically developing populations. The use of analyses to examine dyadic contingencies also provides new information regarding the strategies that parents employ with their children to promote on-task behavior, specifically in children with an intellectual disability. Lastly, this study contributes to the body of research on the behavioral phenotype of children with Down syndrome.

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CHAPTER I

INTRODUCTION

In parent-child interactions, both parent and child have important influences on one another for subsequent behaviors (Childress, 2010; Cress, Grabast, & Burgers Jerke, 2011; de Falco, Esposito, Venuti, & Bornstein, 2008; Floyd & Phillippe, 1993; Roach, Barratt, Miller, & Leavitt, 1998; Smith, Landry, & Swank, 2000; Wilder & Granlund, 2003). These influences within parent-child interactions lead to a reciprocal relationship, which Richard Bell defines as "a moving bidirectional system in which the responses of each participant serve…as the stimuli for the other…" (Bell, 1979, p. 822). The bidirectional nature of parent-child interactions is directly related to idea that children can elicit particular parental strategies by exhibiting particular behaviors during various interactions. Until the early 1960s, research on parent-child relationships focused almost solely on the effects parents have on children's behavior, and failed to acknowledge the active role that children play during interactions with a parent or caregiver (Bell, 1979; Doussard-Roosevelt, Joe, Bazhenova, & Porges, 2003; Glidden, 2002).

The concepts of reciprocity and bidirectionality in parent-child interactions are especially important for children with developmental disabilities and the relationships they have with their parents and/or caregivers, because one partner (the child) of the interaction may have limitations that impact communication and the ability to elicit caregiver responses (Doussard-Roosevelt et al., 2003; Eisenberg et al., 2010). Specific interaction behaviors, such as parent teaching and directive behavior, and child compliance, persistence, and social engagement, have heightened relevance in parent-child dyads in which the child has a developmental disability (Floyd & Phillippe, 1993; Glidden, 2002; Ly & Hodapp, 2005; Slonims & McConachie, 2006).

Parent-child interactions take place in a variety of settings, including routine activities (i.e. at mealtime and bedtime, during trips to the grocery store), play activities, and specific tasks (i.e. helping with schoolwork, creating a puzzle). Healthy interactions between parents and children during family routines and daily activities can help enhance communication and turn-taking skills in children with special needs (Childress, 2010). Parent-child interactions during both play and difficult tasks provide a safe and shared environment for children to begin exploring and understanding their environment (Childress, 2010). The involvement of parents and caregivers in their child's play increases the amount, duration, and complexity of play behaviors (de Falco et al., 2008). During both play and collaborative tasks, interactions between parent and child also provide valuable insight for parents, such as how to structure subsequent interactions, effectively engage with their child, and allow for observation of their child's skills, abilities, and areas of strength and challenge (Childress, 2010). For example, some caregivers have reported that they take into account their child's situation and respond to their child based on the observations they make of their child's play behavior (Wilder & Granlund, 2003). Additional research has shown that mothers continually adjust their behaviors as they engage in collaborative play with their child (Venuti, Falco, Esposito, & Bornstein, 2009).

The type and quality of parental involvement and interactions during play and problem-solving tasks can have both positive and negative implications on subsequent behaviors and skills in children (de Falco et al., 2008). For example, parenting strategies such as scaffolding, positive reinforcement, and responsiveness are associated with higher levels of self-regulation and autonomy, and can stimulate areas of development such as language (Lunkenheimer, Kemp, & Albrecht, 2013; Matte-Gagné & Bernier, 2011). Prior research has also highlighted the negative implications for children (i.e. lower levels of motivation and autonomy) when particular

parenting behaviors, such as directives, are continually used during parent-child interactions for children, specifically during middle childhood (Gilmore, Cuskelly, Jobling, & Hayes, 2009; Roach et al., 1998). This paper examines the strategies used by parents and the subsequent responses of children in the context of parent-child interactions, as well as child eliciting effects in both typically and atypically-developing populations.

CHAPTER II

REVIEW OF THE LITERATURE

Parent Approaches and Interaction Styles

Most existing research in the area of parent-child interactions focuses on mothers and their interactions with typically-developing children, with a small number of studies focusing on father-child interactions and interactions within the area of children with disabilities (eg. Childress, 2010; de Falco et al., 2008; Harrold, Lutzker, Campbell, & Touchette, 1992; Siller & Sigman, 2002; Venuti, Falco, Esposito, & Bornstein, 2009; Wilder & Granlund, 2003). Much of the literature recognizes that parents typically use child cues and the child's developmental stage to determine how best to facilitate interactions with their child (Childress, 2010; Doussard-Roosevelt et al., 2003; Smith et al., 2000; Venuti et al., 2009). However, as Bell (1979) pointed out, what is not as explicit is the idea that some children's cues are more easily read by caregivers than others. This observation has relevance for parents of children with developmental disabilities, where it is often the case that children with special needs have motor, social, and cognitive deficits that make their cues and intent less distinguishable (Cress et al., 2011; Slonims & McConachie, 2006; Wilder & Granlund, 2003). Therefore, parents and caregivers of children with disabilities may find difficulty in determining how best to facilitate their child's development through interactions with one another, and have to learn and use different strategies with their child (Cress et al., 2011; Slonims & McConachie, 2006).

In a study that examined and compared the interaction styles of mothers of children with autism and typically developing children, Doussard-Roosevelt and colleagues (2003) used the Approach-Withdrawal Interaction Coding System (AWICS) to determine maternal behaviors and child behaviors during a free-play session. There were notable differences between the maternal

behaviors used with nonverbal and verbal children with autism and typically developing children (Doussard-Roosevelt et al., 2003). For example, mothers with children with autism used more "high-intensity" approaches behaviors during free-play, which involved directly trying to control their child's behavior to elicit a specific response (Doussard-Roosevelt et al., 2003). These same mothers also used more physical approaches and less social approaches compared to mothers of typically developing children. This study highlights the implications that the diagnosis and severity of disability have on the behaviors of parents during interactions with their child. However, in this study the groups of children were matched on chronological age, not mental ages, and therefore it is important to note that the children with autism were developmentally younger than the typically developing comparison group.

Ly and Hodapp (2005) also illustrated differences among diagnoses and parent strategies in their study of children with Williams syndrome and Prader-Willi syndrome. In this study, mother-child dyads were observed during a puzzle-ability task. The authors found that mothers of children with Williams syndrome more often led the interaction, focused on completion of the task, and helped and rewarded their child, while mothers of children with Prader-Willi syndrome interacted with their child in the opposite way. The differences in visuospatial abilities between Williams syndrome and Prader-Willi syndrome were hypothesized to account for these differences in parenting strategies, as individuals with Prader-Willi syndrome are likely to have higher levels of visuospatial ability, and thus the ability to complete puzzles, than individuals with Williams syndrome (Ly & Hodapp, 2005). Additionally, parent perception of child abilities plays an important role in shaping parent behaviors during interactions between parents and children with disabilities. Parents who perceive their child as having a lack of ability during a particular task may offer their child more help, whereas children perceived to have a higher level

of ability during a task may receive less assistance and more praise for success (Ly & Hodapp, 2005). The above findings illustrate the bidirectional nature of parent-child interactions, specifically in children with disabilities, in that parent responses and strategies may be influenced by a child's pattern of behaviors specific to their diagnosis. Parents also play a role in supporting their child's developmental functioning and eliciting responses from their child in the way they shape interactions with the child.

