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Parent-Implemented Communication Intervention: Sequential Analysis of Triadic Relationships

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Abstract

Collaboration with parents and caregivers to support young children's communication development is an important component to early intervention services. Coaching parents to implement communication support strategies is increasingly common in parent-implemented interventions, but few studies examine the process as well as the outcomes. We explored the triadic relationships between interventionist, parent, and child within a parent-implemented communication for toddlers with Down syndrome (DS), autism spectrum disorder (ASD), or developmental delays (DD). Time-window sequential analyses revealed that parents were more likely to use communication strategies during or immediately following coaching strategies that encouraged the parents' active role. Children were more likely to use targeted communication skills immediately following responsive parent interactions. Intervention occurred in similar frequencies across play and non-play routine contexts. This analysis provides preliminary information on understanding potential mediating variables in parent-implemented interventions. Implications for increasing parent capacity-building and child outcomes through coaching are discussed.

Keywords

communication intervention, coaching, early intervention, family-centered, natural environment, sequential analysis

Recommended practices for infants and toddlers with communication delays include collaborating with parents and caregivers to incorporate intervention within everyday activities and routines (American Speech-Language-Hearing Association [ASHA], 2008; Division for Early Childhood [DEC], 2014; Early Intervention Program for Infants and Toddlers With Disabilities, 2011; National Research Council [NRC], 2001). Specifically, Part C policy is centered on building family capacity to meet children's developmental needs in natural environments (Individuals With Disabilities Education Improvement Act [IDEA], 2004). There is a considerable disconnect between recommended and actual practice—with the biggest gap in the area of building the family's capacity through parent-implemented interventions (Dunst, 2012; Sawyer & Campbell, 2012). It is important to not only examine the effectiveness of parent-implemented intervention for child and family outcomes but also to examine the process used to support and engage the parents in the settings and contexts where intervention is provided (Roberts & Kaiser, 2011; Schertz, Baker, Hurwitz, & Benner, 2011; Trivette, Dunst, & Hamby, 2010).

Routines as Context for Intervention

Whether the terminology is natural environments (ASHA, 2008; DEC, 2014; IDEA, 2004), natural contexts (NRC, 2001), or daily routines and activities (ASHA, 2008; DEC, 2014; IDEA, 2004), providing intervention within meaningful activities that the child and family typically participate in is a foundational construct for early intervention. Routines-based natural environment intervention approaches support children to build developmental skills within the activities in which those skills are needed, support parents to embed strategies and supports within the activities in which they typically participate, and promote generalization of both child and parent skills (Swanson, Raab, & Dunst, 2011; Wilcox & Woods, 2011).

Triadic Intervention

Parent-implemented interventions are triadic in that the interventionist, parent, and child have intersecting roles with reciprocal relationships (Brown & Woods, 2015; Lieberman-Betz, 2015; Roberts & Kaiser, 2011; Woods,

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Wilcox, Friedman, & Murch, 2011). The presupposition of using a triadic model is that the interventionist teaches parents to use strategies designed to promote their child's communication, the parents use the communication intervention strategies in interactions with their child, and the child responds within the interactions, which in turn improves the child's development.

Currently, much of the early intervention coaching literature is focused on examining child and/or parent outcomes (e.g., Meadan, Angell, Stoner, & Daczewitz, 2014; Moore, Barton, & Chironis, 2014) or examining the coaching practices in "business as usual" early intervention practice (e.g., Campbell & Coletti, 2013; Salisbury, Cambray-Engstrom, & Woods, 2012). Both approaches have, and will continue to have, utility in expanding our knowledge about family-centered communication intervention. However, despite their contributions, neither approach fully examines the triadic nature of parent-implemented interventions. The primary emphasis on child outcomes is limited because specific interventionist coaching strategies and/or parent intervention strategies are not directly connected to the change in child outcomes. The emphasis on examining current practices is limiting because we do not know if the intervention being provided is effective in improving children's communication skills. One approach is outcome focused and the other approach is process focused; examining both the process and the outcomes is important for increasing evidence-based intervention implementation.

