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Identifying Critical Elements of Treatment: Examining the Use of Turn Taking in Autism Intervention

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Abstract

Evidence-based treatments for autism spectrum disorders (ASD) are comprised of components that identify therapist behavior necessary to implement the treatment with integrity. Some components are shared across approaches from diverse theoretical backgrounds. One component included in several interventions that has not been researched in isolation is turn taking, or the manner in which the therapist facilitates back-and-forth interaction with the child. The current study used an alternating treatments design to examine the efficacy of four types of turn taking. Six children, ages 30 to 39 months, received behavioral treatment while therapists systematically varied the nature of the turn taking component. Children's responses were behaviorally scored to examine differences based on turn condition. Consistent patterns of behavior were found across children. Results suggest that the optimal type of turn is dependent on developmental level and target skill. Implications for treatment of ASD and future research directions are discussed.

Keywords

evidence-based intervention, naturalistic behavioral intervention, turn taking, critical elements

Recent reviews have identified evidence-based educational and psychosocial interventions for individuals with autism spectrum disorders (ASD) through extensive literature review and careful classification of outcome data (National Autism Center, 2009; Odom, Boyd, Hall, & Hume, 2010; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Rogers & Vismara, 2008). Although no single intervention has emerged as effective for all children (Rogers & Vismara, 2008; Schreibman, 2000; Stahmer, Schreibman, & Cunningham, 2011), there is fairly a good agreement across reviews on which interventions are consistently supported by well-designed research studies (National Professional Development Center on Autism Spectrum Disorders, 2011b). The National Professional Development Center on ASD has organized and developed relevant resources for interventions identified as evidence-based (National Professional Development Center on Autism Spectrum Disorders, 2011a), which represents an important step forward in supporting widespread dissemination and consistent implementation of these interventions in applied settings (Rogers, 2003).

As described by the National Professional Development Center, many evidence-based interventions (EBIs) are comprised of multiple components. For example, a therapist may have to implement several elements such as giving appropriate prompts and providing contingent reinforcement to correctly implement a single EBI. Although some components are specific to individual packages, there is a high degree of overlap across interventions. This overlap has led to interventions with different brand names (e.g., Incidental Teaching, Early Start Denver Model, and Pivotal Response Training [PRT]) and from diverse theoretical backgrounds (i.e., behavioral vs. developmental, social-pragmatic; Ingersoll, 2010) having many similarities in actual implementation. For example, many EBIs for children with ASD involve teaching episodes that are initiated by the child based on the child's interests and preferences. Similarly, many involve direct reinforcement, where the reward offered for the child's communication is natural to the interaction (e.g., the child says "push" and is pushed on a swing). In many cases, components are selected for inclusion in an intervention after research elucidates the component's specific effects on child behavior and outcomes. The

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high degree of overlap between interventions possibly represents good reliability on what we know is effective for supporting interaction and promoting development in children with ASD.

One component that is included in interventions across theoretical perspectives is turn taking, or facilitation of back-and-forth exchanges between the therapist (e.g., teacher, parent, speech pathologist) using the intervention and the child with ASD. To use turn taking, the therapist initiates with and responds to the child in specific ways according to the principles of the intervention procedure using strategies designed to enhance the child's social-communication skills and development. In the earliest interventions for children with ASD, the therapist's role involved strict presentation of cues and consequences (Wolf, Risley, & Mees, 1964). The introduction of therapist turns into ASD intervention shifted the therapist's role to supporting a back-and-forth structure that more closely resembles the social exchange between parents and their typically developing children. Turn taking is now present in naturalistic behavioral interventions, such as Milieu Teaching and PRT (Alpert & Kaiser, 1992; Koegel, Schreibman, Good, Cerniglia, Murphy, & Koegel, 1989), and developmental social-pragmatic interventions, such as Floortime and Responsive Teaching (Greenspan & Wieder, 2006; Mahoney & MacDonald, 2007; Sussman, 1999), as well as combined interventions that integrate strategies from behavioral and developmental literature, such as Project IMPACT (Ingersoll & Dvortscak, 2010) and the Early Start Denver Model (Rogers & Dawson, 2010). Because therapist turn taking focuses on supporting the back-and-forth interactional structure that is a primary mechanism of early learning (Harrist & Waugh, 2002), its inclusion in ASD interventions is intuitively appealing. However, despite the widespread incorporation, there has been limited empirical investigation of the practice in isolation.

One motivation for examining turn taking is to identify the optimal and necessary implementation of the component. Without scientific investigation, it is unknown which aspects of turn taking do (or do not) influence child behavior. For example, a turn may consist of the therapist modeling a communication or play behavior for the child, such as labeling or describing objects in the child's immediate environment in which he is interested. Modeling may also involve the therapist completing a play action with the toys the child is using, that is at or just above the child's developmental level. A second element of turn taking in some treatments is contingency, where the therapist takes a turn by gaining control of the materials and then requires a response from the child to regain access, typically by presenting an explicit cue for the child to respond (e.g., asking "What do you want?" while holding up two toys). These two elements of *modeling* and *contingency* are combined in various ways to comprise turns across ASD treatments. For example, some naturalistic behavioral treatments tend to focus the therapist's use of contingency (Alpert & Kaiser, 1992), while developmental, social-pragmatic treatments are more likely to emphasize modeling (Greenspan & Wieder, 2006; Mahoney & MacDonald, 2007; Sussman, 1999). Other interventions, such as PRT, require the therapist to use modeling and contingency in a turn (Koegel et al., 1989). Because turn taking has not been studied explicitly, there is a considerable debate across interventions as to which pieces are truly necessary to optimally influence child behavior. Because less complex interventions are more likely to be adopted and used with fidelity in the community (Rogers, 2003), it is important to experimentally identify the effects of each turn taking element to inform best practice. This type of examination of micro-level differences in intervention components from interventions known to be effective as a whole (in contrast to broader theoretical differences) can advance the field of ASD intervention toward identification of true active ingredients in interventions, as well as individualization of treatment for specific children.