Child Behaviors and Responses

Although it is crucial to understand how parents interact with their children and influence development, it is also important to recognize how children behave and interact to elicit certain reactions from parents given the bidirectional nature of parent-child interactions. The idea of indirect effects is relevant in parent-child interactions, and in examining the behaviors used by children to elicit parental responses (Dixon & Smith, 2003; Glidden, 2002; Hodapp, 2004; Neitzel & Dopkins Stright, 2004; Slonims & McConachie, 2006; Supplee, Shaw, Hailstones, & Hartman, 2004). Ly and Hodapp (2005) defined indirect effects as the "ways in which such aetiology-related behaviors elicit behaviors from others" (Ly & Hodapp, 2005, p. 930). In other words, characteristics related to a child's behavioral phenotype have an impact on the responses they gain from others during interactions. The concept of behavioral phenotypes can be defined as the likelihood that an individual with a specific syndrome will exhibit specific patterns of behavior associated with that syndrome (Hodapp, 1997). However, not every individual with a given diagnosis will display all of the behaviors commonly associated with that diagnosis, but rather have a heightened probability for exhibiting certain behaviors. For example, children with Williams syndrome and children with Prader-Willi syndrome exhibit different puzzle abilities related to the syndromes' behavioral phenotypes, namely strengths and weaknesses in

visuospatial skills, and these different behavioral phenotypes resulted in differing maternal responses during a puzzle task (Ly & Hodapp, 2005). Studying the indirect effects of parent-child interactions may help bridge the gap between understanding if parent interaction styles and behaviors are framed around actual behaviors in children, or the perceptions regarding a child's diagnosis, specifically in children with developmental disabilities (Ly & Hodapp, 2005).

Wilder and Granlund (2003) conducted a qualitative study of parent-child interactions between seven children with multiple disabilities and their caregivers to elicit information on caregiver strategies, child and caregiver roles during interaction, and caregivers' opinions and goals of interaction with their child. Themes that emerged through interviews with caregivers included strategies of using: children as a starting point for turn-taking interactions; less initiation of interaction and more responsiveness in the children, as perceived by caregivers; and adaptation on the caregiver's part to meet the demands and abilities of the child (Wilder & Granlund, 2003). Caregivers also discussed how children adapted their own behavior styles based on their level of ability, and used behaviors like crying or eye movements to elicit responses, which is an important interaction behavior for children with motor and verbal communication deficits (Granlund & Björck- Åkesson 1998, as cited in Wilder & Granlund, 2003). Communicative behaviors of children also have implications in terms of parent behaviors and responses during both structured and unstructured interactions. The function and type of communicative behavior influences the degree of parent responsivity, which is important to note, as diagnoses that involve deficits in modes of communication may inherently elicit less responsivity during interactions (Cress et al., 2011). This provides further support for the idea that parent-child interactions in dyads in which the child has a developmental disability are less transparent, in terms of how children elicit feedback and support during exchanges with others.

In summary, it is clear in both typical and clinical populations that parent-child interactions are bidirectional and important for child development and socialization. However, for children with developmental disabilities, parent-child relations become increasingly crucial, as these children may have fewer partners to socialize and interact with, and may require more practice learning appropriate behaviors and responses for interactions with others (Doussard-Roosevelt et al., 2003; Glidden, 2002; Smith et al., 2000). By observing patterns of behaviors and responses in parent-child interactions, it can be determined which parent strategies are most optimal in promoting positive child responses during interactions (Siller & Sigman, 2002). Through highlighting the research in the area of parent-child interactions, and specifically interactions within children with disabilities and their parents/caregivers, we can learn how best to support the development of children with disabilities and promote successful interactions within the child's immediate environment. Therefore, it is important to continue work in this area in order to fill gaps in knowledge and create appropriate supports and programs for families and parents of children with disabilities.

Parent-Child Interactions in Typically-Developing Populations

The differences between typically developing children and children with disabilities within parent-child interactions have been clearly cited in previous research (Doussard-Roosevelt et al., 2003; Slonims & McConachie, 2006; Venuti et al., 2009). Even though differences exist between these populations, research in typically developing populations can help inform the area of developmental disability research. For example, Dixon and Smith (2003) found that mothers of typically children who were characterized by a difficult temperament engaged in higher levels of play, which included paying more attention to the child and interacting with the child more. The authors attributed this finding to mothers wanting to provide more stimulation for their

difficult-tempered infant or toddler (Dixon & Smith, 2003). Results from this study have potential implications for children with developmental disabilities, as difficult temperaments are not uncommon for this population (Adamek et al., 2011; Boström, Broberg, & Bodin, 2011; Gunn & Berry, 1985; Wilder & Granlund, 2003). Because research on typically developing populations may facilitate understanding in developmental disability research, it is important to recognize and understand patterns of both child and parent behaviors during parent-child interactions in children without disabilities.

Typically-Developing Child Behaviors

Most of the research in typically developing populations focuses on child compliance and maternal behaviors during interactions, due to the effects that these behaviors have on future development of the child (Gauvain & Perez, 2008). Specifically, compliance has been a crucial behavioral dimension to study in typically developing children, as it has been well established that the development of compliant behavior has implications for self-regulation, secure attachment, and can be a precursor for school readiness and later adjustment (Denham, Warren-Khot, Bassett, Wyatt, & Perna, 2012; Kochanska, Coy, & Murray, 2001; Kuczynski, Kochanska, Radke-Yarrow, & Girnius-Brown, 1987). Noncompliance, which is a common behavior in typically developing toddlers, is typically only considered significant if it is an ongoing behavior beyond toddlerhood, as continuous defiance can be a precursor for different diagnoses and referrals for psychiatric evaluation (Gauvain & Perez, 2008). However, noncompliance may also serve a useful purpose, as it may be a signal that the child does not have the cognitive ability to complete a difficult task, and thus noncompliance may be a strategy used by children to elicit parental assistance (Gauvain & Perez, 2008; Kuczynski et al., 1987). Vygotsky's (1978) concept of the zone of proximal development is relevant to the idea that child noncompliance may be

used to evoke parental instruction during challenging tasks. The zone of proximal development is demonstrated during parent-child interactions in which the parent (the more experienced partner of the interaction) supports the child during a task that is just outside the bounds of the child's ability. As task difficulty increases and children require more guidance, parents adjust their instructional behavior to increase task persistence, and continually adjust their strategies to meet their child's needs (Lunkenheimer et al., 2013). While noncompliance is typically perceived as a negative behavior, it may actually be adaptive for children in specific situations, in that it may help promote regulation of parental instruction to assist children in successfully persisting and completing tasks outside of their current range of abilities (Gauvain & Perez, 2008; Kuczynski et al., 1987).

Parenting Strategies in Typically-Developing Dyads

The literature in parent-child interactions in typically developing children consistently focuses on scaffolding and instructive parent strategies during play and other tasks (Denham et al., 2012; Lunkenheimer et al., 2013; Mulvaney, McCartney, Bub, & Marshall, 2006). Previous evidence has shown that parent strategies, such as scaffolding, have been associated with higher levels of self-regulation, behavioral adjustment, and the development of autonomy in early childhood (Lunkenheimer et al., 2013). Parent teaching strategies may also be associated with task persistence, due to increased autonomy and behavioral regulation (Gilmore et al., 2009; Mulvaney et al., 2006). Scaffolding and teaching behaviors involve promoting the child's active participation in play or an activity by providing age-appropriate problem-solving techniques and instruction as to how something works, asking open-ended questions for the child to respond to, and/or giving hints and prompts to help the child understand objects and actions (Matte-Gagné & Bernier, 2011; Mulvaney et al., 2006; Smith et al., 2000). Gauvain (1992) demonstrated that

when mothers described task strategies, asked questions, and prompted children to explore their own strategies (i.e. autonomy support), their typically developing children were later able to engage in more individual planning in task completion. Additionally, scaffolding has been to shown to be associated with reasoning, task-performance and problem-solving abilities in typically developing children (Mulvaney et al., 2006).