Across early parent-implemented interventions, the process in which an interventionist teaches a parent varies considerably. Often, general descriptions—such as *parent training sessions* or *parents were coached*—and/or length of time spent in training is provided without information on the specific teaching, training, or coaching process and strategies (Meadan, Ostrosky, Zaghlawan, & Yu, 2009; Roberts & Kaiser, 2011). The varied, and often limited, reporting of interventionist and parent practices was highlighted in recent systematic reviews of parent-implemented interventions (Barton & Fettig, 2013; Lieberman-Betz, 2015). In addition, there are important distinctions among parent-implemented intervention approaches (Kemp & Turnbull, 2014). One distinction relates to the role and relationship of the interventionist and parent. On one end, the interventionist provides instruction and information to the parent in a directive or one-directional way. On the other end, the interventionist develops a partnership with the parent, and the information and instruction exchange is transactional. Caregiver coaching interventions differ from directive coaching or training models by including both relational and participatory practices. Interventionists support parents as integral decision makers and collaborators in how the intervention is implemented while providing guidance and feedback (e.g., Brown & Woods, 2015; Cambray-Engstrom & Salisbury, 2010; Wetherby et al., 2014).

Caregiver Coaching

Caregiver coaching is a graduated teaching and learning process designed to build capacity in parents to have the competence and confidence to independently implement strategies and supports when the interventionist is not present (Hughes & Peterson, 2008; Woods et al., 2011). To successfully meet the changing needs of their children, parents need to be able to do more than simply follow an intervention script (Swanson et al., 2011). Understanding their child's strengths and needs, expectations for participation in daily activities and routines, flexible application and adaptation of strategies, making data-based decisions, and reflecting on the process are necessary skills for intensive, effective parent-implemented intervention to be embedded in everyday life (McWilliam, 2012; Woods et al., 2011).

Coaching and collaborative consultation practices are situated within adult learning theories—recognizing that adults are self-directed, learn best when actively engaged in authentic contexts, and have opportunities for problem solving and reflection (Bransford, Brown, & Cocking, 2000; Dunst, Trivette, & Hamby, 2007). Models of coaching behavior sequences have been proposed in the field of early intervention based on the adult learning literature on situated and graduated learning. For example, Woods et al. (2011) described a teaching and learning cycle that flexibly progresses from (a) observation, problem solving, and reflection to (b) direct teaching and demonstration to (c) practice and feedback opportunities and then completing the cycle with additional (d) observation, problem solving, and reflection. These teaching and learning cycle stages align with the three teaching strategy categories Sawyer and Campbell (2012) described (i.e., discussion, demonstration with narrative, and caregiver practice with feedback) in their descriptive analysis of early interventionists' coaching perspectives. Friedman, Woods, and Salisbury (2012) extended conceptual frameworks of coaching behaviors to propose definitions of interrelated, yet differentiated, caregiver coaching behaviors used in early intervention practice. Ten coaching behaviors were individually defined and descriptive data were presented to characterize the utility of coding intervention sessions with the coaching definitions to understand collaborative coaching practices within individual and aggregated sessions. Although the percentage of session intervals in which providers used each strategy provides holistic summary information about the collaborative nature of the sessions, it doesn't yield information about the process within the continuum of coaching behaviors or the association between coaching strategies and parents' implementation of strategies across routines.

Exploring the Process

Examining relationships within triadic interventions that have had positive effects on child communication and that were implemented with high fidelity may be useful in building our understanding of key components needed to effect change. Identifying which behaviors have a high likelihood of resulting in target behaviors is critical in translating research to practice and supporting implementation of parent-implemented interventions. Examining contingent relationships between coaching strategies and parent intervention strategies and between parent intervention strategies and child targeted communication is the first step in determining which strategies are more effective, at which frequency each strategy should be used, and how to prioritize strategy use. Time-window sequential analysis procedures (Bakeman & Quera, 2011; Yoder & Symons, 2010) can be used to determine likelihood ratios of a specified antecedent behavior influencing a target behavior. The relationship is based on an overall probability that the target behavior is more likely to occur in a small window (e.g., 5 s) immediately following a specific antecedent behavior than at other times outside that window (Yoder & Tapp, 2004). Micro-level analysis of parent-implemented intervention research studies has the potential to add a unique and needed understanding of the contextual variables.