In an effort to address the lack of research on turn taking, the current pilot study focused on the relative effectiveness of the therapist's use of the individual elements of modeling and contingency on child expressive language and play behavior. Specific research questions include the following:

Research Question 1: Are modeling and contingency both necessary (alone, together, or separately) to optimally support children's communication and play behaviors during therapy sessions?

Research Question 2: Does the optimal type of turn to support communication and/or play differ based on child characteristics?

Method

Participants

A total of six children ages 2 to 4 years participated (M = 36.00 months, SD = 3.21). Children were recruited from a local university research program. Inclusion criteria for participation were the following: (a) a diagnosis of autism or pervasive developmental disorder—not otherwise specified, as determined through administration of the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999) and best clinical judgment of a licensed psychologist with expertise in ASD employed by the university research program and (b) chronological age between 2 and 4 years. Demographics and assessment scores at intake for each participant are displayed in Table 1.

Setting and Materials

All sessions were conducted in a treatment room at the university autism research program laboratory or in a small play room or area in the participants' home. A variety of

Table 1. Participant Demographics and Intake Assessment Scores.

Name	Gender	Age (in months)	ADOS classification	Diagnosis	MSEL Expressive Language (*T*-score)	MSEL Composite	VABS ABC
Anne	F	39	ASD	PDD-NOS	38	70	67
Ethan	M	36	Autism	Autistic disorder	21	49	81
John	M	34	Autism	Autistic disorder	63	118	89
Ken	M	38	Autism	Autistic disorder	31	61	74
Lauren	F	30	ASD	PDD-NOS	63	128	87
Tom	M	39	Autism	Autistic disorder	46	78	71

Note. ADOS = Autism Diagnostic Observation Schedule; MSEL = Mullen Scales of Early Learning; VABS ABC = Vineland Adaptive Behavior Scales–II, Adaptive Behavior Composite; ASD = autism spectrum disorders; PDD-NOS = Pervasive developmental disorder – not otherwise specified.

developmentally appropriate, motivating toys were used during all treatment sessions. The types of toys for each participant were determined based on the developmental level and parent-reported child preferences. Four bins of toys were created from matched sets of materials (e.g., each bin contained a barn or zoo and a set of animals, each from different toy manufacturers and of slightly different types). Bins of toys were randomly rotated across conditions to minimize the influence of the toys on the child's behavior. Toys in these bins were used exclusively during treatment sessions and no other materials were available to participants in these sessions.

Procedure

The experiment used a within-subjects, alternating treatments design (Barlow & Hayes, 1979), where the treatments were based on two common elements of turn taking: modeling and contingency. This design was selected to allow for a rapid comparison of two or more conditions (Barlow & Hayes, 1979; Hayes, Barlow, & Nelson-Gray, 1999). Each participant received randomly rotated sessions in each of the four conditions, two that included the turn elements of modeling and contingency in isolation and two that combined the elements with varied timing, such that the conditions were as follows: Modeling only, Contingency only, independent use of modeling and contingency (henceforth, referred to as Independent), and simultaneous modeling and contingency (henceforth, referred to as Combined). Across all conditions, the therapist used a specific evidence-based intervention, Pivotal Response Training (PRT), to interact with the child. PRT was selected to allow for natural, systematic therapeutic interaction with the child, while also allowing for manipulation of the turn taking component. All conditions required that the therapist use the components of PRT with fidelity, with the variation in the turn taking component as the only manipulation. Components of PRT that were held constant include (a) gaining the child's attention; (b) using clear, developmentally appropriate instructions; (c) providing a mixture of easy (maintenance) and difficult (acquisition) tasks; (d) following the child's lead and using preferred materials for teaching; (e) providing direct reinforcement; (f) providing contingent reinforcement; and (g) rewarding goal-directed attempts at correct responding (Koegel et al., 1989). Abbreviated operational definitions for each turn taking condition are provided in Table 2 and additional information is available from the authors.

Three of the authors (S.R.R., J.K., and B.R.) served as therapists in the current study. The first author has expertise in PRT and regularly conducts PRT trainings. The other two therapists were trained in typical implementation of PRT through didactic lecture (3 hr) and hands-on practice with feedback (5–10 hr; $M = 6.4$, $SD = 2.1$) from the first author. The therapists learning PRT practiced until achieving 80% fidelity of implementation (see below) across two sessions with a child prior to working with study participants. To ensure treatment adherence, fidelity was continually monitored throughout the study by the first author and observers blind to the study hypotheses.

