

Investigating Contingent Responsivity in Caregivers of Children with Severe Disabilities

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## Introduction

Decades of research have shown that caregivers' behaviors that are contingent and responsive to their children's actions facilitate joint attention, and specifically, the coordinated sharing of attention (Bakeman & Adamson, 1984). In turn, joint attention influences the child's capacity for social engagement (Bakeman & Adamson, 1984; Dunst, Lowe, & Bartholomew 1990) and later language development (Yoder, McCathren, Warren, & Watson, 2001; Fey et al., 2006; Brady, Warren, & Sterling, 2009; Siller & Sigman, 2009). Importantly, behavioral manifestations of joint attention involve children orienting to adults and objects in their environment as a means to an end, which marks the transition from preintentional to intentional communication. Caregivers' contingent responsivity in the context of shared attention is particularly significant in facilitating this transition, and provides the foundation for future reciprocal interactions and symbolic communication. Dunst et al. (1990) define the construct of caregiver responsivity as "a reinforcer to maintain or evoke further behavior from the child." This broad definition leaves room for speculation as to the specific caregiver behaviors that might reinforce child behaviors. Several researchers have attempted to identify and measure these specific caregiver behaviors, most notably, Warren and Yoder, Landry, Klein and Feuerstein, and Mahoney. This work has been valuable in contributing to early intervention that focuses on caregivers' interactions with their children.

Reciprocal interactions between caregivers and their young children depend not only on a caregiver's behaviors and skills, but also on the child's ability to communicate using clear signals. The child's signals must be recognizable for the caregiver to appropriately acknowledge and reinforce them. Children with severe disabilities often present with unclear, unpredictable behaviors that are difficult to read and interpret, leading to significant disruptions in the

caregiver-child interaction. This difficulty can interrupt the reciprocal back-and-forth of successful communication. In this special population, measurement and analysis of caregiver-child interactions are important for planning intervention and selecting appropriate goals for both children and their caregivers. Identifying accurate and reliable ways to measure behaviors associated with contingent responsivity could help clinicians provide feedback and support to caregivers who must learn to facilitate their children's development of conventional communication signals. This study examines the construct of contingent responsivity in the context of play between caregivers and their children with severe disabilities. A rating system of caregiver performance was used to explore the general construct of contingent responsivity in relation to specific caregiver behaviors that are associated with it. The literature review that follows presents an overview of the emergence of early signals of communication, including the role of caregivers in facilitating their children's development. It highlights the challenges faced by children with severe disabilities and their families, and the subsequent implications for planning early intervention that addresses caregiver-child interactions. Finally, the literature review examines the construct of contingent responsivity as measured by several researchers, including Warren and Yoder, Klein, Landry, and Mahoney.

## **Literature Review**

### **Typical Child Development**

Most young children follow a predictable pattern as they develop social communicative behaviors, including behavioral manifestations of joint attention. Importantly, the theoretical construct of joint attention is only observable through associated child and caregiver behaviors, such as gaze, gestures, and vocalizations. By 6 months of age, infants regularly interact with objects and people dyadically, by sustaining a static gaze to an object or person of interest. Gaze

may be accompanied by leaning or reaching as well as vocalizations that are typically vowel-like in structure. This stage is what Bates, Camaioni, & Volterra (1979) refer to as the perlocutionary stage. At this time, caregivers often interpret reflexive or idiosyncratic infant behaviors, such as vocalizations and body movements, as communicative (Sigafos, 2000). However, when infants at this stage engage with an object or person, their focus seems to be on the interaction itself (Bakeman & Adamson, 1984). After mastering fixed gaze, infants develop the ability to follow another person's gaze, referred to as "responding to joint attention" (Mundy & Newell, 2007). This skill is estimated to develop anywhere from 8-9 months (Corkum & Moore, 1998) to 12-14 months (Caron, Butler, & Brooks, 2002). Around this time, infants begin to recognize that outside agents (e.g., caregivers, other people) are the source of some events, and that their own behavior can influence the behaviors of these agents. With this newfound knowledge, infants begin to associate agents with objects by initiating coordinated joint attention. Coordinated joint attention is often demonstrated through triadic gaze (i.e., looking from an object to an agent, and then back to the object), which is sometimes accompanied by vocalizations or gestures (e.g., pointing). In this way, infants are able to direct a caregiver's attention to an object of interest. The transition from dyadic to triadic gaze marks the emergence of intentional communication (Bakeman & Adamson, 1984; Bates et al., 1979; Carpenter, Nagell, & Tomasello, 1998), as children actively communicate requests, comments, and choices to others (Tomasello, 1999). Thus, gaze behaviors are an important manifestation of cognitive and communicative development as infants transition from *sharing* attention with another person to *following* another person's attention (response to joint attention), and finally to *directing* another person's attention (initiation of joint attention) (Carpenter et al., 1998). As infants develop more reliable use of gaze, they also continue to incorporate more sophisticated gestures and vocalizations when

directing caregivers' attention and behaviors (Bates et al., 1979). Around 12 months, children begin to use word approximations or recognizable "real" words as part of their communication; Bates refers to this as the emergence of the locutionary stage of communication development (Bates et al., 1979). The gradual emergence of a child's clear, predictable signals of communication is dependent on consistent caregiver responsiveness and shaping.

### **A Caregiver's Role in Development**

A caregiver's role in his or her child's development is best understood through the transactional model (Sameroff, 2009). This model proposes that a child's development in any domain is influenced by dynamic interactions between that child and his or her environment (e.g., the caregiver), with particular importance placed on the bidirectional and interdependent nature of these interactions. According to the transactional model, a caregiver's response to his or her child's behavior helps the child make associations between behavior and consequence, which supports the child's learning and development of skills. As young children make the transition from preintentional to intentional communication, caregivers support and reinforce their children's social communicative behaviors through a cycle of child behavior and caregiver response. As previously discussed, numerous studies have demonstrated that these early joint attention behaviors are associated with later symbolic language abilities in children (Bakeman & Adamson, 1984; Mundy & Newell, 2007). In the perlocutionary, or preintentional, stage of communication development (Bates et al., 1979), an infant first produces a signal (e.g., cry, gaze, reach). His caregiver then interprets this signal as communicative and complies with the interpreted message (e.g., soothing the child, commenting on the child's focus of attention, giving the child an object of interest). As the caregiver responds consistently to a particular signal, the infant learns that his actions produce predictable reactions (Moore & Corkum, 1994,

as cited in Carpenter et al., 1998). Moreover, the infant begins to learn that each specific action produces a different specific reaction (e.g., a cry and reach leads to the caregiver giving a toy; turning away during mealtime leads to the removal of an objectionable food). Through this process, the infant's signals become more easily readable. Increasingly clear infant signals contribute to the caregiver's belief that the infant's communicative attempts are intentional, which further compels the caregiver to respond (Bates et al., 1979). This continuous cycle supports the infant's transition to intentional forms of communication and on to symbolic ones (Bates et al., 1979). Obviously, the caregiver's ability to read a child's behavior is an essential part of the "circular means-end relationship" (VandenBerg & Ross, 2008). If a child's behavior is inconsistent, unconventional, or difficult to interpret, this cycle is considerably disrupted.

### **Children with Severe Disabilities**

Children with severe disabilities present with limitations that can affect their ability to communicate clearly and reliably. This is a result of two main factors: the impact of their motor, cognitive, and/or sensory impairments on development and the resulting effect on caregivers. As will be discussed, these factors interact and are compounded over time, affecting all domains of children's development and influencing their caregivers' ability to communicate with them.

Of particular interest is how motor impairments, cognitive impairments, and sensory challenges can impact development, specifically children's early communication. In particular, motor impairments can affect a child's ability to accomplish a range of potentially communicative actions, such as gaze behaviors, gestures, and vocalizations. For example, an infant with a motor impairment may produce an intentional communicative signal such as gaze with a corresponding head turn that triggers an involuntary reflex which is not only unconventional for communication, but also interferes with the infant's ability to sustain his or

her gaze and interact naturally. Other infants with severe disabilities may exhibit problems in motor planning or muscle tone that can interfere with their ability to produce clear communication signals. For example, a child with poor motor planning may intend to reach for a desired object but instead physically push it away; a child with poor muscle tone may show flat affect when she is actually excited and interested (Pinder, Olswang, & Coggins, 1993). In addition to interfering with clear communication, some child behaviors may actually be counterproductive to development of motor skills (Olswang, Pinder & Hanson 2006). A child may exhibit a behavior such as hypertonic body extension to indicate his or her excitement or interest, which the mother reads as a request for the toy. The child's body extension is likely to prevent him or her from establishing trunk control that would enable reaching, a more conventional and desired communicative signal. The various manifestations of motor impairments make interpreting signals from the child incredibly difficult for caregivers. Thus, the caregivers of a child with severe disabilities may misinterpret his or her child's behaviors or miss his or her communicative attempts entirely (Pinder et al., 1993). These challenges of identifying and interpreting child behaviors can disrupt the natural cycle of interaction that facilitates communication development (Dunst & Lowe, 1986).