Brown and Woods (2015) examined a parent-implemented communication intervention for toddlers with autism spectrum disorder (ASD), Down syndrome (DS), or developmental delays (DD) in a series of multiple baselines with replication across participants design. Eight of the nine parent and child participants increased their use of communication support strategies and targeted child outcomes, respectively. The interventionists met relatively high fidelity levels (M = 95.4%) of implementing caregiver coaching practices to collaborate with parents to learn how to use communication support strategies in family-identified routines and activities. Similarly, the parents' treatment adherence of using communication support strategies was high (M = 94.9%). The purpose of the current study was to examine triadic relationships and intervention contexts among the participants in the Brown and Woods (2015) intervention study. Specifically, we examined the following research questions:

Research Question 1: What are the frequencies and proportions of parent coaching strategies used by interventionists across routine contexts in intervention sessions?

Research Question 2: Which coaching strategies are more likely to support parents' contingent use of intervention strategies?

Research Question 3: Which intervention strategies are more likely to support children's contingent use of communication acts?

Method

Participants

We evaluated video-recorded intervention sessions from the nine triads (i.e., interventionist, parent, and child) who participated in the parent-implemented communication intervention in Brown and Woods's (2015) investigation. The children (N = 9) ranged in age from 12 to 28 months at the start of the intervention, met Part C eligibility, and had parents who identified communication as their primary concern. Three children were male, and six were female. The children had diagnoses of DS (n = 3), ASD (n = 3), and DD (n = 3). One primary parent for each child (n = 9) participated throughout the intervention. Parents' education level ranged from high school diploma to graduate degree and work status ranged from stay-at-home parent to full-time employment. Family demographics included White (n = 7), African (n = 1), and Hispanic (n = 1). Primary home language was English (n = 7), Luganda (n = 1), and Spanish (n = 1). The interventionists were speech-language pathologists (SLPs) with early intervention experience (n = 4).

Data Collection

We coded and extracted data from the 10-min video-recorded intervention session probes that were used in Brown and Woods's (2015) study. We analyzed 103 ten-min probes (M = 11.44, range = 11–12 of 10-min probes per triad) as an aggregate set, which yielded a total of 1,030 min of triadic intervention.

Measures

Observational coding systems. We coded the video probes for four measured variables—routine context, caregiver coaching, parent-implemented intervention strategies, child communication—independently in The Observer XT 10 software by Noldus Information Technology (2010). This allowed for measurement of the frequency, duration, and co-occurrence of operationally defined behaviors. Undergraduate research assistants and the first author served as coders. The first author was trained in coding and had coded each of the constructs as part of a larger project before refining the definitions with the second author for the current study. The undergraduate research assistants were trained in one or two of the four coding systems specific to this project. The training process consisted of reviewing written definitions and procedures, observing video examples of exemplars and non-exemplars, and coding practice samples as a group and with a partner before coding training videos independently. Each coder was trained to the criterion agreement level of Cohen's kappa values of .60 or greater on a minimum of 10 training intervention videos before

coding sessions for the current study. Coders participated in biweekly coding meetings to minimize drift from coding definitions.

Routine context. Routine contexts are the activities in which interaction occurs and are established to include the following key components: a clear beginning and ending, predictable or logical steps, embedded outcomes, repetition, and opportunities for turns between child and adult (Woods, Kashinath, & Goldstein, 2004). Routines were coded as mutually exclusive state behaviors—the onset of a new routine ended the previous routine and routines could not overlap. There were 16 routine context codes, which were categorized for analysis as four primary categories—play, caregiving, early literacy, and family chores/community activities—as well as transition and no routine.