Each child participated in seven sessions, one introductory session, followed by six treatment sessions. Sessions were scheduled twice per week for a period of 3 weeks. Due to cancellations, the average time for completion of the six treatment sessions was just more than 1 month ($M = 4.8$ weeks, $SD = 1.2$ weeks). Introductory sessions consisted of a brief meeting between the parents, therapist, and child to gather informed consent, determine the session schedule, and build rapport with the child. Because all children had received a comprehensive developmental evaluation by a licensed clinical psychologist with expertise in ASD within the 3 months preceding study enrollment, child assessments were not conducted. Assessment scores for all six participants are presented in Table 1. After the introductory session, the series of six therapy sessions began. Each session consisted of two, 20-min treatment blocks and a short break between blocks to reduce possible child frustration and increase distinction between the conditions. The appropriate level of model complexity and task difficulty for each participant was determined by review of the assessment

Table 2. Turn Taking Component Conditions.

Condition	Description of therapist's turn
Modeling only	Therapist models appropriate play and/or language but does not require a specific response from the child for child to regain access to materials. The therapist may or may not take control of a toy, but, if so, returns it immediately after modeling.
Contingency only	Therapist requests a turn and takes control of the motivating toy or part of the toy the child is using but does not model play or language. The therapist requires a response from the child before returning the toy and prompts behavior as necessary.
Independent	The therapist uses either modeling or contingency (as described above) but does not use both in the same exchange and instead switches between them throughout the session.
Combined	Therapist requests a turn and takes control of the motivating toy or part of the toy, models appropriate play or language, and then requires a response from the child before returning the toy.

data and clinical expertise of the therapist with support from the research supervisors (licensed psychologists with extensive early autism intervention experience). Across all sessions, each participant was presented with each of the four conditions, a total of 3 times. The four turn taking conditions occurred randomly across periods of two sessions (four blocks), such that each condition occurred once before any condition repeated. Randomization of the four conditions across the two session periods occurred separately for every two sessions to reduce possible order effects for the conditions. All other elements of PRT remained constant across all four turn taking conditions.

Dependent Measures

All treatment sessions were digitally recorded to allow for behavioral scoring and data analysis. Scoring definitions for each variable were based on coding schemes used in previous studies, a review of the literature, and discussion among the authors. Scoring was completed using The Observer® by Noldus Information Technology, an event logging software for observational data that allows for precise recording of behavioral events. Undergraduate research assistants were trained in behavioral scoring methods through review of the definitions and practice scoring. Research assistants were required to meet 80% reliability (identical codes within a 3-s window; [agreements/(agreements + disagreements)] × 100) across two consecutive video clips to be considered reliable. A primary rater was assigned for each scoring type (communication, play, and fidelity of implementation) and these data were used in all analyses. A secondary rater scored every third observation to ensure interrater reliability (see *Procedural Fidelity of Implementation*). All raters were blind to the order of the conditions and the study hypotheses.

Child communication behavior was selected for measurement because it is a frequent intervention target for young children with ASD (National Autism Center, 2009) and is targeted across various theoretical approaches to intervention. Communication was scored by identifying the function (comment or request), complexity (vocalization, one word, word combination), and type (spontaneous, cued, imitated) of communicative child utterances (i.e., excluding self-stimulatory verbal behavior and self-talk, where the child's utterance was not accompanied by eye contact or gesture and was not directed toward the therapist). Frequency counts were obtained for codes in each category.

Child play behavior was selected for measurement because it is a frequent intervention target for young children with ASD (National Autism Center, 2009) and is developmentally appropriate for young children. Child play behavior was scored for the frequency of discrete play behaviors and the total duration of functional play. Each discrete play behavior was further classified as either novel or repeated. Abbreviated definitions for all communication and play behaviors scored are provided in Table 3.

Procedural Fidelity of Implementation

Undergraduate research assistants were trained to score the type of turn used in each condition and fidelity of implementation of PRT using developer-derived methods. Fidelity of implementation of PRT was scored by watching the first 10 min of each session. Therapists were unaware when fidelity would be scored and did not know that it would consistently occur in the first 10 min of the session. For fidelity of implementation of PRT and turn conditions, a second rater scored every third session for reliability.

Coders rated the therapist's implementation of each PRT component (except turn taking) on a 1 to 5 Likert-type scale, where 1 indicated that therapist did not implement the component throughout the session and 5 indicated that the therapist implemented the component competently and consistently throughout the session. A score of 4 or 5 was required to be considered meeting fidelity for PRT. PRT was implemented with 80% accuracy or above during all sessions (range = 92%–100%).

Fidelity of implementation for the turn taking conditions was scored by watching the entire session and identifying the frequency of the types of turns taken by the therapist during

Table 3. Behavioral Definitions of Communication and Play Behaviors.

Category	Kind	Description
Communication		
Function	Comment	Communicative child verbalizations not for the purpose of regulating the behavior of others; requires directed eye contact or gesture.
	Request	Child verbalizations for the purpose of regulating the behavior of others.
Complexity	Vocalization	Purposeful, appropriate verbalizations that cannot be identified as words or approximations of words.
	One word	Verbalizations that are understandable enough to be identified as a word or word approximation.
	Word combination	Verbalizations that include more than one word or word approximation.
Type	Spontaneous	Verbalizations that do not follow a related verbalization or nonverbal action by the therapist.
	Cued	Verbalizations that follow a verbal model, question, or gesture by the therapist.
	Imitated	Appropriate verbalizations or approximations that immediately follow and imitate all or part of a therapist's verbalization.
Play		
Action	Novel	The first time any individual play action (separated by at least 5 s from other play actions) is performed by the child.
	Repeated	Subsequent occurrences of individual play actions (separated by at least 5 s from other play actions) during the same session.
Duration	Functional play	The duration of time the child is using a toy in conventional manner or is appropriately participating in a social game or motor activity with the therapist.

each session. For all conditions, the therapist was required to take a minimum of 20 turns across the whole session to meet fidelity. For the Modeling, Contingency, and Combined conditions, a total of 80% of turns matching the assigned condition were required to meet fidelity (e.g., at least 80% of the therapist's turns during the Modeling condition must be modeling turns). For the Independent condition, the therapist was required to implement an equal number of contingent turns and modeling turns, within a 10% window on either side (i.e., if 16 contingent turns occurred in the session, the required number of modeling turns was 14–18 to pass fidelity). Therapists were required to use only one type of turn for each exchange in the Independent condition (i.e., if a therapist provided a model and contingency in the same exchange, this was considered incorrect).