In addition, some children with severe disabilities experience concomitant cognitive deficits which can affect their ability to plan, control, and monitor their physical movements, resulting in slower rate of initiating and responding to bids for joint attention (Arens, Cress, & Marvin, 2007). These children may also have difficulty processing sensory information, which makes them susceptible to both over- and under-stimulation. When children with disabilities experience too much or too little stimulation through one or any combination of their senses, they may produce behaviors, such as motoric flaccidity or rigidity, staring, yawning, crying, or

averting attention, which could interfere with communication. Moreover, these infants may have difficulty regulating their own state, specifically transitioning from a stressed to a calm state without external support (Als, 1982). In turn, this difficulty transitioning can interfere with their ability to communicate with caregivers.

Finally, in addition to motor, cognitive, and sensory difficulties, these children often experience health-related issues that result in extended hospital stays, which in turn can exacerbate impairment-related issues and negatively impact development across domains. For children with and without sensory challenges, the medical environment frequently presents abnormal sensory stimulation (e.g., loud machines, bright lights, intubation, monitor wires). The sensory environment in neonatal intensive care units has been shown to have lasting behavioral and neurophysiological effects on infants (Als et al., 2004). Furthermore, children in these settings experience differences in interactions that can affect their social development in its earliest stages. Compared with typically developing 4- to 6-week-olds who may be “socially and cognitively available” for an hour or more at a time, infants with impairments have significantly decreased opportunities to learn and interact with their caregivers (Als, 1982; Als et al., 2004). Importantly, this often means that caregivers have fewer opportunities to communicate with their children.

Considering all of the factors that contribute to the development of children with disabilities, the circular means-end relationship between caregiver and child in early social communication development may be substantially affected. Due to these complications, caregivers of children with severe disabilities face difficulty in learning to communicate effectively with their children. Early intervention is often needed to facilitate children’s development and enable caregivers to more easily communicate with their children.

**Intervention**

Because children with severe disabilities do not achieve developmental milestones at the same rate as their typically-developing peers, therapeutic services are often necessary to induce and facilitate development across domains. Research suggests that early intervention with these children is effective, although specific treatment approaches may vary (Dunst & Trivette, 2009). The two most common models for early intervention are direct treatment with the child and indirect treatment through parent training or coaching. For children with severe disabilities, direct treatment for communication primarily consists of interactions between a Speech Language Pathologist (SLP) and the child. The value of direct treatment is that the SLP brings unique expertise to untangle the challenges presented by these children. Importantly, SLPs are able to structure activities to provide frequent, highly-salient communication opportunities and can utilize strategies to elicit target behaviors within these opportunities (Cress, Arens, & Zajicek, 2007). One drawback of direct treatment, however, is that the SLP usually interacts with the child no more than one or two times per week, typically for 60 minutes or less. This quantity of direct treatment is generally insufficient to facilitate or induce significant development in children, a fact that has been acknowledged and addressed in the United States by the Individuals with Disabilities Education Act (IDEA) (IDEA, 2004). Therefore, much of early intervention now includes caregivers as active participants in treatment.

Indirect therapy addressing the communication needs of children with severe disabilities consists of the SLP or other professionals training caregivers to produce a variety of behaviors that encourage development. Given children with communication impairments, the primary focus of this approach is helping caregivers to facilitate their children's participation in communicative interactions. Examples of this approach include programs such as Responsivity

Education/Prelinguistic Milieu Teaching (RE/PMT) (Yoder & Warren, 2001) and Playing and Learning Strategies (PALS) (Landry, Smith, & Swank, 2006), which address contingent responsivity. These intervention techniques and contingent responsivity will be discussed in detail below. In these and other indirect intervention programs, the SLP may show a caregiver how to facilitate early communication signals by modeling interactions with the child during therapy, or ask that the caregiver include language-based activities in the family's daily routines.

Importantly, indirect therapy requires that the SLP not only evaluate and measure a child's development, but also evaluate and measure caregiver behaviors. These measurements can inform the SLP's selection of appropriate treatment objectives for the family. However, there is little consensus about how to measure caregiver behaviors, or even which behaviors are important to measure. Research examining caregiver responsivity provides valuable examples of different ways to define and measure caregiver behaviors.

### **Contingent Responsivity Research**

Most broadly, contingent responsivity can be defined as a multidimensional set of contingent behaviors that support reciprocal interactions between parent and child (Bornstein, Tamis-LeMonda, Hahn & Haynes, 2008). Brady et al. (2009) include in this set any caregiver "actions that can be directly linked to changes in child behaviors" (p. 4). As previously mentioned, the literature shows little agreement on which specific behaviors comprise the construct of contingent responsivity. Some of these disagreements will be outlined below. While all of the studies discussed here investigate aspects of contingent responsivity, different researchers use different terminology for caregivers (e.g., mothers, parents, caregivers) and the behaviors being measured. In this section, the term *caregiver* will be used to refer to the adult who raises and takes care of the child, including parents or significant others. The term

*contingent responsivity* will be used to refer to the construct that encompasses caregiver behaviors that are linked to child performance, following the broad definition offered by Brady et al. (2009). As the discussion of contingent responsivity unfolds, specific researcher terminology will be used in regards to definitions and measurement of the construct.

In their research, Yoder and Warren (1998, 2001, 2002) investigated the effects of implementing RE/PMT, an intervention that focuses on increasing caregivers' contingently responsive behaviors as a means of facilitating children's communication development. Yoder and Warren (1998, 2001) measured contingent responsivity as a broad construct that encompassed a variety of caregiver behaviors, including vocal or motor imitation, translation of the child's message into words, and compliance with the child's communication. This broad view of contingent responsivity came from Yoder's (1986) conclusion that the use and measurement of only a few discrete infant behaviors (e.g., smile, gaze to caregiver, reach) might underrepresent the actual number of cues to which a caregiver responded. Yoder and Warren (2001, 2002) argue that this conclusion might be particularly true among infants with developmental and/or intellectual disabilities, whose signals might not be as clear or as readily interpretable. Yoder's (1986) solution to this obstacle was to use "a coding system that allow[ed] many forms of infant behavior to be communicative" (p. 283). By measuring a greater number and diversity of infant signals, Yoder and Warren (2001, 2002) were likely to capture a larger number of caregiver behaviors that were contingently responsive. Although measuring contingent responsivity in this way successfully demonstrated a connection between increases in caregiver responsivity (i.e., in caregivers who were provided with RE/PMT training) and child language gains, this approach does not inform our understanding of specific caregiver behaviors that may reinforce child behaviors.

Landry et al. (2006) measured contingent responsivity in more specific terms. Similar to Yoder and Warren, Landry et al. (2006) evaluated the effectiveness and outcomes of a responsivity training program, Playing and Learning Strategies (PALS), based on implementation with caregivers of typically-developing children born at term and at very low birth weight. However, instead of measuring contingent responsivity as a singular concept, Landry and her colleagues described four “distinct but conceptually-related behaviors” (p. 629): (1) contingent responding, (2) emotional-affective support, (3) support for infant foci of attention, and (4) language input that supports developmental needs. Each of these terms will be briefly defined. *Contingent responding* referred to behaviors that were prompt, appropriate, and in response to a child’s behavior. *Emotional-affective support* addressed the caregivers’ use of affect, emotion, and enthusiasm when interacting with their children. *Support for infant foci of attention* considered whether caregiver behaviors appeared to follow the infant’s lead or, conversely, were used to direct the child’s attention. Finally, *language input* referred to the amount and appropriateness of the language caregivers used towards their children. Landry et al. (2006) used a combination of frequency counts (for *support for infant foci of attention* and *language input* behaviors) and 5-point Likert ratings (for *contingent responding* and *emotional-affective support* behaviors) to capture caregiver performance. Measuring contingent responsivity in these ways revealed that specific aspects of this construct were associated with child outcomes (e.g., infant cooperation/social abilities, early communication, negative affect). In particular, significant relations were found between increases in infant word use and two caregiver behaviors: contingent responsiveness and language input (Landry et al., 2006).