Caregiver coaching. Descriptive data from individual home visits and aggregate programs have demonstrated promise for the systematic definitions based on the family-guided routines-based intervention (FGRBI) coding protocol (Brown & Woods, 2012; Cambray-Engstrom & Salisbury, 2010; Friedman et al., 2012; Marturana & Woods, 2012; Woods, 2005; Woods & Kashinath, 2007; Woods et al., 2004). In the current study, these reliable documented definitions were adapted from 30-s interval codes to hierarchical, mutually exclusive state behaviors in an attempt to capture the duration and transition of each strategy. There are nine behaviors that can be categorized as (a) specific coaching strategies (problem solving/reflection, caregiver practice with feedback, guided practice with feedback, direct teaching/demonstration), (b) general coaching strategies (information sharing, observation, joint interaction, conversation, modeling), and (c) other. Summary of coding definitions, with hierarchy, is provided in Table 1. Additional information on caregiver coaching is provided at http://cec-rap.fsu.edu.

Parent-implemented intervention strategies. Parents' use of specific communication intervention strategies that were taught as a part of the intervention were coded as start-stop behaviors. The strategies were grouped into categories of responsive interactions (e.g., contingent imitation, mirroring and mapping, and verbal expansions), modeling (e.g., providing a model at the child's target level), and prompting (e.g., sequence of expectant pause, open-ended question, choice question, direct prompt preceded by one of the other prompting strategies).

Child communication. Children's communication acts were coded as start-stop, non-exclusive behaviors according to modified definitions of the Individual Growth and Development Indicator–Early Communication Indicator (IGDI-ECI) communication definitions (Luze et al., 2001). Single words were separated into two behaviors: single signed words and single verbal words. Multiple words were also separated into multiple signed words and multiple verbal words. Each child's communication was coded for gestures, vocalizations, single signed words, single verbal words, multiple signed words, and multiple verbal words. Definitions for coded parent-implemented intervention strategies and child communication definitions can be found in Brown and Woods (2015).

Reliability

For each coding system, a minimum of 20% of the sessions across coders were independently coded by a second coder ensuring ongoing reliability. Cohen's kappa inter-observer reliability measures were calculated in The Observer XT. Reliability means exceeded the good agreement level for each variable: routines (.92), caregiver coaching (.74), parent strategy use (.76), and child communication (.86).

Data Analysis

Sequential analysis. Time-window sequential analyses can be used to determine contingencies between antecedent and target behaviors in experimental and descriptive data (McComas et al., 2009). Yule's Q sequential analysis is not dependent on or influenced by the number of event sequences or total behavior tallies (i.e., instances of recorded behavior). It is robust for analyzing behavior sequences within individuals and groups after the minimum value of five tallies in each cell of the two-by-two contingency table is met, with strength of relationships ranging from +1 for a perfect positive relationship to −1 for a perfect negative relationship (Yoder & Symons, 2010). Therefore, this approach is appropriate for analyzing grouped data from this series of single-case experimental studies. Coded intervention sessions across the interventionists and families were combined to uncover salient interactional patterns that extend beyond individual differences (Bakeman & Quera, 2011). Specifically, we analyzed likelihoods of contingent relationships within 5-s time windows between coaching strategies and intervention strategies and intervention strategies and child communication.

Data extraction and preparation. Data recorded through the coding software The Observer XT were exported as a comma delimited text file. Those files were extracted in ObsTxtSds (Bakeman & Quera, 2008) and converted into Sequential Data Interchange Standard (SDIS) format. The SDIS files were modified for state and time event sequential analysis in Generalized Sequential Querier 5.1 software (GSEQ; Bakeman & Quera, 2011; Bakeman, Queara, & Gnisci, 2009). Preliminary data analyses included data reduction of the routine context, coaching, communication

Table 1. Summary of Caregiver Coaching Strategies Used by Interventionists.