The turn taking conditions were implemented with 80% accuracy or above during all sessions (range = 79.8%–100%). In addition, the number of turns taken by the therapist did not differ significantly across conditions ($p > .05$).

One third of all treatment sessions for each child were double-coded for reliability purposes. Identical codes within a 3-s window were considered agreements (language, play, and types of turns). For PRT fidelity, codes within 1 point on the 5-point Likert-type scale were considered agreements. Percent agreement between coders was calculated using the following formula: (agreements / [agreements + disagreements]) × 100. Mean percentage agreement was above 80% in all areas, indicating high levels of agreement (see Table 4).

Table 4. Interobserver Agreement for All Categories Scored.

	% agreement	
Category	*M*	Range
Language		
Function	83	76–91
Type	81	72–95
Complexity	94	85–96
Play		
Action	84	69–91
Duration	93	79–96
PRT fidelity	97	89–100
Turn condition fidelity	87	85–92

Data Analysis

Observationally scored communication and play data were analyzed by visual inspection (Gilner, Morgan, & Harmon, 2000). Level, trend, variability, overlap, and consistency of data patterns across participants were all used to determine whether results demonstrated a causal relationship, as is recommended by national standards for single-subject research (Kratochwill et al., 2010). Percentage of nonoverlapping data points was calculated for observed patterns to confirm visual inspection (Parker, Hagan-Burke, & Vannest, 2007).

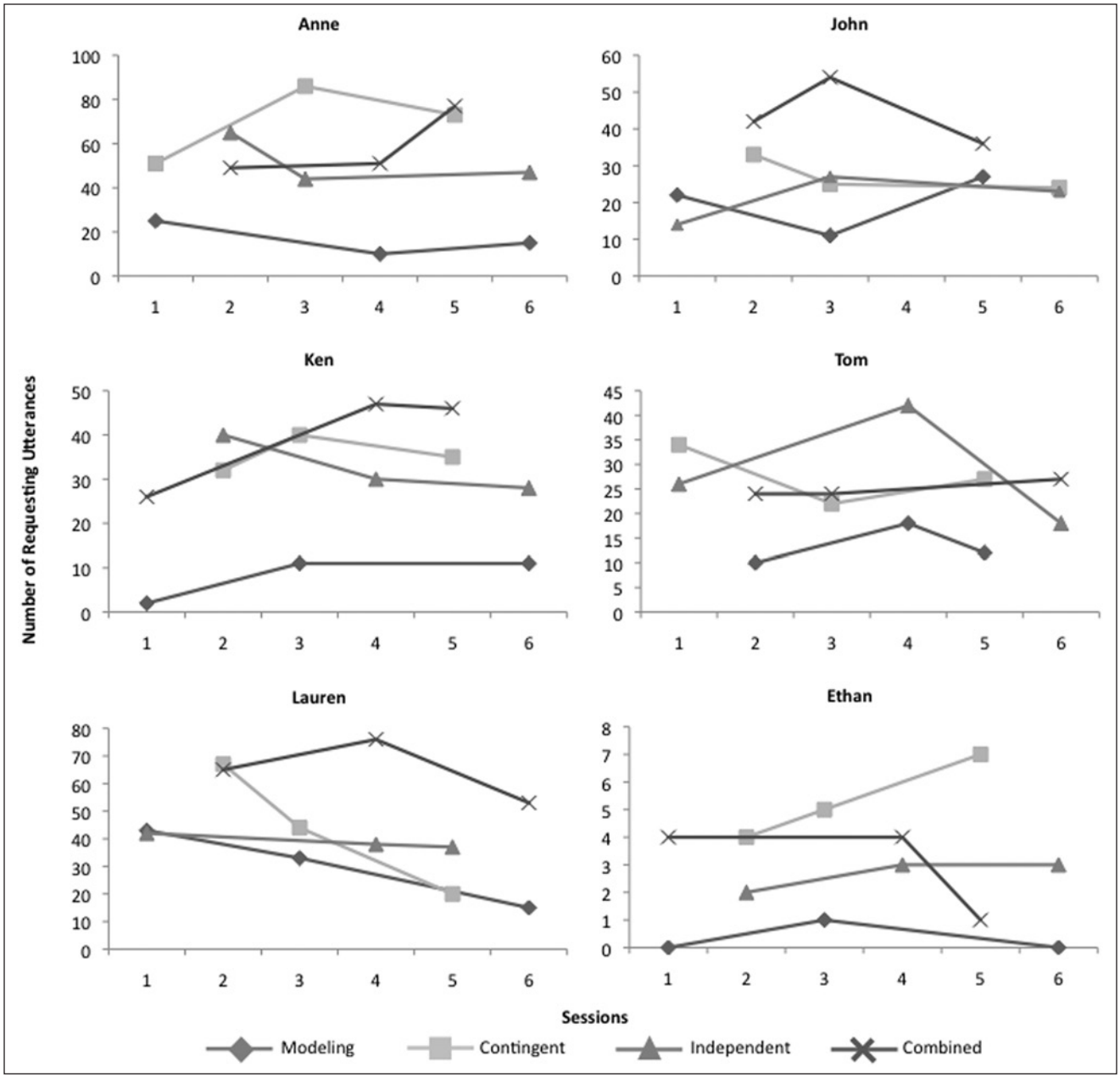

Figure 1. Number of requesting utterances across conditions.
Note. Vertical scale differs by participant.