Klein, Weider, & Greenspan (1987) offered another approach to examining the role of contingent responsivity in development. Based on Feuerstein’s theory of Cognitive Modifiability

and Mediated Learning Experience, Klein et al. (1987) identified discrete caregiver behaviors related to contingent responsivity that were essential for facilitating a child's communicative success. Klein and her colleagues developed the Mediational Intervention for Sensitizing Caregivers (MISC) to teach these behaviors to diverse samples of caregivers, including parents of typically-developing children (Klein et al., 1987; Klein & Alony, 1993), parents of children with Down Syndrome (Klein et al., 2009), parents of children with Sensory Processing Disorder (Jaegermann & Klein, 2010), and families of different cultural backgrounds (Klein & Rye, 2004). MISC was designed to teach and subsequently measure five discrete caregiver behaviors: (1) intentionality and reciprocity, (2) mediation of meaning, (3) transcendence, (4) mediated feelings of competence, and (5) mediated regulation of behavior. As described by Klein et al. (1987), *intentionality and reciprocity* was a "focusing behavior," and encompassed any caregiver act "directed toward affecting the child's perception or behavior" (p. 117). *Mediation of meaning* referred to "exciting" behaviors, which expressed "verbal or nonverbal excitement, appreciation, or affect in relation to objects, animals, concepts, or values" (p. 117). *Transcendence* referred to caregiver behaviors "directed toward the expansion of a child's cognitive awareness, beyond what [was] necessary to satisfy the immediate needs of the child" (p. 117). *Mediated feelings of competence* referred to any verbal or nonverbal caregiver behavior that "expresse[d] satisfaction with something the child [had] done" (p. 117). Finally, *mediated regulation of behavior* referred to caregiver behaviors that "model[ed], demonstrate[d], and/or verbally suggest[ed] to the child regulation of their own behavior in relation to the specific requirements of a task" (p. 117). Many of these behaviors closely paralleled the behaviors identified by Landry et al. (2006) (e.g., Klein's definition of *transcendence* was similar to Landry's definition of *quality of language input*). Unlike Landry, Klein (1984) used only frequency counts or a behavior's presence/

absence when measuring caregiver performance. As with Landry's work, Klein's dissection of the concept of contingent responsivity into discrete behaviors that were associated with it provided a window into those aspects of contingent responsivity that might contribute to child outcomes. For example, Klein's findings indicated that children of caregivers who learned these distinct behaviors demonstrated greater gains in cognitive and language skills than children of caregivers who did not learn these distinct behaviors. However, while discrete definitions are valuable, measurement of these behaviors remains challenging, particularly in regards to counting each occurrence of these behaviors.

Mahoney (Mahoney, Finger, & Powell, 1985; Mahoney, Powell, & Finger, 1986; Mahoney, 1999) took a unique approach by solely using ratings of caregiver performance to examine contingent responsivity. Mahoney et al. (1985) developed the Maternal Behavior Rating Scale (MBRS) based on analysis of videotaped play sessions between caregivers and their young children with cognitive impairments. Through the process of assessing the reliability and validity of MBRS ratings, Mahoney (1999) identified 12 essential caregiver behaviors believed to capture contingent responsivity. These 12 behaviors overlapped with those identified by Klein and Landry, though terminology differed somewhat. As an overview of Mahoney's perspective, the 12 caregiver behaviors were: (1) sensitivity to child's interest, (2) responsivity, (3) effectiveness, (4) acceptance, (5) enjoyment, (6) expressiveness, (7) inventiveness, (8) warmth, (9) achievement, (10) praise (verbal), (11) directiveness, and (12) pace. The primary contribution of Mahoney's research to the present study was the use of a rating scale to completely capture caregiver performance. Mahoney used a 5-point Likert scale to rate each of the 12 caregiver behaviors, where 1 reflected very low performance, and 5 reflected very high performance. The rating scale yielded an overall judgement of a caregiver's performance in each of the 12

behaviors based on observation of 10-minute videos of caregiver-child interactions. The success of Mahoney's 5-point Likert scale (1985, 1986, 1999) suggests this procedure might be a feasible and useful tool for clinicians when evaluating caregiver behaviors and planning intervention.

### **Research Purpose**

Clearly, evaluating and measuring caregiver behaviors is no simple task. While research has examined the construct of contingent responsivity and its positive association with child outcomes, the current literature lacks consensus about which discrete caregiver behaviors may be associated with or comprise the broader concept of contingent responsivity. The present study was designed to look at associations between six caregiver behaviors and the broader construct of contingent responsivity as measured during play interactions between caregivers and their young children with severe disabilities. The six behaviors were based primarily on the work of Landry and Klein, and attempted to capture discrete caregiver behaviors that facilitate child communication development. Contingent Responsivity and the six behaviors were measured via a 5-point rating scale (following Mahoney et al., 1985; 1986), contributing to our understanding of ways to measure caregiver performance. Specifically, the following research questions were addressed:

1. Which of six specific caregiver behaviors were most strongly correlated with Contingent Responsivity across caregivers?
2. Were specific caregiver behaviors highly associated with each other?

### **Method**

#### **Study Overview**

This project is part of a larger study, the Triadic Gaze (TG) project, conducted at the University of Washington Child Language Research Laboratory. The University of Washington

Institutional Review Board approved all procedures. Caregivers provided informed consent for their participation as well as their child's. The TG study was designed to examine the treatment efficacy of teaching triadic gaze as a communication signal to infants with moderate to severe motor impairments. Infants in the study's experimental group received two 30-40 minute treatment sessions targeting TG each week, over the course of approximately 16 weeks. ASHA-certified SLPs served as clinicians and provided a treatment protocol consisting of the following key elements: providing communicative opportunities for requesting and choosing toys, waiting, recognizing and responding to child behavior, and shaping behavior to TG. Infants in the experimental group also continued to receive standard care from their birth-to-three centers. Infants in the study's control group received treatment from their birth-to-three centers, but did not receive TG treatment.

All caregivers of children in the study were given an educational manual that explained the study and provided information and resources relevant to early communication development. This manual provided definitions of early signals of communication, including gaze, gestures, and vocalizations. Caregivers of children in the experimental group also received information regarding how to provide opportunities, wait for a response, and respond to a signal during daily activities, plus ideas for play.

The TG study included two types of measurement sessions. Every three weeks, a measurement SLP visited each family's home and played with the child participant for a "clinician probe." During this session, the SLP interacted with the child in a structured way for the purpose of measuring his or her progress in producing communicative gaze, gesture, and vocal behaviors with novel toys and an unfamiliar adult. In this session, the SLP provided opportunities for communicating requests, choices between toys, and comments about toys;

waited for a child response; and recognized and responded to child behaviors. No shaping or teaching occurred in these sessions. The second type of measurement session, a “home probe,” was conducted every four weeks to measure the child’s production of communicative gaze, gesture, and vocal behaviors with the caregiver. In home probes, the caregiver was instructed to play with the child for approximately 20 minutes: 10 minutes without toys and 10 minutes with toys. The measurement SLP set up the home probe by providing verbal instructions, supplying optional toys, and recording the session with a video camera. Caregivers of children in the experimental group were invited to observe both treatment and clinician probe sessions. Caregivers of children in the control group were invited to observe clinician probe sessions. Details about the home probe and caregiver-child interaction are provided below under the subheading *Data Collection Procedures*.

### **Participants**

The current study examined caregiver-child dyads from the experimental (n=7) and control (n=7) groups from the larger TG study. Child participant characteristics will be described first, followed by caregiver participant characteristics.

**Child Participants.** Infants in the preintentional stage of communication development were recruited for the larger TG study via five birth-to-three centers in the community. The centers included in participant recruitment were: South King Intervention Program (SKIP), Kindering Center, Little Red School House, Northwest Early Intervention Program, and Boyer Children’s Clinic. A liaison from each center contacted clinicians and families for referrals of children who fit the study’s entry criteria.

To qualify for participation, children had to meet the following criteria: (1) between 10 and 24 months of age at the time of consent, (2) evidence of moderate to severe motor delay

evidenced by  $\geq 2$  standard deviations below the mean on either the gross or the fine motor subtests of the *Bayley Scales of Infant Development* (Bayley, 1993), (3) adequate vision measured by passing 5 of the first 7 items on the *Visual Reception Subtest* from the *Mullen Scales of Early Learning (MSEL)* (Mullen, 1995), (4) adequate hearing judged by passing 4 of the first 6 items on the *Receptive Language Subtest* from the *MSLE* (Mullen, 1995), as well as behavioral observation consistent with functional hearing, (5)  $>80\%$  dyadic gaze and  $<20\%$  TG during a baseline probe of 20 opportunities, and (6) evidence of interest in toys and people measured by observed response such as change in muscle tone, facial expression, vocalization, direction of gaze, or increased movement. Table 1 (below) provides a summary of child participants, including gender, age, experimental/control group assignment, and diagnoses. In addition, informal indicators of the children’s motor abilities are addressed. There include notes regarding whether the child can hold his or her head up independently, sit without supports, and reach and point communicatively. Only the skills the child was able to demonstrate at baseline are listed. Other pertinent information about the child’s overall motor impairments are also included (e.g., tone, involuntary movements).

Table 1  
*Child Characteristics*

Child ID #	Gender	Age in Months at Consent	Experimental or Control	Etiology	Informal motor characteristics
102	M	12	Experimental	Down syndrome	Able to hold up head reach, and sit independently. Hypotonia
106	M	20	Experimental	Osteogenesis Imperfecta -type IV	Able to hold up head, reach, and sit independently. Good fine motor.
120	F	19	Experimental	Congenital abnormalities w/unknown genetic syndrome	Able to hold up head and reach independently. Oculomotor deviation.
122	F	22	Experimental	Non-accidental head trauma; Cerebral palsy; developmental delay	Able to hold up head independently. Hypotonia.