Specific coaching behaviors (Category 1 hierarchy)
Direct teaching: Interventionist provides print, verbal, visual, and video information on "how to" and "why" content about specific strategies, about child development, and about how to embed intervention.
Demonstration: Interventionist narrates her/his actions while modeling the strategy with the child and describes what she/he is doing while the caregiver observes. The explanation can occur immediately before the model, simultaneously with the actions, or immediately following the actions.
Guided practice with feedback: Interventionist offers specific recommendations or suggestions in the context of the routine to help the caregiver implement the strategy or maintain the child's engagement and participation. The caregiver and interventionist may be jointly supporting the child or taking turns.
Caregiver practice with feedback: Interventionist offers encouragement and feedback to the dyad while the caregiver is the primary partner with the child. Feedback may be specific to the child's or caregiver's participation or performance.
Problem solving and/or reflection: Interventionist and caregiver jointly describe the child or routine status from their perspectives. The caregiver, with supports from the interventionist, evaluates alternatives and/or appraises, assigns meaning, or expresses feelings about what happened.
General coaching behaviors (Category 2 hierarchy)
Conversation: Caregiver and interventionist make comments and/or ask and respond to questions about the early intervention program in general that are *not* specific to the child's and/or family's outcomes. Conversation is not coded when conversation shifts to sharing information specific to the child and family goals or when it shifts to general chit-chat (i.e., weather, traffic).
Information sharing: Caregiver and interventionist share information, make comments, and ask and respond to questions relevant to the child's and family's outcomes.
Observation: Interventionist observes caregiver and child interaction without offering any feedback or suggestions.
Joint interaction: Interventionist and caregiver work as partners with the child by taking turns interacting with the child or each other depending on the routine. Specific performance feedback is not provided.
Modeling: Interventionist works directly with the child, with the caregiver present and actively observing. The interventionist's attention is directed to the child. Interventionist does not narrate what is happening or provide guidance or feedback.
Other (Category 3 hierarchy)
Other: Interventionist and caregiver talk about topics unrelated to the child or family outcomes or early intervention program. They may also attend to other family members or visitors. The caregiver may be out of the room. Other is also coded when the video cannot be coded because of poor audio or video.

intervention strategies, and child communication data to provide summary information for each code. Because the codes were designed at a molecular level to provide a more comprehensive view of what happened during the session (Bakeman & Quera, 2011), aggregates of certain code combinations were used for further analysis and reporting based on the context of the intervention. Durations of time spent in each coaching strategy were used to calculate session proportions. Proportions were displayed as percentage of time to characterize the coaching behaviors distributed across routine contexts.

Results

Coaching Strategies in Routines

The intervention was conducted in a variety of family-guided routines. The context of the coaching intervention was represented by the following percentages of duration: 41% in play, 26% in caregiving, 17% in early literacy, 5% in chores, 9% no routine, and 2% transition. Interventionists used a variety of coaching strategies in each of the four routine context categories. Descriptive data depicting the percent of time spent in each of the coaching strategies is displayed in Figure 1. Overall, the interventionist engaged the parent and child in specific coaching strategies (i.e., direct teaching/demonstration, guided practice with feedback, caregiver practice with feedback, and problem solving/reflection) 52.61% of time. General coaching strategies (i.e., modeling, conversation, information sharing, joint interaction, and observation) were used 44.89% of the time. The specific percentages of time in which interventionists engaged the parents and children in each coaching strategy are presented in Figure 2.

Relationship Between Coaching Strategies and Intervention Strategies

Sequential analyses were conducted to examine the likelihood that particular coaching strategies were contingently related to parents' use of intervention strategies. Joint frequency and conditional probability statistics demonstrated

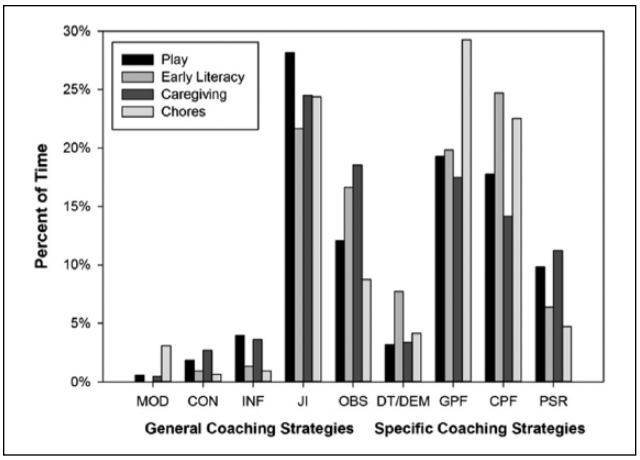

Figure 1. Coaching strategies across routine contexts.
Note. General coaching strategies: MOD = modeling; CON = conversation; INF = information sharing; JI = joint interaction; OBS = observation. Specific coaching strategies: DT/DEM = direct teaching/demonstration; GPF = guided practice with feedback; CPF = caregiver practice with feedback; PSR = problem solving/reflection.