Results

Results varied by skill targeted as well as developmental level of participants. Consistent patterns seen across multiple participants and conditions are discussed below.

Language

Figure 1 displays the number of requesting utterances that each participant used across conditions. Results were variable by child, but two distinct patterns emerged. Anne, Ken, Tom, and Ethan show a decreased level of requesting in the Modeling condition, and similar, higher levels of requesting across the three other conditions. John and Lauren show an increased number of requests in the Combined condition, and similar, lower levels of requesting across the other three conditions.

Figure 2 displays the number of commenting utterances across conditions. For participants who consistently commented (Anne, John, and Lauren), more commenting occurred in the Modeling condition than in the other three conditions. For participants using comments sporadically

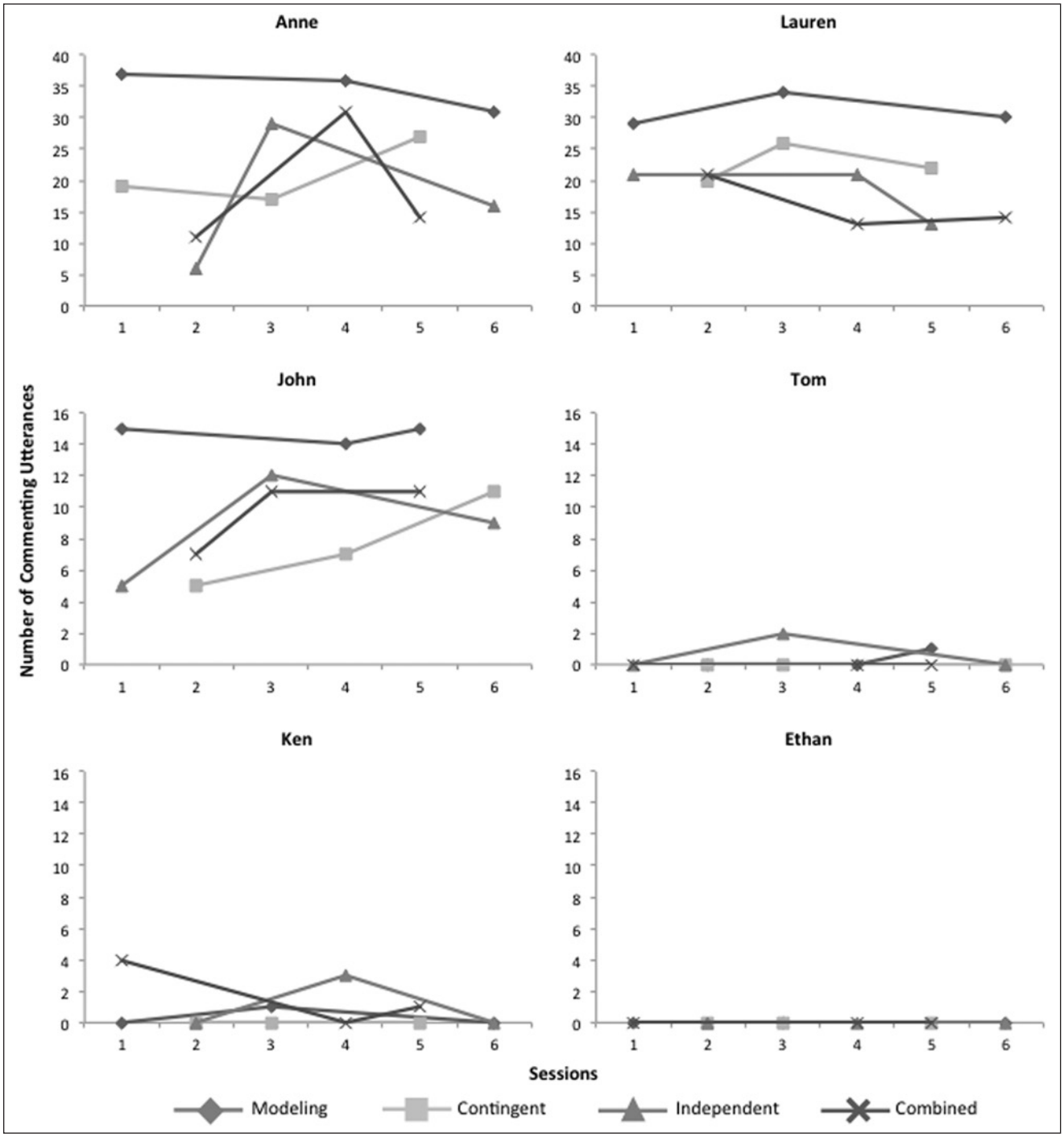

Figure 2. Number of commenting utterances across conditions.
Note. Vertical scale differs by participant.

(Ken and Tom), there did not appear to be any differentiation between conditions. Ethan was not using any comments at the time of the study, and therefore also did not show any differentiation between conditions.