Just as scaffolding and instruction are associated with positive aspects of development, directive parenting behavior, when coupled with insensitivity, is usually associated with negative implications for typically developing children (Gilmore et al., 2009; Roach et al., 1998). For example, continually providing directives in a harsh or insensitive manner may contribute to a lack of autonomy and even externalizing behavior (Lunkenheimer et al., 2013). Because of the implications insensitive parenting strategies have on development, parental responsiveness is endorsed in research on parent-child interactions, and is associated with positive developmental outcomes for children (compliance, behavior regulation, secure attachment; Denham et al., 2012; Gilmore et al., 2009; Lunkenheimer et al., 2013; Mulvaney et al., 2006; Schueler & Prinz, 2013). Parental responsiveness is also often positively associated with scaffolding, both of which are behaviors that have been clearly as associated with effective parenting strategies (Mulvaney et al., 2006). While it is clear that particular parenting behaviors are associated with positive developmental outcomes in typically developing children, parents of children with developmental disabilities may have to practice different patterns of behavior during interactions with their children, in order to promote compliance, persistence, problem-solving skills, and autonomy. These patterns may also be disability-specific, in that specific strategies are employed by parents in an attempt to elicit specific child behaviors in different diagnoses (Cress et al., 2011; Doussard-Roosevelt et al., Floyd & Phillippe, 1993; Gilmore et al., 2009; Glidden, 2002;

Lemanek et al., 1993; Ly & Hodapp, 2005; Roach et al., 1998; Roskam & Schelstraete, 2007; Slonims & McConachie, 2006).

Population of Interest: Down Syndrome

Down syndrome is the most common genetic cause of intellectual disability and has been widely studied in the field of developmental disabilities (Daunhauer & Fidler, 2011; Fidler, Hepburn, & Rogers, 2006; Fidler, 2005; Kasari & Freeman, 2001; Walz & Benson, 2002). Areas of relative strength in this population include receptive language abilities, visuo-spatial processing, gestural symbolic activities, and sociability (Fidler, 2005). Areas of relative challenge include expressive language skills, hearing and vision impairments, motor planning skills, and aspects of executive functioning, which include cognitive processes such as working memory, planning, and inhibition (Daunhauer & Fidler, 2011).

Research on families of children with Down syndrome typically reports lower levels of stress and greater well-being when compared to families with children with other disabilities (Cahill & Glidden, 1996; Hodapp, 2004; Most, Fidler, Booth-LaForce, Laforce-Booth, & Kelly, 2006; Povee, Roberts, Bourke, & Leonard, 2012; Richman, Belmont, Kim, Slavin, & Hayner, 2009). This idea has been termed the "Down syndrome advantage" and takes into account the "easier" behavioral phenotype of individuals with Down syndrome, including their social personalities and lower presence of maladaptive behaviors (Hodapp, Ly, Fidler, & Ricci, 2001; Hodapp, 2004; Kasari & Sigman, 1997; Stoneman, 2007). Parental stress, mental health, and family functioning have been widely studied in this population, and outcomes in this area have been cited as better than in parents and families raising children with other intellectual disabilities. However, less is known about how the behavioral phenotype of individuals with

Down syndrome, specifically in children, influences parents and caregivers during task-oriented interactions.

Children with Down syndrome typically exhibit heightened social relatedness in relation to their cognitive and language abilities (Fidler, 2005; Hodapp et al., 2001; Kasari & Freeman, 2001; Rosner, Hodapp, Fidler, Sagun, & Dykens, 2004). While this particular aspect of the behavioral phenotype of individuals with Down syndrome can be an advantage, for both the individuals themselves and their families, it can also serve as a disadvantage. Mothers may be more likely to consider their child's negative behaviors as typical because of the notable sociability and positive personality in children with Down syndrome (Hodapp, 2004). In addition, research related to the sociability in this population has suggested that individuals with Down syndrome "charm" their way out of challenging tasks by engaging socially with parents or examiners (Fidler, Hepburn, & Rogers, 2006; Most et al., 2006). The strengths in social functioning can also be disadvantageous, as they contribute to individuals with Down syndrome exhibiting outerdirectedness (Bybee & Zigler, 1998). The idea of outerdirectedness is illustrated in studies that report children with Down syndrome exhibiting longer eye gazes towards people rather than objects and more positive facial expressions, which is evident of these individuals looking to their environment for cues rather than internal problem-solving skills during cognitive tasks (Kasari & Freeman, 2001). While outerdirecteness may not always be a negative trait, it can serve as a hindrance in the development of motivation, individual problem-solving abilities, and thus, successful performance during challenging tasks (Bybee & Zigler, 1998). The social competence of people with Down syndrome also plays a role in the development of cognitive avoidant behaviors, in which there is an overuse of social skills to compensate for challenges with cognitive processes (Wishart, 1996). The social nature typical of people with Down

syndrome can influence how parents and others in the child's environment structure interactions and respond to their child, especially in situations that are task-oriented and involve problem-solving on the part of the child (Rosner et al., 2004).

While past research has added a wealth of knowledge regarding the behavioral phenotype of Down syndrome, less is known regarding the transactional nature of interactions between children with Down syndrome and their caregivers. Specifically, less research exists on which parent behaviors elicit specific task-related responses in children with Down syndrome, such as compliance and persistence, or off-task behavior, such as social engagement. The most frequently cited notion in the interactions between parents and children with Down syndrome, as well as other developmental disabilities, is that of maternal overdirectedness, which involves statements to change or control a child's behavior (Cielinksi et al., 1995; Cress et al., 2011; Doussard-Roosevelt et al., 2003; Floyd & Phillippe, 1993; Gauvain & Perez, 2008; Gilmore et al., 2009; Roach et al., 1998; Slonims & McConachie, 2006). While it is clear that parents of children with Down syndrome and other developmental diagnoses may use more directives when interacting with their child, specifically during a goal-oriented task, the implications of overdirectiveness are unclear. For typically developing children, it has been cited that the overuse of directives may contribute to decreased levels of autonomy, increased dysregulation, and more outerdirectedness (Lunkenheimer et al., 2013). However, for children with Down syndrome, the use of directives may actually be appropriate and adaptive for parents to use during interactions (Glidden, 2002; Slonims & McConachie, 2006). In fact, directive parenting behavior may serve as a substitute for the teaching strategies that are common in promoting compliance, persistence, and problem-solving ability in typically developing children (Floyd & Phillippe, 1993). The quality of directiveness, coupled with responsiveness, may actually

promote success in children with Down syndrome and other diagnoses during difficult tasks (Doussard-Roosevelt et al., 2003; Floyd & Phillippe, 1993; Gilmore et al., 2009). However, Gilmore and colleagues (2009) found in their study of parent-child interactions in children with Down syndrome that maternal directives were associated with lower levels of sensitivity and task persistence. De Falco and colleagues (2008) studied 19 children with DS and their play interactions with fathers, highlighting the important influence of fathers in atypical development. The fathers in this study successfully used scaffolding in their interactions during play to potentially help their child with Down syndrome reach higher potentials (de Falco et al., 2008).