127	F	15	Experimental	Velo-Cardio Facial Syndrome (VCFS)	Able to hold up head and reach independently. Possible motor overflow, highly uncoordinated fine motor. Oculomotor deviation.
136	F	24	Experimental	Infantile spasms; chromosomal abnormality (XYY aneuploidy); global developmental delay	Severe hypotonia.
153	M	23	Experimental	Cerebral palsy; kernicterus; significant neurological impairment	Severe hypertonia.
107	M	16	Control	“Brain injury at birth, fluid in head”	Able to hold up head independently. Hypotonia. Possible oculomotor deviation.
121	M	10	Control	“slow development”	Able to hold up head independently. Hypotonia
135	M	24	Control	Epilepsy, developmental delay	Able to hold up head independently. Hypotonia.
140	M	17	Control	“Intractable epilepsy”	Able to hold up head independently. Involuntary/choreatic movements.
145	M	23	Control	Speech delay, motor delay, P.E. tubes	Able to hold up head and sit independently. Hypotonia. Oculomotor deviation.
147	F	23	Control	Apert’s Syndrome	Able to hold up head, reach, and sit independently.
148	F	17	Control	Down syndrome	Able to hold up head and reach independently. Hypotonia. Oculomotor deviation.

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Although the children were characterized by a wide variety of diagnoses and severity of impairments, the eligibility criteria ensured some degree of homogeneity amongst the participants; this was particularly true for motor and communication skills. All children had evidence of significant motor impairment based on their *Bayley* performance. All children had gross motor impairments (e.g., hypotonicity or hypertonicity), and all but one (participant 106) had fine motor impairments, resulting in moderate to severe challenges in toy manipulation.

Many children in this study also demonstrated hypersensitivity or hyposensitivity to sensory input (e.g., sounds, textures, lights).

Further, the children performed similarly in communication development. They all scored  $\geq 1.5$  standard deviations below the mean on the *MSEL*'s receptive and expressive language domains, and were deemed "preintentional" communicators based on gaze performance (following Bates et al., 1979) and the absence of single word or sign use. They displayed intentional behaviors (e.g., looking at objects sometimes accompanied by reaching), but did not use these behaviors to explicitly communicate with another individual as a means to an end, as exhibited by TG, signs, or words.

**Caregiver participants.** While the primary focus of the over-arching TG research examined direct treatment of infants, the current study focuses on the caregivers and their behaviors when interacting with their infants. Caregivers met the following criteria to participate in the study: (1) able to speak and read English adequately to understand the consent form, (2) available to participate, and (3) no known hearing or vision impairments that would interfere with hearing the infants' vocalizations or seeing the infants' gaze. Additionally, caregiver-child dyads were excluded if the caregiver was unable to identify any objects or activities that their child seemed to prefer. For the current study, caregivers who primarily used a language other than English while interacting with their children in the videos were excluded. However, some caregivers reported the use of multiple languages in the home. Self-reported caregiver demographics are detailed in Table 2.

Table 2  
*Caregivers' Demographic Information*

Participant ID#	Primary caregiver	Experimental or Control	Language in Home per Caregiver Report	Total Household Income	Highest Caregiver Education Level
102	Mother	Experimental	English, Spanish & Norwegian	Over \$100,000	High School/GED
106	Mother	Experimental	English	Over \$100,000	4 Year College
120	Mother	Experimental	English	No data reported	4 Year College
122	Foster Mother	Experimental	English & Spanish with Biological Parents 1x week	Between \$50,000-59,999	High School/GED
127	Father	Experimental	English	Between \$50,000-\$59,999	2 Year Associates Degree
136	Mother	Experimental	English	No data reported	Graduate School
153	Mother	Experimental	Spanish/English	Between \$70,000-\$79,999	2 Year Associates Degree
107	Mother	Control	English	Less than \$9,999	High School/GED
121	Mother	Control	Spanish	Less than \$9,999	Some High School
135	Mother	Control	English	No data reported	2 Year Associates Degree
140	Adoptive Mother	Control	English	No data reported	4 year college
145	Mother	Control	English	Over \$100,000	4 year college (2 bachelor's degrees)
147	Mother	Control	English	Between \$10,000-\$19,999	High school/GED
148	Mother	Control	English	Between \$60,000-\$69,999	2 Year Associates Degree

## Data Collection Procedures

**Probe sessions and video recording.** Home probe sessions consisted of approximately 10 minutes of natural play between the caregiver and infant with toys, and 10 minutes without toys. For the current research, only the toy play segment was examined. The measurement SLP offered a set of toys for use during the interaction, but caregivers were also encouraged to use their own toys if desired. Caregivers were instructed by the SLP as follows:

“We are interested in watching you and your child play together for about 20 minutes. We have brought a bag of toys for you to use. Feel free to use any of your own toys during the play as well. In fact, if you would like, use some of your child’s favorite toys or games; we want XXX and you to feel comfortable. (If you want to include snack for part of the time, like 10 minutes, please do so.) We’ll be videotaping, so we would like to have XXX in the highchair. But otherwise, just play naturally with XXX.”

The measurement SLP made a video recording of home probe sessions with a digital camera. The camera set-up included a view of both the caregiver and the infant, such that the infant’s eyes were visible to allow monitoring of gaze behaviors. A mirror was placed behind the infant to capture the caregiver’s face during the interaction. The SLP monitored the video during interactions between infants and caregivers and adjusted the camera position as needed. The SLP also provided reminders as needed to change activities from play with toys to play without toys at 10-minute intervals. Otherwise, she did not intrude on the caregiver-child interaction.

The current research examined five minutes of toy-based play from each of two home probe sessions: baseline (i.e., first session following initial eligibility testing) and follow up (i.e., a session four weeks after the end of the 16-week “treatment” phase). A five-minute segment was selected as a sample interval based on the work of Landry and colleagues (2006). The total

corpus included 28 videos: one baseline and one follow up video for each of the 14 total dyads (7 in the experimental group, 7 in the control group).

**Selection of five-minute video clips.** A master's level student in speech and hearing sciences selected video clips based on consideration of (1) maximal direct caregiver-child interaction time and (2) types of toys used in play. The majority of the toys used in the videos were from a limited set provided by the measurement SLP; however, caregivers were also able to use their own toys. Because of this, the types of toys in video clips differed across dyads. Video clips were matched as closely as possible in order to reduce the possibility of certain toys influencing the caregivers' behaviors. For example, a toy with buttons and switches may provide more opportunities to regulate the child's behavior than a toy with no comparable features, such as a pink feather boa. Toy-related considerations included: (a) the *number* of toy introductions, (b) the *types* of toy used, and (c) the *complexity* of the toys.

**Blinding.** Before rating began, a doctoral student not associated with the current study assigned random numbers to all 28 videos. Observers were blind to both the time (baseline or follow up) and group (control or experimental) conditions of the dyads in the video clips.

### **Caregiver Behaviors Rating Scale.**

Rating scale items were selected based primarily on the research of Landry and colleagues (Landry, Miller-Loncar, Smith, & Swank, 2002; Landry, et al., 2006; Landry, Smith, Swank, Assel, & Vellet, 2001) and Klein and colleagues (Klein, 1997, 2006; Klein, et al., 2010; Klein & Feldman, 2007; Klein, 1996). Their research was synthesized and used as touchstones to best capture caregiver behaviors that would be relevant for children with severe disabilities. First, the scale will be explained with respect to the contributions of different researchers; then, the scale itself will be presented.

**Contributions to the Caregiver Behaviors Rating Scale.** In their research regarding caregiver responsiveness, Landry et al. (2001; 2002; 2006) operationally defined caregiver responsivity by describing four domains (contingent responding, emotional-affective support, support for infant foci of attention, and language input) that captured a variety of observable caregiver interactive behaviors. Landry's taxonomy focused on a descriptive collection of caregiver behaviors that were linked to the child's social and communicative outcomes. A strength of Landry's taxonomy was that its measurements were shown to effectively capture caregiver behaviors within interactions with children with very low birth weight (Landry et al., 2001; 2006), a population that experiences similar developmental disadvantages as the participants in the present study. Items in the Caregiver Behaviors Rating Scale that were adapted from Landry were chosen for their specific relevance for children with severe disabilities. For example, the Caregiver Behaviors Rating Scale's rating of *Non-Restrictiveness/Non-intrusiveness* was adapted from Landry's items Restrictiveness and Physical Intrusiveness, because some studies have suggested that caregivers of children with disabilities are more highly restrictive and intrusive than caregivers of typically-developing children (see Crawley & Spiker, 1983 for a review of these studies).

The research of Klein (1996, 1997, 2003, 2006) also influenced the creation of the Caregiver Behaviors Rating Scale. Based in the cognitive modifiability literature (Feurstein, 1979), Klein's work focused on the concept of *mediation*, which addressed caregiver teaching behaviors that served to increase the child's ability to learn from new experiences. Klein's taxonomy described five discrete caregiver behaviors (intentionality and reciprocity, mediation of meaning, transcendence, mediated feelings of competence, and mediated regulation of behavior) that were taught to caregivers and subsequently measured. Though Klein's taxonomy

was primarily implemented as a behavioral observation coding system, the behaviors in Klein's construct lend themselves to measurement via rating scales as the behaviors were operationally defined as categorical types, encompassing many specific but related caregiver actions. For example, while *focusing* was defined as a mediation behavior, one caregiver might focus her child by shaking toys, another by calling her child's name, and a third by bringing an object of interest close to a child. Rating scales applied to Klein's constructs could capture an overall impression of a caregiver's performance in each behavior.