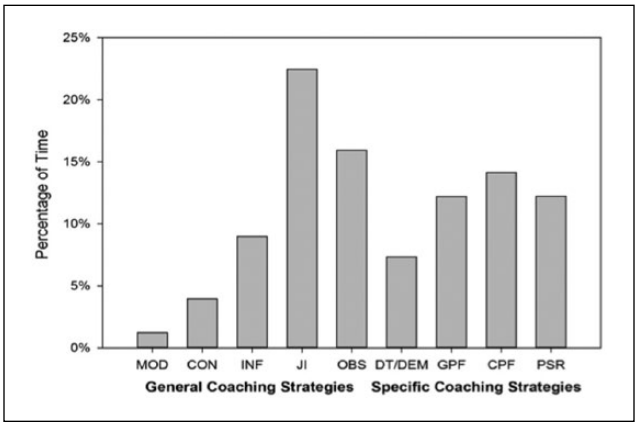

Figure 2. Aggregate density of coaching strategies across intervention.
Note. General coaching strategies: MOD = modeling; CON = conversation; INF = information sharing; JI = joint interaction; OBS = observation. Specific coaching strategies: DT/DEM = direct teaching/demonstration; GPF = guided practice with feedback; CPF = caregiver practice with feedback; PSR = problem solving/reflection.

that parents used intervention strategies at differing frequencies during and within a 5-s window following each coaching strategy. Yule's Q statistics were used to determine the likelihood beyond chance that there is a contingent relationship and to provide values appropriate for comparison (Yoder & Feurer, 2000). The likelihood values of parents using an intervention strategy during or within 5 s following the completion of a particular interventionist coaching strategy are displayed in Table 2. Parents were most likely to use intervention strategies contingent to the interventionist's use of caregiver practice with feedback, observation, and guided practice with feedback coaching strategies. Parents' use of intervention strategies following other coaching strategies did not yield likelihood probabilities with an effect size greater than chance.

Table 2. Yule's Q Values of Sequential Association Between Coaching Strategies and Parent Intervention Strategies.

Coaching strategies	Parent intervention strategies
Specific coaching behaviors	
Problem solving and reflection	−0.68
Caregiver practice with feedback	0.37**
Guided practice with feedback	0.13*
Demonstration with narration	−0.23
Direct teaching	−0.64
General coaching behaviors	
Conversation	−0.75
Information sharing	−0.57
Observation	0.24*
Joint interaction	−0.09
Modeling	−0.84

Note. Effect size for Yule's Q is small ≥ 0.1*, medium ≥ 0.3**, and large ≥ 0.5***.

Relationship Between Intervention Strategies and Child Communication

Conditional probabilities demonstrated positive relationships between parents' use of intervention strategies and children's communication production. As the frequencies of intervention strategies and communication acts were not equal, it is inappropriate to compare those values in determining which intervention strategies increased the likelihood of contingent child communication. Accounting for chance and differing base rates, a small effect was found between parents' implementation of intervention strategies and children's communication within a 5-s time window, Yule's Q = 0.17. Intervention strategies and communication acts were separated into categories to determine if types of strategies had differential associations with specific communication types. Yule's Q values for the comparative associations are presented in Table 3. Responsive strategies had the highest effect sizes. Single word communication was associated with higher effect sizes than vocalizations, gestures, and multiple word communication for all of the intervention strategies.

Discussion

Implementation of evidence-based and recommended practices requires more than a knowledge of which interventions effect change. It is important to understand the process of the intervention and how each component relates to

Table 3. Yule's Q Values of Sequential Association Between Parent Intervention Strategies and Child Communication.