Overall, it is still ambiguous how and if specific parenting responses, such as directives or instruction, promote or hinder success in cognitive tasks, and if particular strategies produce on-task behavior vs. off-task behavior, such as unrelated social engagement, in children with Down syndrome. The proposed study will add to the understanding of how we can optimally structure parent-child interactions in children with Down syndrome, in an effort to support programming and intervention efforts for families raising children with disabilities.

CHAPTER III

CURRENT STUDY

The goals of the current study were to examine patterns of behavior in both parents and children during a problem-solving task, and to compare these patterns between dyads of typically developing children or children with Down syndrome and their parents. Behaviors of specific interest in this study included parent directives and teaching strategies, and child compliance, persistence, and social engagement. This study builds on the theory of reciprocal influences in parent-child interactions in an attempt to begin to understand the indirect effects of behavioral phenotypes in children with developmental disabilities. Additionally, this study employed a coding system that allowed for a sophisticated examination of bidirectional processes, through the use of dyadic contingencies, rather than just frequencies of observed behavior, which has been suggested in previous work in this field (Cress et al., 2011; Crockenberg & Leerkes, 2004; Lemanek et al., 1993). Based on prior research and gaps in the field of parent-child interactions in special populations, this study aimed to shed light on several specific questions:

1) Is there a specific profile of parenting behaviors for parents of children with Down syndrome (DS) compared to parents of typically developing (TD) children?
    a. Specifically, do parents of children with (DS) engage in more directive parenting behavior than parents of TD children?
    b. Additionally, do parents of TD children engage in more teaching behavior than parents of children with DS?
2) Do children with DS exhibit more social engagement (social and/or off-task behavior) during a problem-solving task compared to their TD counterparts, in support of previous research (Fidler, Hepburn, & Rogers, 2006; Most et al., 2006; Wishart, 1996)?

3) Do certain parenting behaviors increase the likelihood of on-task behavior in children with DS?
    a. Do parent directives promote on-task behavior (defined as child compliance and persistence) in children with DS?
    b. Do parent teaching behaviors promote on-task behavior in children with DS?
    c. Does child social engagement behavior promote directive parenting behavior in parents of children with DS?
    d. How do the dyadic contingencies of the above behaviors differ among children in Down syndrome and typically-developing children and their parents?

It was hypothesized that parents of children with DS would use more directive behavior during a problem-solving task than parents in the typically developing group, and children with DS would engage in more off-task, socially-related behavior during a problem-solving task than children in the TD group. In terms of indirect effects and the bidirectional nature of parent-child interactions, it was hypothesized that directive parenting behaviors will result in higher levels of compliance and persistence in children with DS than will parental teaching, whereas teaching behaviors would result in higher levels of compliance and persistence for typically developing children than would parental directives. It was also hypothesized that higher levels of social engagement in the DS group would elicit more directive parenting strategies in response to off-task behavior.

CHAPTER IV

METHODS

Participants

The participants in this study were drawn from a larger study of executive functioning in children with Down syndrome and other developmental disabilities. Participants included 20 children with Down syndrome whose chronological ages ranged from 5-10 years and 13 typically developing children whose chronological ages ranged from 2.5 to 5 years. These two groups were matched on mental age to allow for comparison and analysis of group differences. The majority of parents included in this study were White, middle-class mothers who resided in a state in the Western US. Participant characteristics can be found in Table 1.

Participants were originally contacted through flyers distributed at early childhood centers, local resources for children with disabilities, and families that the primary investigators had previously had contact with. Additionally, the research team contacted organizations, support groups and other resources for families with children with disabilities via phone and email to explain the study and gain participants. Nonrandom sampling procedures were used, including convenience and snowball sampling. The majority of participants were recruited locally, with a small percentage of participants being from more than 50 miles from the primary investigation site.

Measures

Cognition. The subtests of the Leiter International Performance Scale-Revised Brief-IQ were administered to participants during data collection for the larger study (Roid & Miller, 1997). This assessment is useful for children with disabilities, as it a nonverbal measure of intelligence. Four Visual Reasoning subtests of the Leiter-R (Figure Ground, Form Completion,

Sequential Order, and Repeated Patterns) were administered, and a Brief-IQ Composite was derived from those subtests. This composite allowed for nonverbal, mental age matching of participants. This assessment has been standardized on a national sample of almost 2,000 individuals from 2.0 to 20.11 years old. The Leiter-R Brief IQ Composite has demonstrated concurrent validity with the WISC-III Full Scale and Performance IQs (.85) and has high test-retest reliability (upper .80s and .90s).

Parent-Child Interaction Task. Lunkenheimer's Dyadic Interaction Coding System (DICS) was used to measure the parent and child behaviors of interest (Lunkenheimer, 2009). The Dyadic Interaction Coding System was adapted from the Relationship Process Code (Dishion et al., 2008; Jabson, Dishion, Gardner, & Burton, 2004) and the Michigan Longitudinal Study (e.g. Lunkenheimer, Olson, Hollenstein, Sameroff, & Winter, 2011). The original DICS includes four coding categories, however, only two of these categories (Parent and Child Behavior) were used for analyses in the present study (the remaining coding categories, Parent and Child Affect, will be analyzed in future work with this sample and task). The DICS was modified for use with the sample in this study, as it was originally designed to be used with typically-developing populations. The parent behaviors of the modified version of the DICS included Proactive Structure, Positive Reinforcement/Support, Teaching, Directive, Engagement, Disengagement, Correction, Intrusion, and Criticism/Threat. The child behaviors included Compliance, Noncompliance, Persistence, Nonpersistence, Social Engagement, and Emotion Dysregulation.

The parent-child interaction task, coined the parent-child challenge task (PCCT; Lunkenheimer et al., 2013), was adapted for use in the larger study of executive functioning and was used to observe parent and child behaviors in this particular study. The task involved a five

minute session in which parent-child dyads were provided with seven wooden pieces and an instructional booklet depicting three castle configurations ranging in difficulty from easy to hard. Parents were instructed to "play as they would at home" and were asked to try and let their child do as much as they can on their own. The task was videotaped and the examiner also observed the reaction behind a one-way mirror and returned after the allotted time to clean up the task and finish other assessments and activities with the child. This particular task was useful for the current study, in that it allowed for observation of different parent and child behaviors during a challenging problem-solving task. Below are the descriptions of each behavior used by graduate students in the coding of parents and children during the castle task.

Parent behaviors.

Teaching. The parent explains to the child how something works, offers clear instruction about the task, or asks an open-ended question designed to encourage learning. This behavior is worded in a gentle way or phrased in a question to keep the child involved in the task, or to help the child complete the task him/herself. Examples of teaching behaviors include "Where does the red one go?", "What does the picture show?", "Hmmm, we might want to flip it the other way.", etc. This behavior was coded using a frequency approach, in that each statement fitting the description of teaching was coded as a single event.