Just as Landry related caregiver *responsivity* behaviors to child outcomes, research by Klein related *mediation* to specific child outcomes. Caregivers' mediation behaviors were found to support and enhance children's performance, which could be particularly important for children with severe disabilities whose development is delayed. In fact, Klein implemented MISC and its associated coding system with caregivers of children with a variety of disabilities, including Down Syndrome, Sensory Processing Disorder, and children born at very low birth weight.

The Caregiver Behaviors Rating Scale attempted to bring together the research of Landry and colleagues (2002, 2006) and Klein and colleagues (1996, 1997, 2006) as a way to describe and analyze caregivers' interactions with their children with severe impairments. These researchers developed taxonomies for measuring caregiver-child interaction that, while not identical, were complimentary. Elements from each of the taxonomies were combined and modified to best suit the population described in the present study. The rating scale included judgments about the broad construct of contingent responsivity, as well as judgments about six distinct caregiver behaviors, adapted from the work of Landry and Klein. The purpose of these

ratings was to capture caregiver performance of contingent responsivity, and compare this to ratings of the six distinct caregiver behaviors.

**Definitions of items on the Caregiver Behavior Rating Scale.** As described above, the Caregiver Behaviors Rating Scale was divided into seven items, including the construct of Contingent Responsivity and six caregiver behaviors. The items on the scale are listed and defined in Table 3.

Table 3  
*Definitions of Items with Reference to Landry and Klein*

Item	Expanded definition and examples
<b>1. Contingent Responsivity*</b>	The caregiver promptly provides appropriate responses or reactions to the infant’s behaviors at a pace that fits the infant’s abilities and patience. <i>Caregiver behaviors that can be considered contingently responsive include <u>a multidimensional set of behaviors that support a reciprocal interaction between caregiver and child</u>. These caregiver behaviors may be verbal or nonverbal. For example, an infant may push away a toy and the caregiver may say, “Oh, you’re done with that” or simply take the toy away. Other caregiver behaviors may include imitating a child’s play (e.g., banging, facial expression or vocalization), or establishing turn taking by following an infant’s actions with complementary ones (e.g., closing a pop-up box door after the infant has opened it). Idiosyncratic or subtle signals may include: (1) the infant increases muscle tone and widens eyes, and the caregiver infers the infant’s excitement, saying “You like it!”, or (2) a caregiver responding to the infant’s eye gaze directed towards a toy by saying, “You want that one?” and giving it to the infant.</i>
<b>2. Exciting/affecting*</b>	c Examples include gasping, exaggerated volume or pitch, clapping, smiling, and laughing.
<b>3. Non-restrictiveness /Non-intrusiveness</b>	The caregiver’s behavior allows the child to interact and explore freely, without intruding by physically or verbally restricting, interrupting, <i>dominating, or controlling</i> the child’s activities. A caregiver who is highly nonrestrictive and nonintrusive can be active (e.g., participating in the child’s play) or passive (e.g., not interacting with the child). Making comments such as “get that toy out of your mouth”, <i>dominating toy play without regard to the child’s signals (e.g., withholding toy from reach), or physically manipulating the child</i> (e.g., removing the child’s hands from a toy) are consistent with low nonrestrictive and nonintrusive ratings.
<b>4. Focusing</b>	<u>The caregiver acts in a manner that encourages the child to attend to or engage with an object or event. The caregiver may use verbal or nonverbal behaviors. Examples include bringing objects closer to the child; repeating; sequencing/grouping; exaggerating or accentuating sights, sounds, etc.; highlighting different functions or characteristics of toys; playing with one toy in a variety of ways to maintain the child’s attention; moving or shaking objects to gain attention; repetition of directions; and covering up distracting stimuli to assure that the child focuses on the relevant object or person.</u>
<b>5 Regulation of Behavior</b> (continued on next page)	<u>The caregiver assists the child in regulating his/her behavior in relation to the specific requirements of a task. The caregiver uses modeling, demonstrating, or verbal instructions/suggestions to help the child modulate his/her behavior when performing an action, rather than merely requesting the execution of an action. The caregiver may help</u>

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guide the child's perception through systematic exploration of a toy (e.g., using hand over hand guidance to push a button on a toy, saying "turn this key to open it") or mediate the child's engagement with a task or object by suggesting the need to think or plan before doing (e.g., "Be careful now, slowly, gently", "Reach higher"). The caregiver may mediate the child's responses in light of the task/context, helping the child to regulate his/her behavior either to accelerate or inhibit impulses, (e.g., "slow down", "try harder")

### **6. Expanding**

*The caregiver verbally builds on the child's performance. The caregiver labels or describes objects, actions, persons, activities, or functions, mapping meaning onto the child's behaviors or building on the child's behaviors by transcending the immediate context. This can include, but is not limited to, asking questions, making statements, describing the toy or activity, talking about feelings and emotions, teaching cause and effect, specifying the function or activity that can be done with the object, or relating the object or activity to a previous experience. For a younger population, examples might be the caregiver saying "It's a yellow star"; "Monkey, zebra, lion! We saw these at the zoo" as child is pointing to animals in a book; "You're rolling the ball to me- my turn"; or "oh, you like the butterfly!"*

### **7. Encouraging**

The caregiver verbally expresses satisfaction with the child's behaviors. The caregiver encourages or praises the child's efforts (e.g., "way to go!") or serves to encourage or praise the child's actions or communication (e.g., "yeah, that's it!", "good reaching!"). The verbal encouragement may identify a specific component or components of the child's behavior which contribute to the experience of success. For example, the caregiver might say, "very good, you opened it", or "good boy, you put every toy back into its box."

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*Italics indicate changes to Landry's (2006) definitions. Asterisk (\*) indicates the behavior was coded as a frequency count in Landry (2006)'s study. Underline indicates definitions from Klein et al.'s (2006) research. Double-underlined indicates a definition drawn from Bornstein & Tamis-LeMonda (1989)*

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**Use of a 5-point rating scale.** Each of the seven items was rated using a 5-point Likert scale with verbal qualifiers, which were based on research conducted by Landry and colleagues (Landry et al., 2002; Landry et al., 2006; Landry et al., 2001) and Klein and colleagues (Klein, 1997, 2006; Klein, et al., 2010; Klein & Feldman, 2007; Klein & Hundeide, 1996b) with supplements from Mahoney (1999). Similar scales used by Landry et al. (2006) were shown to be valuable measures of differences in caregiver behaviors before and after instruction, and "reflect[ed] a disposition that permeate[d] all of a [caregiver's] interactive behaviors" (p. 630). To create a measure of caregivers' "dispositions" across behaviors during their interactions with their children with severe disabilities, a rating scale was determined to be appropriate. Furthermore, rating scales tend to be less time-intensive than other forms of measurement

(Spector, 1992), potentially making them easier to use clinically. In the present study, all items were measured on 5-point scales, with 1 indicating the behavior was rarely displayed, and 5 indicating the behavior was almost always displayed. In an effort to make the distance between points on the scale meaningful, the scale included basic percentage-of-occurrence guides for each number that served to define the verbal qualifiers more clearly:

5 = construct/behavior was displayed almost constantly (>75% of the time)

4 = construct/behavior was frequently displayed (50-75% of the time)

3 = construct/behavior was sometimes displayed (about 50% of the time)

2 = construct/behavior was infrequently displayed (25-50% of the time)

1 = construct/behavior was rarely displayed (<25% of the time)

These percentages provided a fixed reference point for the raters. In addition, anchor videos (described in training procedure below) offered external reference points for each end of the spectrum for each of the items being rated.

**Observer training.** Two master's level students in speech and hearing sciences rated all of the videos in this study. Training began with the observers reading foundational literature and discussing the definitions of each of the seven items as outlined in the literature and operationally defined in the training manual. The observers then viewed four anchor videos that represented a spectrum of caregiver profiles. The anchor videos consisted of five minutes of an interaction between four different caregiver-child dyads screened for but not enrolled in the study. All seven items were rated for each video. Numerical ratings (1-5) were provided for caregiver performance in the specific anchor videos as determined by the primary observer and the faculty supervisor. To facilitate training, these numerical ratings also included rationale for their assignment as well as examples of standout instances of the specific item. After viewing

and discussing all anchor videos, observers rated practice videos and participated in real-time discussion about the items observed; ratings were then assigned by consensus. Next, three videos were rated simultaneously but independently, with discussion occurring immediately after each observer assigned a rating. Finally, nine practice videos were rated independently until 6 out of the 7 items were within one point on the five point scale. Disagreements of 1 or more point on the scale were discussed by both observers to arrive at a consensus rating during training. In total, 30 hours was spent training (i.e., reviewing anchors, rating videos, discussing discrepancies) prior to rating videos included in the present sample.

**Rating collection procedures.** Based on Landry's procedures, ratings were made on the five minute clips of the video recordings for the 28 videos in the corpus. Each of the seven items was rated for each video. The order of items was randomized and assigned for each video, so that across videos, items were not always rated in the same order.