Parent intervention strategies	Vocalization and gesture	Single word	Multiple word	Combined communication
Responsiveness	0.16*	0.46**	0.21*	0.27*
Modeling	0.12*	0.33**	0.08	0.12*
Prompting	0.16*	0.20*	0.13*	0.19*
Combined strategies	0.12*	0.34**	0.09	0.17*

Note. Effect size for Yule's Q is small ≥ 0.1*, medium ≥ 0.3**, and large ≥ 0.5***.

another to identify the active ingredients associated with the change (Abry, Hulleman, & Rimm-Kaufman, 2015). It is possible that all components of a multi-component intervention are not necessary or that the components in concert with each other are necessary but some components should have a greater emphasis. Examining the components of a triadic communication intervention with demonstrated parent and child effects contributes to supporting intervention implementation. The microanalysis of intervention data provided preliminary information on the associative relationships between (a) routine context and coaching strategies, (b) interventionist coaching strategies and parent intervention strategy use, and (c) parent intervention strategy use and child communication. This level of understanding is not only a logical step in examining parent-implemented interventions but is also a first step in understanding potential mediating variables in effective interventions.

Coaching in Family-Guided Routines

In contrast to many interventions in which play activities are the primary context for teaching parents to implement communication strategies (Rakap & Rakap, 2014), our analysis yielded similar frequencies of intervention time spent in play and non-play routines (e.g., caregiving, literacy, and chores). This result supports the use of varied family-identified routines as the context for coaching parents in several ways. First, these results demonstrate that it is feasible to provide triadic communication intervention in not only play routines but also in routines that families participate in on a daily basis (e.g., meals, laundry, checking the mail, brushing teeth, feeding the dog, watering plants). Families identified the routines in which to embed intervention strategies, and the integrity of each family's routines was maintained throughout the intervention, demonstrated by fidelity data reported in Brown and Woods (2015). This differs from parents being given prescribed plans of how to make a specific activity a learning opportunity. Embedding teaching and learning into families' preferred routines supports their capacity and aligns with adult learning principles. Second, when parents learn to use communication intervention strategies throughout varied routines, the likelihood of the child having increased supported communication opportunities expands. Collectively, coaching parents across family-identified routines, as opposed to in a single routine or in varied prescribed activities, may be a key component in achieving increased intervention dosage and dispersed frequent learning opportunities.

Coaching Strategies

The explicit measurement and analysis of coaching strategies used by interventionists to actively engage parents within family-guided routines supports the practice of capacity-building (Dunst & Trivette, 2009). Capacity-building differs from training parents in both theory and application. Parent training models increase parents' knowledge and skills to demonstrate use of specific strategies based on the interventionists' plans for the session (e.g., Vismara, Colombi, & Rogers, 2009). Capacity-building models extend the parents' confidence and competence by collaborating with them to provide opportunities to expand on their existing strengths and address their priorities (Dunst & Trivette, 2009; Swanson et al., 2011). The history of parent-implemented interventions has shown that parents can be taught to implement intervention strategies; however, few communication intervention studies have provided enough information to examine whether the intent or results supported capacity-building as evidenced by self-efficacy and maintenance (Kemp & Turnbull, 2014; Roberts & Kaiser, 2011).

Unpacking the components of coaching is valuable to identify what, when, and how to guide the parent's learning to support their satisfaction and functional use (Basu, Salisbury, & Thorkildsen, 2010). Examining the sequential relationship between coaching strategies and parents' use of intervention strategies provides a preliminary view into which coaching strategies are associated with parents' active implementation. The use of Yule's Q as the index of association provided results that extend beyond chance. Considering its purpose, it is important to make clear that lower Yule's Q values do not indicate that parents were not actively using intervention strategies contingent to those coaching strategies. Lower values mean that parent strategy use during those times were not greater than other times. It is also important to examine the sequential analysis results in their appropriate context—as contingent associations not as causal links. The results suggest that providing parents

opportunities to practice, with the interventionist giving feedback and/or guidance (i.e., caregiver practice with feedback and guided practice with feedback) or the interventionist stepping back to observe the dyad (i.e., observation), supports parents' active use of intervention strategies. This is in contrast to conversational strategies or child-focused intervention that is characterized by less parent participation. It was interesting that joint interaction, which is a triadic interaction strategy without feedback or guidance, was not associated with higher contingent frequencies of parent strategy use. Joint interaction has been used in relatively high proportions in this study as well as other studies examining providers' coaching practices (Brown & Woods, 2012; Cambray-Engstrom & Salisbury, 2010; Friedman et al., 2012; Marturana & Woods, 2012). It is possible that the collaborative strategy of joint interaction sets the stage for other coaching strategies, provides time for the provider to assess child and caregiver interaction as they practice, or is used to maintain a pace that supports parent and child engagement. Each coaching strategy supports different transactional styles between the triad and, therefore, may contribute in different ways to the outcomes for the parent, child, and interventionist (Basu et al., 2010).