Directive. This parent behavior captures any clear and firm demands the parent places on the child for a behavior change. In order to accurately code a behavior as directive, child compliance to the demand must be potentially observable within the observation (i.e. a parent cannot demand something that is unrealistic for the child to comply with in the context of the task). Directives include "I want" or "I would like" statements, do and don't commands, including "Hurry", "Now", "Come on", and statements such as "Grab the blue block", "No, you

do it", or "Build the castle like the picture". Additionally, it should be noted that directives are not coded if they are given in the form of a harsh or critical tone, as this would be coded Criticism/Threat. This behavior was also coded using a frequency approach, in that each statement fitting the description of directive was coded as a single event.

Child behaviors.

Compliance/Noncompliance. Compliance is defined as the child clearly responding to a parent's directive, teaching, or proactive structure behavior. For example, if the parent asks the child "Where is the blue one?", and the child finds the blue castle piece, this would be coded as child compliance. If the child does not comply within ten seconds of a directive, teaching, or proactive structure statement or behavior, the child behavior is coded as noncompliant. Additionally, noncompliance was specified as either Passive or Active when it was coded. Passive noncompliance includes the child ignoring the preceding parent statement and/or continuing to work on the task without taking directions into account, and Active noncompliance includes the child actively stating "No" or a similar statement to the parent after a teaching, directive, or proactive structure statement, or physically noncomplying (i.e. pushing blocks back to the parent when handed to him/her). Compliance and noncompliance were also coded using a frequency approach, in that each instance of these behaviors were coded as a single event, given that this behavior could only last a maximum of three seconds per the above rules.

Persistence/Nonpersistence. Persistence can only occur if the child sustains work on the task without a preceding parent statement for behavior change. Therefore, persistence will either follow compliance (after 3 seconds of compliance, the coded child behavior switches to persistence), or if the child works on the task with no directive, teaching, or proactive structure statements given. Persistence can include the child verbally engaging with the parent about the

task (i.e. “Is that right?” or “Here’s the orange one”), or it can include the child working on the task without engaging with the parent. If the child is noncompliant and continues noncompliant behavior for three seconds, the noncompliance code is switched to nonpersistence. Persistence and nonpersistence were coded using a duration approach, in that once the child began exhibiting one of these behaviors, this code was started and did not end until the child engaged in a different behavior. This approach was taken, versus a frequency approach, as it was noted that when this behavior did occur, many children engaged in long bouts of persistence (or nonpersistence), either following compliance or by sustaining work on the task without preceding parent statements.

Social engagement. Child social engagement captures social or non-task related behavior or conversation with the parent. Examples include the child stating “Where’s my shoe?”, “I’m tired”, “You’re silly!”, “Where’s [examiner’s name]?”, or “I don’t like this game”. Social engagement was also coded using a duration approach, in that once the child began exhibiting social, off-task behavior, this code was started and did not end until the child engaged in a different behavior. Similarly to persistence and nonpersistence, this approach was taken, versus a frequency approach, as it was noted that once a child began engaging in this behavior, they continued to do so for a longer duration of time.

Procedures

For the larger study from which this sample is drawn, interested participants were contacted by the lab coordinator to schedule a laboratory visit. For each child participant, the research team described who the principal investigators were, the purpose of the study, what would be asked of both the parent and the child during study visits, risks and benefits from being in the study, who would see the child’s research records, costs and compensation associated with

participating, information on the child being videotaped and any reasons as to why a child should not participate in the study. Parents signed the consent form if they agreed to what was outlined in the form. Additionally, assent was obtained from the child before starting the protocol. A minimal monetary amount was given to each family for each visit for participating in the study. For the majority of the protocol that makes up the larger study, child participants were seated with an examiner, while parents watched behind an observation mirror, and completed several developmental assessments. In addition to the Leiter-R Brief-IQ, the children participated in other developmental assessments and tasks to measure executive functioning.

CHAPTER V

PLAN OF ANALYSIS

Existing video data was coded in Noldus Observer XT software, using the modified version of Lunkenheimer's DICS described above, by the author and one other graduate research assistant. Coding was mutually exclusive, to ensure that every second of video data was coded with a behavior from each behavior group. Each coder was provided with a coding manual of definitions of behaviors (variables), specific instructions on when to code for each behavior, and decision rules for coding behaviors. Additionally, coders met each week to discuss issues with reliability and make necessary coding decisions. Inter-rater reliability for this coding system was calculated using a percent-agreement approach, with the author calculating a percent agreement of codes by hand using a standard 3-second window of behaviors. This particular approach was employed due to discrepancies in how Noldus Observer calculated percent agreement and kappas for this type of complex coding scheme; previous research using the DICS employed a similar approach and was therefore recommended for this study as well (Lunkenheimer et al., 2013). The author and graduate research assistant each coded 33% of the video data with an average percent agreement of .73. The remaining data was coded individually by each coder, with frequent reliability checks to ensure stable reliability via percent agreement.

Hypothesis 1 and 2. To test the first two hypotheses (parents of children with DS would use more directive behavior during a problem-solving task than parents in the typically developing group, and children with DS would engage in more off-task, socially-related behavior during a problem-solving task than children who are typically developing), difference inferential statistics, specifically independent samples t-test, were performed.

Hypothesis 3. To test the last hypothesis of indirect effects, transitional probabilities were calculated using state lag sequential analysis in Noldus Observer XT. This method of analysis tested for the likelihood of a criterion behavior (i.e. child compliance) following a target behavior (i.e. directive). The use of transitional probabilities measured dyadic contingencies within the two groups of interest to determine which behaviors were likely to elicit other behaviors (i.e. parent behaviors → child responses and child behaviors → parent responses), as well as if dyadic contingencies differed among the two groups.

CHAPTER VI

RESULTS

Group Characteristics

To examine whether the typically developing (TD) group and the group of children with Down syndrome (DS) differed on mental age (MA), independent samples *t* tests were performed. Nonverbal MA was calculated using age equivalences from the Brief IQ composite of the Leiter International Performance Scale-Revised. The results of this *t* test were not significant, $t(25.18) = .39$, $p = .70$, which indicated that the groups did not significantly differ in their nonverbal mental ages. The groups were significantly different in terms of chronological age (CA), $t(28.93) = -20.99$, $p = .00$, with the DS group being an average of 59.2 months older than the TD group. The means and standard deviations for the chronological ages (CA) and nonverbal MA for both groups, as well as participant demographic information, can be found in Table 1.

Table 1

Participant Characteristics by Group

Child Characteristics	DS (N = 20) $M(SD)$	TD (N = 13) $M(SD)$	t	p-value
CA (in months)	97.7(10.88)	38.5(5.16)	-20.96	.00
Nonverbal MA (in months)	48.1(11.87)	49.2(4.07)	.39	.70
Gender (% male)	75.0%	53.8%	-	-
Race (% White)	80.0%	92.3%	-	-
Ethnicity (% Non-Hispanic)	90.0%	92.3%	-	-
Parent Characteristics				
Parent Gender (% female)	80.0%	100%	-	-
Mother's Age (in years)	41.6	37.5	-	-
Father's Age (in years)	42.1	40.4	-	-

Parent Behaviors

To evaluate whether there were mean differences in parent behaviors, *t* tests were performed to examine differences among teaching and directive parenting behaviors. Teaching

and directive behaviors were variables of particular interest given the reviewed literature of both interactions with typically-developing children and children with disabilities, specifically Down syndrome. It was found that parents of children with DS engaged in significantly more teaching and directive behaviors than parents of TD children, $t(31) = -2.04$, $p = .05$, and $t(30.54) = -3.17$, $p = .003$, respectively. On average, parents of children with DS used 32.43% more teaching statements and 61.11% more directive statements during the entire 5 minute problem-solving task than parents of TD children. These results demonstrated that, in this sample, parents of children with DS not only used more directive statements with their children, but also teaching (or scaffolding-type) statements when assisting their children during a problem-solving task than parents of TD children. The means and standard deviations for these behaviors can be found in Table 2, along with *t* values and confidence intervals to indicate effect size.