First, the observers watched a given video in its entirety to note (1) child behaviors, which were often idiosyncratic, and (2) any communicative attempts, which were unique to each child. Observers did this in order to have a clear idea of possible communication signals to which the caregivers might respond in the video, as the observers had no previous knowledge of the children's conventional and unconventional behaviors prior to rating. Next, the observers independently watched the video to rate caregiver performance. The observers watched two and a half minutes of a given video and paused to make an initial judgment (a rating of 1-5) of a specific item. The observers then continued watching the final two and a half minutes of the video, modifying the original rating if needed based on the overall interaction. This process was repeated for each of the seven items. Liberal use of comments and timestamps was encouraged to provide rationale and promote discussion in the case of rating discrepancies. Both of the

observers provided ratings for each of the items for the 28 videos in the corpus. In order to prevent drift, the observers met weekly throughout the rating period to discuss video ratings. At the midpoint of rating, the observers reviewed and discussed the anchor videos used in training to recalibrate ratings overall.

### **Data Reduction and Analysis.**

**Reliability.** As previously discussed, both observers provided ratings for all items on all videos. Exact agreement (i.e., when each of the observers gave an item the same rating for a caregiver) occurred 61% of the time (119/196 ratings). Agreement within one point on the scale occurred 98% of the time (192/196). Disagreements (i.e., when the observers' ratings differed by two points on the scale) occurred 2% of the time (4/196).

**Final rating score.** Following procedures recommended by a statistical consultant (Dr. Kenneth Rice, Department of Biostatistics, personal communication) a final score for each item was calculated by averaging the ratings of the two observers at the two time points (baseline and follow up) for each caregiver. Final rating scores provided data that ranged from 1-5. For each of the seven items of our scale there were 14 data points; one data point representing each caregiver's final rating score on each of the items. Collapsing the data from both experimental and control groups was determined to be acceptable for the present analysis, as all dyads were judged to be homogeneous having met the inclusion criteria for the TG study. Furthermore, at the time of the baseline measurement, none of the infants had yet received TG treatment. Collapsing the data across time points (baseline and follow up) yielded a final score that more robustly represented each individual caregiver's performance across time.

**Data analysis.** Data used for analysis included the final rating scores (1-5) for each caregiver. Recall an item rated as 5 was judged to be occurring almost constantly, whereas an

item rated as 1 was judged to be occurring rarely. For all items this rating would match the literature suggesting that ratings at the upper end of the range should positively impact child outcomes.

Data were first analyzed to examine the relationship between ratings of contingent responsivity and ratings of each of the six other caregiver behaviors. A second set of analyses examined the relationship among the six behaviors. Due to the nature of our questions and the small sample size of this study, Spearman's rank correlations were used to examine the relationships. Spearman's correlations are less sensitive than other correlation coefficients to scaling and non-linear relationships, which may occur in small samples. Furthermore, because final rating scores were derived from ordinal data, the use of Pearson's correlation coefficients would be invalid. Spearman's correlations maintain the ordinal nature of the present data by assigning ranks to each data point, rather than considering differences in the data's exact numerical values. Ranks of final rating scores allowed for the investigation of the relationships between the items on the Caregiver Behaviors Rating Scale.

The primary analysis examined pairwise Spearman's rank correlations between the rank order of Contingent Responsivity final rating scores and the rank order of each of the six behaviors' final rating scores. Correlation coefficients were then ordered to determine the relative contribution of each behavior to ratings of the construct of Contingent Responsivity.

The second analysis examined intercorrelations between the rank orders of each of the six behaviors' final rating scores, to determine how the behaviors were related to each other. Fifteen pairwise Spearman's rank correlation coefficients were calculated, corresponding to the 15 distinct pairings of the six caregiver behavior scores.

**Results**

To address the study’s primary question about *which specific caregiver behaviors have the strongest association with Contingent Responsivity*, the rank order of final rating scores of Contingent Responsivity was compared to the rank orders of the final rating scores for each of the caregiver behaviors. Table 4 presents the associations between contingent responsivity and each of the six caregiver behaviors for the 14 participants in this study.

Table 4.  
*Spearman’s Correlation Coefficients Between the Caregivers’ Ranks of Contingent Responsivity and Ranks of Caregiver Behaviors in Order of Strength of Association*

	Contingent Responsivity		Association Strength
	$\rho$	$p$	
Non-restrictive/Non-intrusive	.661	.010	Moderate
Encouraging	.474	.087	Minimal
Exciting/Affecting	.389	.170	Minimal
Focusing	.143	.625	None
Expanding	.068	.817	None
Regulation of Behavior	-.031	.915	None

As indicated in Table 4, of the six caregiver behaviors, *Non-Restrictive/Non-Intrusive* was most highly associated with Contingent Responsivity with a moderate association ( $\rho=.661, p=.010$ ). *Encouraging* and *Exciting/Affecting* were minimally associated with Contingent Responsivity ( $\rho=.474, p=.087; \rho=.389, p=.170$ ). The other three behaviors (*Focusing, Regulation of Behavior, and Expanding*) did not appear to be associated with Contingent Responsivity in the present sample.

Figure 1 illustrates these results, with the x-axes representing ranks of each of the caregiver behaviors, and the y-axes representing ranks of Contingent Responsivity. Note that although the association and regression line for *Encouraging* appear robustly positive, closer examination calls this association into question. In particular, many of the caregivers shared the

same rank of *Encouraging* (i.e., 10 of the 14 caregivers received a rating of 1 for this behavior and therefore shared the rank of 5.5). Although Spearman's rank correlations can be conducted with data that is non-normally distributed, examination of Figure 1 (*Encouraging* Graph) suggests that the association between *Encouraging* and Contingent Responsivity may be more apparent than real.

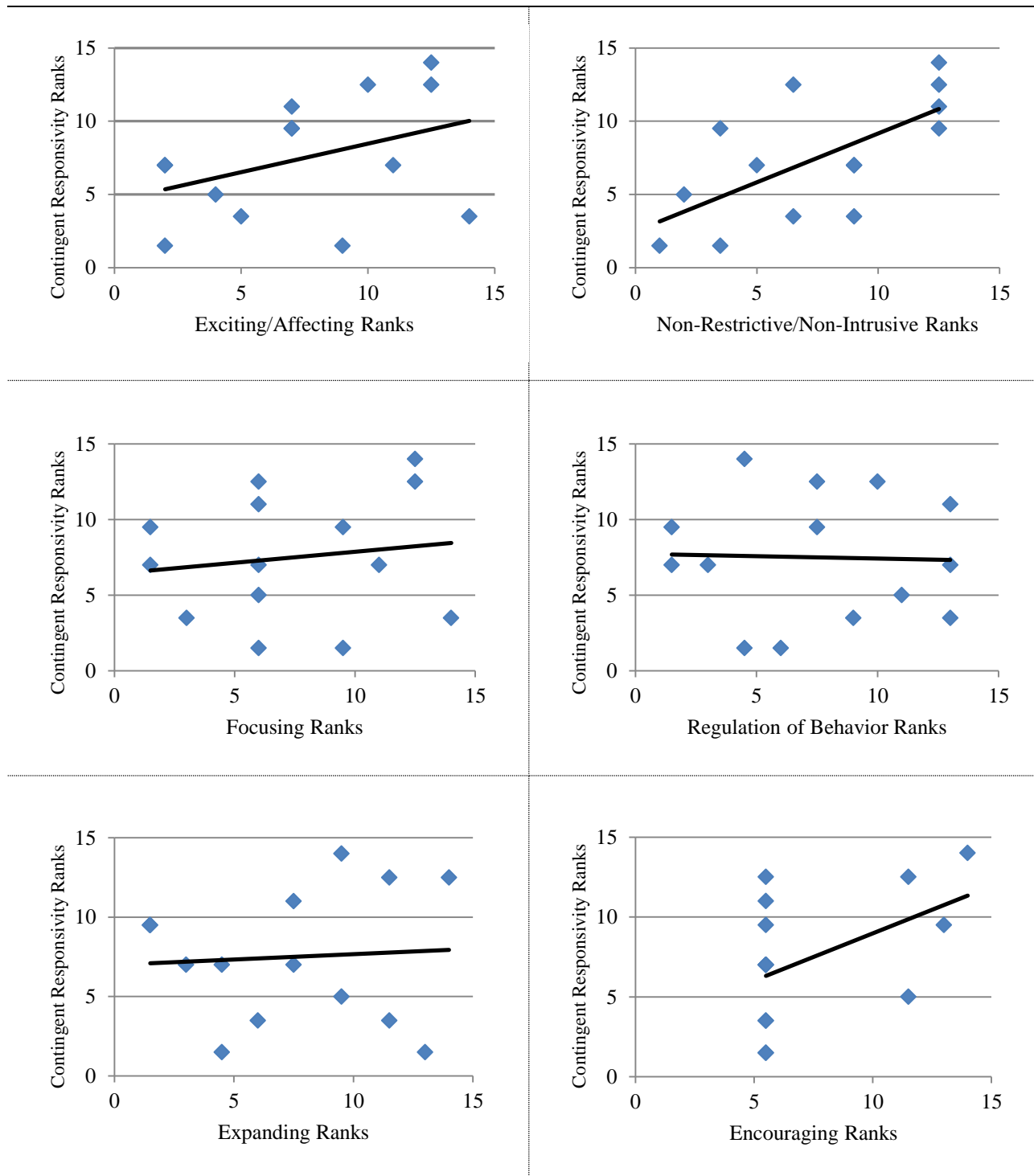


Figure 1. Scatterplots of Contingent Responsivity Ranks Versus Ranks of Each of the Six Caregiver Behaviors

The second question in this study asked whether *specific caregiver behaviors were highly associated with each other*. This question was answered by calculating 15 pairwise coefficients, corresponding to the 15 distinct pairs of the ranks of the six caregiver behaviors. Table 5 presents the associations of these 15 pairs of ranks.