Table 5, Panel A displays the average number of each type of utterance in each condition for all participants. Although there was significant variation in the amount of spontaneous language used by each child, no differences emerged in the amount of spontaneous language used based on the condition. Cued language showed a decrease in the Modeling condition for all six participants, with similar levels of cued language across the other three conditions.

Table 5. Average Type and Complexity of Utterances Across Conditions.

		A: Type											
		Spontaneous				Cued				Imitated			
Participant	Type	Mod	Cont	Ind	Comb	Mod	Cont	Ind	Comb	Mod	Cont	Ind	Comb
Anne	*M*	59.3	61.7	62.0	57.0	11.3	32.0	29.0	27.7	10.3	15.0	13.7	16.7
	SD	7.8	6.1	7.3	12.1	3.0	5.6	3.7	4.9	2.3	4.6	3.7	2.3
John	*M*	43.3	35.0	38.3	45.0	5.7	20.0	20.7	22.7	6.0	4.0	4.7	5.3
	SD	11.6	13.5	12.7	9.6	2.5	2.0	2.5	2.5	3.0	3.5	1.2	0.6
Ken	*M*	10.7	14.7	12.3	15.7	2.0	21.0	20.0	20.7	11.7	8.7	6.7	12.0
	SD	4.7	3.1	4.5	6.4	1.0	6.0	3.0	3.5	1.2	1.2	2.5	7.2
Tom	*M*	7.7	10.7	8.7	8.3	23.3	29.3	35.0	22.0	24.7	28.7	23.0	20.0
	SD	2.3	15.6	4.6	3.0	5.0	10.6	10.5	3.6	5.6	23.1	11.0	8.9
Lauren	*M*	40.7	45.0	37.7	56.0	11.0	29.7	24.7	25.0	9.0	13.0	4.0	7.3
	SD	0.6	2.0	0.6	2.6	6.2	7.9	6.1	7.3	14.6	23.1	11.6	10.8
Ethan	*M*	0.03	0.3	0.3	0.3	0.3	0.7	0.7	0.0	0.0	4.3	2.7	2.0
	SD	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.0	0.0	2.1	0.6	1.7
		B: Complexity											
		Vocalization				Single word				Word combination			
Participant	Type	Mod	Cont	Ind	Comb	Mod	Cont	Ind	Comb	Mod	Cont	Ind	Comb
Anne	*M*	2.0	3.0	1.7	0.7	28.7	31.3	21.3	26.0	75.3	74.3	72.7	72.7
	SD	1.7	1.7	2.0	0.6	8.0	6.1	4.1	4.6	16.2	12.5	7.7	23.4
John	*M*	1.3	2.0	0.7	3.0	21.0	15.0	16.3	19.0	37.7	42.0	36.7	59.3
	SD	0.6	2.0	0.6	2.6	19.2	9.8	11.1	11.3	14.6	23.1	11.6	10.8
Ken	*M*	0.7	0.0	3.0	4.0	6.0	9.3	10.3	15.3	7.7	35.0	25.7	29.0
	SD	1.2	0.0	2.6	6.9	6.6	8.5	6.8	10.1	4.9	6.1	1.5	14.1
Tom	*M*	7.7	2.7	5.0	6.3	17.7	14.0	25.7	17.3	29.3	32.0	32.0	32.7
	SD	2.3	2.6	4.6	5.7	2.5	7.2	7.8	8.5	14.7	12.9	10.5	10.0
Lauren	*M*	6.7	2.3	3.0	4.3	8.3	17.7	23.0	18.0	45.7	67.7	40.3	66.3
	SD	0.6	2.0	0.6	2.6	4.3	9.8	4.1	7.3	14.6	13.1	11.6	10.8
Ethan	*M*	0.3	5.3	2.7	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	SD	0.6	1.5	0.6	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note. Mod = Modeling; Cont = Contingent; Ind = Independent; Comb = Combined.

Imitated language showed high variability within and across children and no consistent differences across conditions.

Table 5, Panel B displays the complexity of utterances for each participant averaged across conditions of the same type. These data illustrate that the language complexity for each child stayed relatively stable across conditions; it does not appear that the length of utterances children used was affected by the differences in the therapist's behavior.

Play

Figure 3 displays the number of discrete play actions performed by each participant across conditions. A larger number of discrete play actions were seen in the Independent and Combined conditions than in the Modeling or Contingent conditions for all participants. Number of play actions appeared equivalent during Independent and Combined conditions, as indicated by the overlapping data paths. The same is true for the Contingent and Modeling conditions. There are no overlapping data points between the Contingent or Modeling conditions and the Independent or Combined conditions, and this pattern is consistent across all six participants. Data for duration of functional play showed a very similar pattern, with the Modeling and Contingent conditions producing less functional play than either the Independent or Combined conditions (not shown). Although there was variation in the proportion of novel versus repeated play actions across children, each child demonstrated little variation across conditions (i.e., the proportion of novel vs. familiar play actions for each child was stable across conditions; not shown).

Discussion

The results of this study suggest that the use of therapist turn taking to affect responsiveness of children with ASD warrants further exploration. In the current pilot investigation, the types of turns the therapist used had predictable effects on participants' communication and play behavior that varied by the functioning level of the child. Based on these data, preliminary recommendations for the types of turns therapists should use to target various child skills can be offered.