Table 2

t-Tests for Parent Behaviors

	DS		TD				
	M	*SD*	*M*	*SD*	*t*	*df*	95% CI
Behavior							
Teaching[n]	33.40	12.84	24.08	12.89	-2.04*	31	[-18.67, -0.20]
Directive[n]	18.80	10.19	10.00	5.73	-3.17**	30.54	[-14.47, -3.13]

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

Child Behaviors

To test hypotheses regarding differences in child behaviors used during a problem-solving task by children of DS and TD children, *t* tests were performed on the following behaviors: compliance, persistence, social engagement. Compliance and social engagement were variables of particular interest given previous research with populations of children with Down syndrome. Compliance was the only variable of interest that elicited significant results, in that children with DS exhibited significantly higher rates of compliant behavior, $t(31) = -2.48$, $p = .02$.

Specifically, children with Down syndrome were 37.86% more compliant during the five-minute interaction than their typically-developing peers. While the result of the *t* test for social engagement was not statistically significant, $t(12.70) = 2.08$, $p = .06$, it is at least worthwhile to note (due to the hypothesis that children with DS would use more social engagement during the task) that TD children spent, on average, 14.98 more seconds than their peers with Down syndrome engaging in off-task, socially related behavior during the problem-solving interaction. These results demonstrated that compliance was the only child behavior of interest that significantly differed among the two groups, in terms of the rate at which it was coded. While differences among the other child behaviors did exist between the groups, these results were not statistically significant and can be found in Table 3, along with the means and standard deviations for all child behaviors mentioned above.

Table 3

t-Tests for Child Behaviors

	DS		TD				
	M	*SD*	*M*	*SD*	*t*	*df*	95% CI
Behavior							
Compliance[n]	32.95	12.07	22.46	11.60	-2.48*	31	[-19.13, -1.85]
Persistence[d]	84.55	60.92	106.46	70.86	0.95	31	[-25.28, 69.10]
Social Engagement[d]	3.40	5.39	18.38	25.58	2.08	12.7	[-0.60, 30.57]

Note. * = $p \leq .05$. [n]Total number during 5 minute interaction. [d]Total duration (in seconds) during 5 minute interaction.

Dyadic Contingencies

To examine the likelihood of specific criterion behaviors following target behaviors, state lag sequential analyses were performed in Noldus Observer XT. This type of analysis was particularly useful for this study, as it allowed for the examination of dyadic contingencies and reciprocal interactions between parent and child behaviors (i.e. the probability of one behavior directly following another). The original research questions focused on the probabilities,

specifically within the DS group, of on-task child behaviors (compliance and persistence) directly following either teaching or directive parenting behavior, as well as teaching and directives following off-task behavior, such as noncompliance and child social engagement. However, persistence was not analyzed in any of the contingencies due to the nature of how persistence was coded (i.e. persistence was either coded following an instance of compliance or with no parent behavior/instruction preceding it; therefore, it did not make sense to examine this variable in isolation for this particular lag sequential analysis). Furthermore, *t* tests were performed to examine differences among the probabilities between the two groups; however, results of these *t* tests did not elicit any significant differences in the dyadic contingencies between the two groups.

The mean probabilities for each combination of dyadic contingencies can be found in Table 4. There were no a priori "cut off" points to determine what level of probability indicated a significant likelihood of one behavior following another, therefore these data are purely exploratory in nature. By examining the means for each dyadic contingency, it can be seen that the highest probability that occurred was for compliance following parent teaching behavior in the DS group (M = 59.29%). In other words, the likelihood of child compliance directly following a parent teaching statement was 59.29%, on average. Similarly, the highest probability in the TD group occurred for compliance following parent teaching behavior (M = 53.17%). It was also more likely for teaching parenting behavior, than for directive parenting behavior, to directly follow noncompliance in both groups; however, these probabilities were higher in the Down syndrome group than in the typically-developing group. For child social engagement, it was more likely for this behavior to be directly followed by teaching parenting behavior in the TD group and by directive parenting behavior in the DS group. By examining the means in Table

4, it is evident that differences did occur between the two groups, in terms of the likelihood of the various contingencies; however, it could be possible that *t* tests were not sensitive enough to detect additional significant differences due to small sample size and unequal variances, as well as the distribution of the data (as evidenced by the standard deviation being much higher than the mean in a handful of the behavioral combinations).

Table 4

t-Tests for Behavioral Probabilities (%)

	DS		TD				
	M(%)	*SD(%)*	*M(%)*	*SD(%)*	*t*	*df*	*95% CI*
Behavior *A* → Behavior *B*							
Teaching[P] → Compliance[C]	59.29	19.34	53.17	19.76	-0.88	31	[-20.29, 8.06]
Directive[P] → Compliance[C]	49.81	21.41	38.36	25.77	-1.33	22.34	[-29.27, 6.38]
Noncomply[C] → Teaching[P]	26.89	33.46	15.98	13.78	-1.30	27.27	[-28.13, 6.33]
Noncomply[C] → Directive[P]	15.65	23.62	12.13	16.82	-0.46	31	[-18.95, 11.93]
Social Engage.[C] → Teaching[P]	1.67	7.45	18.69	31.15	1.94	12.90	[-2.00, 36.05]
Social Engage.[C] → Directive[P]	5.00	22.36	1.54	5.55	-0.55	31	[-16.43, 9.50]

Note. [C] Child behavior, [P] Parent behavior.

CHAPTER VII

DISCUSSION

The overarching goal of the present study was to examine specific patterns of behavior in parent-child interactions for both typically developing children and children with Down syndrome. This work aimed to build on previous research regarding the parenting strategies of children with disabilities (Doussard-Roosevelt et al., 2003; Floyd & Phillippe, 1993; Glidden, 2002; Slonims & McConachie, 2006), specifically those with Down syndrome, and child behaviors during a challenging cognitive task (Fidler, 2005; Hodapp et al., 2001; Kasari & Freeman, 2001; Rosner et al., 2004). Findings in this area of research on parent-child interactions can help illustrate effective strategies used by parents of children with intellectual disabilities in assisting their child on a problem-solving task, as well as patterns of parenting behavior in typically developing populations. This study also used a unique form of analysis, lag sequential analyses, to examine dyadic contingencies between parent and child behaviors for this specific sample of children.

It was hypothesized in this study that the use of parental directives would lead to higher levels of compliance, or on-task behavior, in children with Down syndrome, in comparison to other parenting strategies, such as scaffolding. Based on previous findings, it was also hypothesized that children with Down syndrome would exhibit more social engagement (off-task behavior) during the problem-solving task, compared to typically developing children (Fidler, 2005; Hodapp et al., 2001; Kasari & Freeman, 2001; Rosner et al., 2004). The findings from this study both supported previous findings in research on individuals with Down syndrome, but also shed new light on the bidirectional nature of parent-child interactions in dyads in which the child has an intellectual disability, namely Down syndrome.