Table 5  
*Spearman’s Correlation Coefficients Between the Ranks of Caregiver Behaviors*

	Non/Non	Focusing	Regulation	Expanding	Encouraging
1. Exciting/Affecting	.459*	.469*	.279*	.171	.182
2. Nonrestrictive/Nonintrusive		-.172	-.046	-.102	.053
3. Focusing			.084	.280*	.224*
4. Regulation of Behavior				.509**	-.025
5. Expanding					.044
6. Encouraging					

Note: \* = minimal association, \*\* = moderate association. The names of some of the items on the scale have been abbreviated in the top row of this table.

Among the six behaviors, the largest association existed between *Regulation of Behavior* and *Expanding*, which were moderately associated ( $\rho=.509, p=.063$ ). *Exciting/Affecting* was minimally associated with *Focusing* ( $\rho=.469, p=.090$ ), *Non-Restrictive/Non-Intrusive* ( $\rho=.459, p=.099$ ), and *Regulation of Behavior* ( $\rho=.279, p=.335$ ). *Focusing* was also minimally associated with *Expanding* ( $\rho=.280, p=.332$ ) and *Encouraging* ( $\rho=.224, p=.442$ ). Other behaviors showed little-to-no association with each other.

### Discussion

The discussion that follows will focus on results from the present investigation, first exploring caregiver behaviors that were associated with Contingent Responsivity, and then caregiver behaviors that were associated with each other. This discussion will include a summary and interpretation of findings, as well as consideration of the strengths and weaknesses of the participant corpus and data collection. The discussion will continue with the clinical implications

of the findings. Finally, an exploration of the study's limitations and future directions for investigation will be presented.

### **Answers to Research Questions**

1. *Which six specific caregiver behaviors were most strongly correlated with Contingent Responsivity across caregivers?* This question was motivated by wanting to understand the relationship between the broad measure of Contingent Responsivity and distinct caregiver behaviors, particularly for caregivers of children with severe disabilities. In the present sample, Contingent Responsivity was most associated with *Non-Restrictive/Non-Intrusive*, followed by *Encouraging* and then *Exciting/Affecting*. The other three behaviors (*Focusing*, *Regulation of Behavior*, and *Expanding*) did not appear to be associated with Contingent Responsivity. The association between Contingent Responsivity and *Non-Restrictive/Non-Intrusive* likely reflected the incompatibility of intruding upon a child's play and responding appropriately to a child's signals. A caregiver who demonstrated Contingent Responsivity, by definition, "provide[d] appropriate responses and reactions to the infant's behaviors" (Table 3) and thus was unlikely to restrict the child's play. Conversely, a caregiver with a high rank of Contingent Responsivity might have received a high rank of *Exciting/Affecting*, because of the compatibility of these behaviors. In particular, he or she might have used affect and excitement in his or her contingent responses. As noted earlier, a large number of caregivers shared the same rank of *Encouraging*, and thus, the minimal association between Contingent Responsivity and *Encouraging* may have been more apparent than real. Finally, it should be stressed that all associations between caregiver behaviors and Contingent Responsivity were only of minimal and moderate strength.

Overall, this suggests that Contingent Responsivity may represent a unique construct, corresponding to something distinct from the six caregiver behaviors described, particularly for

caregivers of children with severe disabilities. Likewise, the six caregiver behaviors may measure caregiver acts that differ from the broad construct of Contingent Responsivity. This finding highlights a difference in the literature between two approaches to caregiver behaviors. One approach describes Contingent Responsivity as a singular, but “multi-level construct” (Brady et al., 2009). The other describes it as an important construct, but one which does not necessarily capture the full array of caregiver behaviors used in teaching interactions (Klein & Alony, 1993). Klein and colleagues (1993, 1996, 1997, 2006), for example, acknowledged the latter position by addressing a variety of individual caregiver behaviors in their caregiver-focused MISC program. The present study contributes new evidence supporting the contention that Contingent Responsivity provides useful information about caregiver-child interactions, but is insufficient to capture all aspects of a caregiver’s interaction with his or her child.

2. *Were specific caregiver behaviors highly associated with each other?* This question was motivated by a desire to better understand individual behaviors considered important to Contingent Responsivity, particularly as they might relate to each other. In the present sample, *Expanding* and *Regulation of Behavior* were moderately associated with each other. Five other pairs (of 15 total pairs) showed minimal association, while remaining pairs did not demonstrate any association. The association between *Expanding* and *Regulation of Behavior* might be explained by the population of children in this sample. The caregivers in this study often helped their children interact with toys while they “buil[t] on the children’s performance” by “label[ing] or describ[ing] objects, actions, persons, activities, or functions” (Table 3). For example, if a child was playing with a spinning toy activated by a large button, his or her caregiver might have verbally described features of the toy while simultaneously helping him or her to activate it.

Minimal associations between *Exciting/Affecting* and both *Non-Restrictive/Non-Intrusive* and *Regulation of Behavior* might reflect the fact that a caregiver who “display[ed] ... enjoyment of the child” (*Exciting/Affecting*) might be less inclined to restrict their child’s exploration (*Non-restrictive/Non-intrusive*) and more inclined to “mediate the child’s engagement with a task” (*Regulation of Behavior*). For example, a caregiver from the present study who received relatively high ratings of these three behaviors frequently provided her child with hand-over-hand support to activate a spinning toy (*Regulation of Behavior*), which allowed her child to explore the toy (*Non-Restrictive/Non-Intrusive*). This caregiver demonstrated enjoyment (i.e., smiling, laughing) in response to her child’s delight with the toy (*Exciting/Affecting*). The minimal association between *Exciting/Affecting* and *Focusing* might be an extension of this relationship, in that a caregiver who received a high rating on *Exciting/Affecting* might also be more likely to demonstrate focusing behaviors, such as calling the child’s name, repeating words and phrases, and accentuating toys by moving them and bringing them closer to the child. However, the lack of association between *Regulation of Behavior* and *Focusing* might call into question the logic of this explanation.

Recall that the behaviors identified for measurement in this study were adapted from the research of Landry and colleagues (2002, 2006) and Klein and colleagues (1993, 1996, 1997, 2006). Landry and Klein each identified specific behaviors that measured discrete aspects of caregivers’ interactions with their children rather than measuring caregiver behaviors through the broad construct of Contingent Responsivity. The present results support this method of measuring caregiver behaviors. In particular, the lack of strong associations between any of the caregiver behaviors suggest that these six behaviors are indeed discrete. Because each behavioral item appears to measure a unique aspect of caregiver interactions, the collection of all of the

behaviors' ratings can be regarded as an individual profile. This profile may reflect a consistent pattern of behavior, or a *style* that is unique to a given caregiver. Two such caregiver profiles will be outlined and analyzed.

The two caregivers selected for discussion have similar total ratings (i.e., the sum of the ratings of all items on the Caregiver Behaviors Rating Scale). The first caregiver (referred to as MM) received ratings totaling 16.5, and the second caregiver (SS) received ratings totaling 16.25. In spite of their similar total ratings, the two caregivers demonstrated different profiles of behaviors. Their profiles are displayed in Figure 2, below.