Gaining control of materials and requiring a contingent response from the child is an element of therapist turns present in all conditions except Modeling. Conditions involving contingency promoted the use of requesting utterances for a subgroup of children. These children all had expressive language age equivalents below 60 months of age and Mullen Scales of Early Learning (MSEL) Composite scores below 80. For this group, modeling alone did not promote the same level of requesting, which is often the first expressive language skill targeted in naturalistic, behavioral interventions for children with ASD. These results are consistent with previous research indicating that children with lower language levels respond more favorably to interventions that use direct prompting than those that use purely facilitative strategies (Yoder et al., 1995). In addition, the lack of differentiation between the Contingency, Independent, and Combined conditions suggests that therapists need not necessarily use modeling and contingency within the same exchange when targeting requesting with these children, thus potentially simplifying implementation of turns with some children. These data support contingency as a critical element in increasing the use of requests for children acquiring early language skills. Although this is not surprising and further exploration is necessary to confirm these results, it is useful to provide some evidence to the notion that modeling alone was insufficient to promote this type of communication for certain children, as this is a current debate in the ASD intervention literature.

In contrast, the two participants with expressive language age equivalents above 60 months, who also had above average MSEL Composite scores, used increased requests in the Combined condition. These results indicate a need for modeling and contingency to occur within the same exchange for optimal responding. These data are also consistent with earlier research on the positive influence of facilitative strategies such as responsive commenting on children at higher language levels (Yoder et al., 1995). One possible explanation for this result is that a turn in the Combined condition is the most similar to the give and take of a typical interaction, where both participants alternate offering new content and providing a lead for the other partner to follow. The more advanced developmental level of the participants who were optimally supported by the Combined condition suggests the need for a shift in the type of turn used over time, such that therapists incorporate modeling alongside contingency as children make progress and gain skills. This is important preliminary information for how to best individualize intervention to a child's changing needs over time that should be explored with further research.

The type of therapist turns that supported commenting was also variable across children but demonstrated a consistent pattern. The Modeling condition best supported use of comments for participants' who were already using this type of communication at the time of intervention. This finding may indicate that therapists modeling behavior may play an important role as children become increasingly skillful in using language for a variety of functions beyond requesting. These data support the notion that intervention implementation needs to be individualized based on child characteristics, and they also provide direction for future exploration on when therapists might want to use modeling alone during treatment sessions. The identification of which communication skills are best taught using specific components of interventions is crucial for the continued refinement and improved efficiency of ASD intervention (Schreibman, Suhrheinrich, Stahmer, & Reed, 2012).

Consistent patterns were also seen in the type of language (spontaneous, cued, and imitated) children used across conditions. Children used cued speech less often in the Modeling condition. It is possible that the decrease in the use of cued language is primarily due to the therapist's lack of explicit withholding of materials, which is consistent with previous research (Ingersoll, 2011). The lack of differentiation between conditions for spontaneous language is noteworthy, as a common goal across behavioral interventions for ASD is independent communication that does not rely on therapist support or environmental manipulation. The similar levels of spontaneous language across conditions replicates results seen in previous comparison of Milieu teaching (a naturalistic behavioral approach that includes contingency; Alpert & Kaiser, 1992), responsive interaction (a developmental approach more likely to include modeling alone; Mahoney & MacDonald, 2007), and a combined approach for children with ASD (Ingersoll, 2011), as well as comparison of behavioral versus responsive teaching methods for children with Down syndrome and agenesis of the corpus callosum (Salmon, Rowan, & Mitchell, 1998). The consistency of this result is encouraging, as it indicates that children's spontaneous use of language is likely supported equally across significant variations in therapist behavior. However, a baseline measure of spontaneous language in the absence of therapist interaction is necessary to conclusively determine whether the therapeutic strategies in use are responsible for supporting spontaneous communication and whether rates seen in the session are above usual levels.