Of particular interest in this study were parental teaching and directive behaviors, as previous research has indicated that parents (specifically mothers) of children with Down syndrome are more directive with their children (Cielinksi et al., 1995; Cress et al., 2011; Doussard-Roosevelt et al., 2003; Floyd & Phillippe, 1993; Gauvain & Perez, 2008; Gilmore et al., 2009; Roach et al., 1998; Slonims & McConachie, 2006), whereas parents of typically developing children rely more on the use of scaffolding behaviors with their children to promote on-task behavior (Gilmore et al., 2009; Matte-Gagné & Bernier, 2011; Mulvaney et al., 2006; Smith et al., 2000). The results from this study support previous research that parents of children with disabilities are more directive with their children; however, the results concerning the differences in teaching behaviors were unexpected, yet revealed interesting patterns of behavior for interpretation. In this sample, parents of children with Down syndrome not only used more directives than parents of typically developing children during a 5 minute problem-solving task, but they also used more teaching behaviors. While it was originally hypothesized that these parents would indeed use more directives during this intereaction with their child, it was not expected that they would employ signifcantly more teaching strategies than parents of typically developing children. In fact, it would have been less surprising if the findings had illustrated that parents of typically developing children utilized more teaching behaviors, due to a focus on scaffolding and instructive patterns of behavior in the literature on parent-child interactions for typically developing populations (Denham et al., 2012; Lunkenheimer et al., 2013; Mulvaney, McCartney, Bub, & Marshall, 2006). Therefore, a pattern emerged that parents of children with Down syndrome were significantly more “hands on” with their child during the problem-solving task, as evidenced by their higher use of both directives and instructive statements. However, one interpretation of this finding is based in chronological age differences among the two groups of

children participants, as the typically developing children in this study were of preschool age, whereas the children with Down syndrome averaged a third-grade age range; this difference illustrates the possibility that parents of the typically developing children were less directive and instructive in an attempt to match their child's needs or ability levels, or to allow their child to explore the task on their own, whereas parents of the children with Down syndrome may have had higher expectations for their child based on their chronological age and placement in elementary education. Based on the differences in chronological age in the two samples of child participants, the results concerning unexpected patterns of parent behaviors may be a function of parenting children of significantly different ages, and not necessarily a result solely based on parenting children with or without intellectual disabilities. To better understand the effects that either developmental status or chronological age have on parent-child interactions, specifically parenting strategies during a challenging cognitive task, future research may consider matching groups of typically developing children and groups of children with developmental disabilities not only on mental age, but on chronological age as well.

This study also aimed to answer questions regarding patterns of child behavior for the two present groups of participants. The results concerning child behaviors did not fall in line with previous findings or with the original hypotheses, providing new insight to not only parent-child interactions in children with developmental disabilities, but also the behavioral phenotype, or pattern of behaviors, of individuals with Down syndrome. It was hypothesized that the children with Down syndrome in this sample would exhibit higher levels of social engagement than their typically developing peers, based on prior evidence that individuals with Down syndrome exhibit an over-reliance on social skills during tasks, or cognitive-avoidant behaviors (Fidler et al., 2006; Kasari & Freeman, 2001; Most et al., 2006; Wishart, 1996). While the

difference was not statistically significant, the typically developing children in this sample were found to exhibit higher rates of social, non-task related behavior, in comparison to the children with Down syndrome. Therefore, the original hypothesis concerning social engagement was not found to hold true for this particular sample. Again, this could be explained in terms of differences in chronological age between the two groups, with the younger, typically developing group exhibiting a tendency to play games with the blocks or match levels of their parents' social engagement. However, another interpretation of this finding concerns the operational definition of social engagement in this study and the meaning of hypersociability in previous studies of individuals with Down syndrome. The disconnect between the results from this study and previous findings concerning social behaviors in children with Down syndrome may be based in how these behaviors are measured. For example, children with Down syndrome have been classified as more sociable as a result of longer eye gazes towards people rather than objects during tasks (Kasari & Freeman, 2001); eye gaze towards a social partner may reflect a measurement of social referencing rather than social engagement. Because the manner in which social engagement was operationally defined in this study may not have been in line with how previous research has measured the hypersociability of children with Down syndrome, it is not surprising that this sample of children with Down syndrome were not found to be more socially-engaged compared to the typically developing group of children. Therefore, the results obtained here may have differed if social engagement had been coded more similarly to social referencing, by measuring the looking time or amount of eye gazes toward parents vs. the task materials. Future research using a similar study design should implement various ways to measure social, non-task related behavior, to determine if these variations in operational

definitions make a difference in the findings of child behaviors during a problem-solving task in children with Down syndrome.

The rates of compliance, one aspect of on-task behavior, significantly differed among the two groups of children in this study. Specifically, children with Down syndrome exhibited higher rates of compliance in comparison to their younger, typically developing peers. This finding was particularly interesting, given that individuals with developmental disabilities are more commonly described as noncompliant in comparison to typically developing populations (Mace et al., 1988). The simplest explanation for this finding is that parents of children with Down syndrome utilized more teaching and directive behaviors, which are prerequisites to either compliance or noncompliance per the coding system that was used. Therefore, children with Down syndrome had more "chances" to exhibit compliance simply based on the logistics and coding rules of the Dyadic Interaction Coding System (Lunkenheimer, 2009). Conversely, typically developing children engaged in longer bouts of task persistence, which was either coded directly following compliance, or because the child sustained work on the task without a preceding parent teaching statement or directive. Since it was found that parents in the typically developing group exhibited significantly lower rates of directive and teaching behaviors, it is logical to interpret differences between compliance and persistence among the two groups as a function of the different patterns of parenting behaviors.

In addition to examining patterns of both parent and child behaviors for typically developing children and children with Down syndrome, this study employed a separate form of analysis to examine dyadic contingencies and reciprocal interactions in these two populations during a parent-child interaction task. These analyses, specifically termed state lag sequential analyses, allowed for a different perspective on the relationships between specific parenting

behaviors and subsequent child behaviors. This additional approach was taken as a recommendation from previous work (Cress et al., 2011; Crockenberg & Leerkes, 2004; Lemanek et al., 1993) in order to demonstrate the potential bidirectional effects of parent and child behaviors, which has not been noted in the field of developmental disability research and parent-child interactions. Therefore, this added approach has potential implications for not only future research in this specific area, but in working with parents and families of children with intellectual disabilities.

Results from the lag sequential analyses performed in this study did not demonstrate any significant differences between the groups; however, the original hypotheses did not concern differences among the groups, but rather the probability, or likehilood, of certain behaviors following or preceding others. However, since this aspect of the study was much more exploratory, it is difficult to determine the significance of the probabilities within each group, as there were no a priori critical probability values to determine significant likelihoods of one behavior following another. Probabilities in the Down syndrome group for teaching and directive behaviors to directly follow both compliance and noncompliace were higher than in the typically-developing group, with these dyadic contingencies being higher, or more likely, following compliance. Additionally, compliance was preceded by teaching at a higher probability than directive behavior in both groups, with the likelihood being higher in the DS group. Off-task social behavior was more likely to be followed by teaching than directive behavior in the TD group, whereas it was more likely to be followed by directive than teaching behavior in the DS group. These probabilities illustrate that parents in the Down syndrome group were most likely to direct their child following their off-task behavior, and that while directive parenting strategies did precede on-task behavior at an increased probability, teaching (or

instructive/scaffolding) behaviors promoted child compliance at a higher probability than directives. Previous research has discussed that directive parenting behavior for children with developmental disabilities may be a positive strategy for these parents, rather than a behavior that should be criticized, to increase compliance and success on tasks (Doussard-Roosevelt et al., 2003; Gilmore et al., 2009). Additionally, other work has suggested that directive parenting behaviors in parents with children with disabilities may serve the same function as teaching, or scaffolding, behaviors in parents of typically developing children, and therefore directive behaviors "replace" the use of teaching strategies (Floyd & Phillippe, 1993); the results from this study support the positive aspects of directedness in parents of children with intellectual disabilities, specifically Down syndrome, but also builds the case for the successful use of other non-directive behaviors in this population as well.