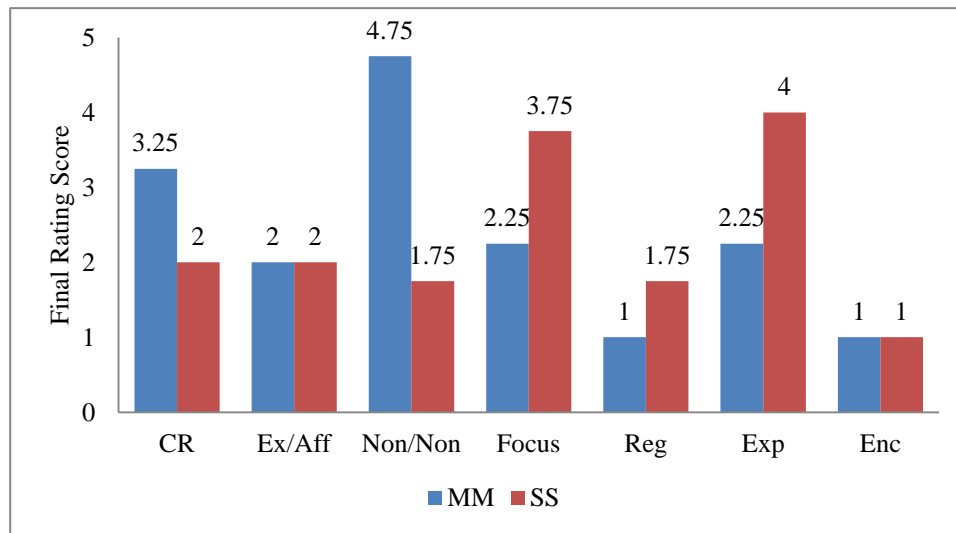


Figure 2. Representations of caregivers' profiles for MM and SS from the Caregiver Behaviors Rating Scale

Figure 2 illustrates that these two caregivers received different rating scores on five of the seven items on the Caregiver Behaviors Rating Scale (i.e., all items except for *Exciting/Affecting* and *Encouraging*). Examining the differences reveals the uniqueness of their profiles. MM was rated as demonstrating Contingent Responsivity more frequently than SS. In video observation, MM more frequently responded appropriately to her child's cues (e.g., activating a toy when her child's eyes widened). In contrast, there were occasions in the videos of SS and her child when

the child presented an overt signal (e.g., selecting a toy of interest by reaching and grabbing), and SS appeared to ignore this signal (e.g., by continuing to provide her child with options of other toys to play with). Another striking difference between these two caregivers is their final rating scores of *Non-Restrictive/Non-Intrusive*. In interactions with her child, MM usually allowed her child to explore toys freely, without restricting or intruding upon her child's play. SS, on the other hand, frequently controlled her child's play by manipulating the toys in the child's space and withholding some toys from her child, sometimes despite the child's signals. A third difference between MM and SS is observed in their final rating scores of *Expanding*. On this item, SS received a higher final rating score than did MM. In video observations, SS frequently narrated the play interaction, labeling items, actions, and feelings. In comparison, MM was quiet and infrequently commented on actions and feelings. These data and examples demonstrated that these two caregivers presented with different profiles. Importantly, this difference was detected even though the sums of their final rating scores were nearly identical. As previously discussed, these profiles of performance reflected their unique styles, capturing the essence of their individual approaches to interactions with their children. As will be discussed, this points to the potential utility of rating scales for measuring behaviors of caregivers with a variety of styles.

### **Clinical Implications**

The clinical implications drawn from the results fall into two major themes: implications of our findings for early intervention and utility of rating scales for clinicians working with caregivers of children with severe disabilities.

As previously discussed, treatment that is directed towards caregivers is an effective and important aspect of early intervention for children with severe disabilities. While clinicians bring professional expertise to intervention, caregivers bring intimacy with the child as well as ongoing

interactions that provide rich teaching opportunities throughout the day. The dominant approach to training caregivers of children with severe disabilities is to address ways in which caregivers can facilitate interactions with their children. Programs that promote facilitative behaviors in caregiver-child interactions have demonstrated positive cognitive and language outcomes for children (Dunst et al. 1990; Klein, 1997; Landry et al., 2006; Brady et al., 2009). That said, working directly with caregivers presents a unique challenge, particularly with respect to severe disabilities that impact communication. First, there are different opinions about how to best instruct caregivers in light of the fact that children with severe disabilities present with a variety of challenges. Second, the caregivers themselves may be quite different from each other, with a variety of parenting and teaching styles. The issue becomes not only what to teach the caregiver, but how to modify teaching to fit each unique caregiver and child dyad. The results of the present study may shed some light on the issue of treatment design. In particular, Contingent Responsivity was only moderately and minimally associated with some of the six caregiver behaviors adapted from Landry and Klein. Thus, Contingent Responsivity did not fully capture the multitude of behaviors that support children with severe disabilities during interactions. Additionally, results indicated only minimal associations among some of the six behaviors, suggesting that each of these behaviors was indeed distinct. Therefore, each of these behaviors may need to be taught separately in order to adequately address each of these aspects of caregiver-child interactions. Treatment approaches such as PALS (Landry et al., 2006) and MISC (Klein et al., 1987) teach caregivers multiple behaviors to use in interactions with their children and have been shown to lead to improvements in children's communication. Through programs like these, caregivers learn a wide range of behaviors, each of which supports the child in different ways. Importantly, these programs can be modified given particular child

characteristics and caregiver styles, emphasizing specific behaviors that are most likely to benefit each dyad.

The results of the present study also highlight the potential usefulness of rating scales for clinicians working with caregivers. As previously discussed, effective communication treatment for children with severe disabilities should not only involve teaching caregivers multiple facilitative behaviors; it must also include adequate measurement of caregivers' use of each of these behaviors before, during, and after treatment. Initial evaluation of the caregiver allows an SLP to determine how often a caregiver engages in various behaviors at baseline, and which behaviors they may benefit from learning. Continued measurement of the caregiver's behaviors allows the SLP to further tailor treatment to each caregiver-child dyad and to provide accurate and supportive feedback to caregivers. Finally, measurement of the caregiver's behaviors after treatment can demonstrate change that might be attributed to treatment.

One traditional approach to measurement is to count the frequency of occurrence of each caregiver behavior. However, collecting the data in this way is time-consuming in clinical practice. A rating scale, on the other hand, may serve as a more feasible clinical tool, as it allows the SLP to swiftly arrive at a gestalt impression of a caregiver's performance of important behaviors. Previous literature has supported this conclusion. For example, Landry et al. (2006) used a scale to measure two of their four main caregiver behaviors (i.e., *contingent responding* and *emotional-affective support*). The present study suggests that rating scales may be successful in measuring a broader range of caregiver behaviors than originally described by Landry. By design, rating scales provide operational definitions for target behaviors and the opportunity to judge performance on a Likert scale, for example, by rating a behavior as occurring rarely (1) or almost constantly (5). In clinical practice, a comparison of a caregiver's ratings across multiple

behaviors on the scale can quickly identify caregiver strengths and weaknesses. As previously discussed, the resulting profile of behaviors may be useful for planning treatment, guiding treatment, and ultimately measuring the effects of treatment. For example, given caregiver SS (discussed above), an SLP might initially use the rating scale to identify her profile of strengths and weaknesses. Specifically, SS presents with strengths in *Expanding* (for which she received a final rating score of 4). The SLP can plan to discuss this strength in the context of a behavior not performed as consistently, such as *Non-Restrictive/Non-Intrusive*. In treatment, the SLP can highlight the importance of labeling items and actions when narrating play, without interceding and interrupting the play physically. Finally, post-treatment measurement via the rating scale could be used to measure SS's improvement across behaviors. The ability of a rating scale to help individualize treatment is particularly important for the diverse population of children with severe disabilities and their caregivers, as each dyad will require different kinds of support.

### **Study Limitations and Future Directions**

The primary limitation of the current study concerns the sample size. First, the small sample ( $N = 14$ ) may not be adequate to capture differences and patterns in outcomes that can be reliably applied to the broader population. Furthermore, it does not allow for sophisticated statistical analyses, and reduces the power to detect statistically significant differences. Additionally, the caregiver-child dyads used in the present study were drawn from a study that controlled for child variables, but not for caregiver variables. Thus, the small number of caregivers and their relatively unknown histories result in threats to the validity of this study. Given a larger sample size, the overall variability of extraneous factors would be greatly reduced.

Possible directions for future research include (1) further investigation of caregiver factors as they relate to caregiver styles and child performance and (2) the development of a

caregiver rating scale as a clinical tool, particularly for use with children with severe disabilities. First, future studies may be able to investigate demographic factors that influence a variety of caregiver styles. For instance, level of education, cultural background, and employment (to name a few) may affect the behaviors a caregiver demonstrates in interactions with his or her child. This type of information could inform early intervention treatment planning for a wide variety of caregivers.

A second path to pursue in future investigations is the further development of the Caregiver Behaviors Rating Scale as a clinical tool to measure caregiver behaviors in their interactions with their children with severe disabilities. As previously discussed, some potential benefits of such a tool are that important caregiver behaviors are clearly defined, and the scale allows for an efficient evaluation of caregiver performance during play interactions with their children with severe disabilities. Furthermore, a rating scale could help a clinician individualize treatment for the caregiver. Further research will be needed in order to gather evidence regarding the validity and reliability of rating scale scores for each intended purpose (e.g., sensitivity to detecting differences in caregiver styles or detecting change over time, predictive value for planning and individualizing treatment). Practically, this research should also ensure the feasibility of the rating scale's training and use in clinical settings.

### **Conclusion**

In conclusion, this study allowed for an investigation of the associations between Contingent Responsivity and six caregiver behaviors, as well as the associations among the six caregiver behaviors when exploring play interactions between caregivers and their children with severe disabilities. Contingent Responsivity is often identified as a critical element in early intervention with caregivers; however, little is known about which behaviors comprise this broad

construct; this is particularly true for caregivers of children with severe disabilities. This study concluded that based on the present sample, the six caregiver behaviors adapted from the work of Landry and Klein were distinct from each other and from the traditional concept of Contingent Responsivity. This reveals the importance of teaching multiple behaviors to caregivers of children with severe disabilities. Additionally, rating scales may be a feasible and useful tool for measuring behaviors of caregivers during play interactions, which may ultimately influence early intervention.

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