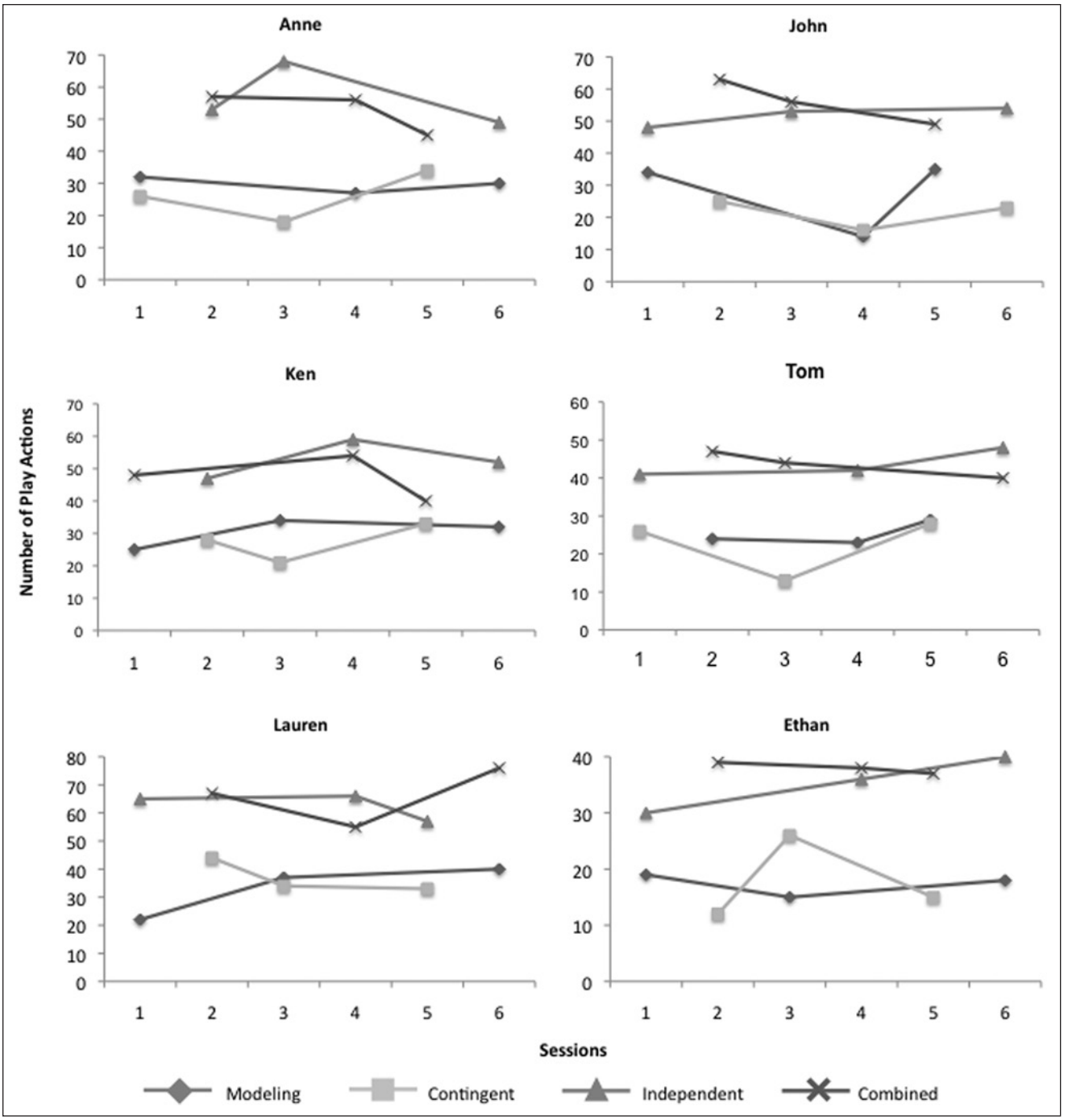

Figure 3. Number of play actions across conditions.
Note. Vertical scale differs by participant.

The data for the frequency of functional play behaviors were consistent across all six children, indicating good reliability on the effect of the therapist's type of turn on the object play behavior for children in the study. It appears that modeling and contingency were necessary to promote functional play (in duration and number of discrete acts). The absence of variation in this pattern of response across children may indicate a feature of how play is learned versus how language is learned. Children have the opportunity to hear others speak and communicate with each other continually, regardless of whether they are the ones being spoken to or are participating in the interaction. It is more rare, however, for a child to observe or witness a play interaction that they are not themselves a part of. One

explanation for the requirement for modeling to support a child's use of play behaviors is the decreased input of play behaviors that children otherwise likely receive. However, these data do not speak directly to this issue. It is clear that using modeling and contingency at the same time is equivalent to using both strategies separately, which reduces the complexity of using turns to promote children's play behavior and, therefore, increases the likelihood of adoption of this effective strategy (Rogers, 2003). For example, a therapist could model a play action for several children, while providing contingent reinforcement for completing play actions at different times for each child in the group. The consistency of this pattern across all six children in the current study highlights promoting object play as a useful area of further exploration in this type of work.

There are several limitations to the current study that must be addressed. The work presented here is preliminary and relies on a small number of children, and therefore requires replication in future research. Each condition was implemented a limited number of times, which restricts the strength of the conclusions that can be made regarding differences in condition. Although the type of alternating treatments design used here does constitute a demonstration of experimental control (Cooper, Heron, & Heward, 2007), the short duration, low intensity, and lack of baseline data are limitations that should be addressed in future research. In addition, such limitations indicate that these data can assess neither whether the conditions used improve overall language ability nor the long-term effects of each condition on child behavior. Future research should investigate these conditions at greater intensities and over longer periods of time to address these limitations. A comparison of the Independent and Combined conditions may be particularly fruitful. One potentially important characteristic of the participants that was not measured here is the generalized motor imitation skills of each child prior to intervention implementation. Because modeling was one of the components used by the therapists, it is possible that there are individual differences based on this characteristic. Specific exploration of the role of imitation skill in responding to turns containing modeling and contingency should occur in future research. Another limitation is that only a small number of potential target skills (expressive language and play) were assessed in the current study, and it may be that other skills are supported in different ways by the type of therapist turn, thus limiting the extent to which these results can be generalized to other learning domains. Similarly, although the number of overall turns did not vary across therapists, the content of these turns was not controlled (i.e., communication or play action). Therapists were instructed to take roughly half communication-related turns and half play-related turns, but the breakdown of turn content was not specifically measured in the context of the current study. Future research should manipulate the content of turns specifically to identify differences in child behavior based on turn content. Finally, the turn taking manipulations used here resulted in somewhat artificial implementation of PRT, with strict controls on how many opportunities to respond the therapist provided to allow for consistency across therapists and turn taking conditions. The results from children participating in this slightly contrived therapy context may not match what would happen if the intervention were used in a more natural way.

These results preliminarily identify the influence of therapist turn taking on child communication and play behavior during behavioral treatment sessions. The elements of a turn that optimally support child responding were dependent on the nature of the skill being targeted (requesting, commenting, play behaviors) and the developmental level of the child. This study provides an important model for elucidating critical elements in intervention strategies for children with ASD, informing the individualization of treatment, and providing direction for future research.

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