The cyclical nature of coaching strategies is not captured in this analysis; therefore, there may be patterns of strategies that contribute to the effect more than single coaching strategies. Further examination of the sequence of strategies within the coaching process is needed to understand how coaching strategies with different transactional styles interact with each other and if these interactions are beneficial to parent implementation, self-efficacy, and generalization.

Parent Implementation and Child Communication

Sequential analyses demonstrated that children were likely to use communication acts contingent to their parent's implementation of a specific intervention strategy. The strongest relationship between responsive interaction strategies and child communication is supported by an extensive evidence-base for responsive parenting interactions (e.g., Landry, Smith, & Swank, 2006; McDuffie & Yoder, 2010; Siller & Sigman, 2008). In addition, the finding that contingent relationships between responsive interaction strategies and multi-word communication acts were lower than with single word communication aligns with recent responsive results and implications (Ingersoll, Meyer, Bonter, & Jeline, 2012; Siller, Hutman, & Sigman, 2012). Modeling had the weakest relationship with combined communication and a negligible effect size for multiple word communication targets. The lower effect sizes for multiple words suggest that children with more advanced communication skills may require additional strategies beyond the combined intervention strategies in this study. Conversely, it may also suggest that as children's language progresses the impact of the strategy use may present in different temporal patterns. This is interesting and an important step in exploring which intervention strategies are best suited for which communication levels as well as providing information on contextual measurement of children's functional communication use beyond specified evaluative probes.

Differences between single word and multiple word productions contingent to intervention strategies may be more nuanced than the aggregate analysis depicts. For example, we would not expect children with targeted communication levels at the single word level to produce more sophisticated acts. Examining differential impacts of intervention strategies on specific child outcomes, not just child production, is a useful next step.

Limitations and Implications

The sequential analyses were based on nine triads with four interventionists. It is critical to interpret the sequential analyses as a preliminary exploration for this specific group of participants. In addition, the selected time window may have excluded some contingent behaviors when the behavior is a nuanced communication act. Conversely, the time window may have been too inclusive leading to additional non-contingent behaviors being included. These are questions for further exploration.

Although the data from this analysis are preliminary, they collectively provide several direct application considerations when working with infants and toddlers with communication delays and disorders. Coaching strategies with high levels of parent participation (i.e., caregiver practice with feedback, guided practice with feedback) should be prioritized throughout individual intervention sessions and over the course of intervention. Interventionists should use these coaching strategies in varied routines to encourage the diversity of experiences that occur across the day. This requires moving beyond the approach of coaching during play coupled with planning discussions of how the parents can generalize the strategies to other routines. This analysis strongly supports the active use of coaching strategies that promote parent and child participation in varied family-identified routines. Interestingly, the proportion of time of caregiver practice with feedback and guided practice with feedback was higher in chores than play, further supporting the need to move beyond play as the only intervention context. Additional emphasis should be placed on the use of responsive strategies to promote communication, particularly for early communicators.

Future research should expand upon the sequential analyses of how particular coaching strategies are associated with parent implementation, self-efficacy, and maintenance. Examining how coaching strategies are related to each other would be of interest so interventionists can have information on the types, frequencies, and patterns of coaching strategies to use. Specifically, it would be useful to study which strategies precede and are subsequent to the strategies with higher parent implementation. Understanding

coaching strategies as a process and providing data to support its utility would provide a foundation for making parent-implemented interventions as effective as possible. Additional studies could separate parents into groups of high and low implementers and examine the coaching strategies used in each group to determine if there was a relationship between a particular pattern of coaching strategies and parent implementation.

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