Limitations and Future Directions

As with other research in the field of human development, one of the limitations of this study involves the ability to generalize results to participants outside this study's sample. The majority of participants were White, middle-class parents and children with a willingness to take part in research. Recruitment of this sample was not random, and involved mostly convenience or snowball sampling methods, and therefore the external validity of the findings in this study is not high. Results from future studies of parent-child interactions in samples of children with development disabilities, namely studies using a random sampling approach with more variation in participant demographics, would provide more meaningful and generalizable results; however, this is a common struggle for studies involving vulnerable populations. Another common limitation in research of vulnerable populations, including this study, is that of sample size; a larger sample size is always more ideal, as large samples allow for additional statistical

approaches that are more sensitive to detecting significant differences among groups. This limitation certainly impacted the ability to detect statistically significant differences in this study, particularly for the behavioral contingency data.

Previous research has noted a paucity of fathers in developmental research, which held true for this study as well. The majority of parent participants in this study were mothers, and the term "overdirectedness" in parents of children with Down syndrome has typically been framed as a maternal trait (Cielinksi et al., 1995; Cress et al., 2011; Doussard-Roosevelt et al., 2003; Floyd & Phillippe, 1993; Gauvain & Perez, 2008; Gilmore et al., 2009; Roach et al., 1998; Slonims & McConachie, 2006). Therefore, the results presented here add to the body of research focused on mothers of children with disabilities, but lacks the ability to generalize results to fathers. The work done by de Falco and colleagues (2008) was the only study reviewed in this area of parent-child interactions that focused on paternal behavior with children with disabilities. Future work should be cognisant of this limitation and aim to define strategies to include more fathers in development research, which could help to determine potential differences and implications fathers have on child behavior.

In regards to the methods employed in this study, the results shed light on a potential flaw of the Dyadic Interaction Coding System in capturing behaviors of children with intellectual disabilities. For example, during the coding process it was found that children with Down syndrome tended to exhibit a unique pattern of behavior that was not accounted for by the existing child behaviors of the DICS; it was not uncommon for children in the Down syndrome group to exhibit a "no response" behavior following teaching or directive statements from a parent, and this behavior did not fit the definition of compliance or noncompliance. In these cases, no behavior was coded at all in an effort to eliminate errors or judgments in coding

participants' no response behavior; however, this distinctive pattern of behavior was not noted in the typically developing group. The DICS was originally created for use with typically developing populations, and so it would be wise to further refine and modify this coding system before it is used in future work with populations of children with various diagnoses. Some recommended changes include adding behaviors to account for 1) children's negotiations, a unique form of noncompliance, 2) parental flexibility, or accommodation, of their child's behavior, 3) no-response behavior, as discussed above, 4) variations of child social engagement (i.e. eye gaze to people vs. objects, joint attention or social referencing behaviors) or modifiers for different types of social behavior. These modifications may help address some of the limitations of the DICS that were noticed during this study to better capture the behaviors of children with developmental disabilities. It would be particularly important to reference the literature on some of these specific behaviors, such as negotiation as noncompliance and parental accommodation, to determine how best to operational define these behaviors in an already complex coding system. While there were limitations of the applicability of the DICS to this sample of children with Down syndrome, it proved useful in examining dyadic contingencies, and therefore the underlying concepts of this coding system should continue to elicit meaningful results in future work examining the bidirectional nature of parent-child interactions.

The different ways in which the variables of interest were coded and measured is another critical limitation to note in this study. Not all of the variables were coded using the same measurement approach; most of the variables were measured using a frequency, or total count, approach, whereas the remaining variables (i.e. persistence and social engagement) were measured using a duration approach. These measurement differences reflected a coding decision that attempted to best capture the unique patterns of behavior observed in the Down syndrome

group, but was not the same measurement system used in the original Dyadic Interaction Coding System. This discrepancy made it difficult to objectively compare variables across one another, and it is recommended in future work using this particular task to remain consistent in the measurement system of all variables and to choose either a frequency or duration approach, rather than a combination of the two.

Future research may consider examining parent-child interactions and reciprocal influences in children with various developmental disabilities, to determine the effect different diagnoses have on both parent and child behaviors. Results from studies utilizing this approach would provide insightful information to the behavioral phenotype of various disorders, as patterns of findings may be diagnosis-specific (Ly & Hodapp, 2005). The results from this study of children with Down syndrome do not generalize to children of all developmental disabilities, and therefore it is important to study the effects diagnosis may have on findings of parent and child behavior and the dyadic contingencies of those behaviors. On the other hand, future research should also not only look at the effects of diagnosis, but the effects of age as well; in this study, participants were matched on nonverbal mental abilities, however, findings revealed that chronological age differences may have attributed to differences between the two groups, rather than mental age. An ideal study would include both groups of children matched on mental age and chronological age, to determine age-specific and diagnosis-specific patterns of findings.

Conclusions and Implications

In conclusion, the findings in this study demonstrated specific patterns of child and parent behaviors during a challenging cognitive task for both typically developing children and children with a developmental disability, specifically Down syndrome. This study partially supported previous research in parent-child interactions for both populations, while also shedding new light

on parent-child interactions for a unique population. Of particular importance was the focus on dyadic contingencies, as this innovative approach provides useful information for work with parents and families of children with intellectual disabilities, among typically developing populations as well (Lunkenheimer et al,. 2013). Parents, especially mothers, of children with Down syndrome have previously been recognized as over-directive with their child, a term that does not necessarily have a positive connotation. However, in this study it was found that parents with children with Down syndrome employing a directive, as well as an instructive approach, had successes in assisting their child to remain on task during a challenging activity. Therefore, parents of children with developmental disabilities may utilize a more "hands on" approach with their child because it is a successful strategy for interacting with their child, specifically during an interaction that requires the child to utilize cognitive skills outside of their current repertoire of abilities. We should focus more on *why* parents of both typically developing children and children with intellectual disabilities engage in certain strategies, rather than just the strategies themselves. By taking this approach we can better understand the mechanisms behind parent-child interactions, in an effort to assist parents in interacting with their child and helping their child perform and thrive on tasks outside of their current abilities. We can also better understand how children influence their parents' behaviors, as parent-child relationships are certainly not one-sided and each party plays a role in how the other acts (Bell, 1979; Cress et al., 2007; Doussard-Roosevelt et al., 2003; Gilmore et al., 2009; Slonims & McConachie, 2006; Wilder & Granlund, 2003). Results from this study, and studies like it, may be useful in parent trainings and interventions specific to parents of children with unique needs and abilities. The overall goal in working with individuals with developmental disabilities and their families is to increase their

quality of life, and findings from studies such as this one may be one avenue in which to pursue and support this goal.

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