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ORIGINAL PAPER

A Randomized Clinical Trial Comparison Between Pivotal Response Treatment (PRT) and Structured Applied Behavior Analysis (ABA) Intervention for Children with Autism

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Abstract Accumulating studies are documenting specific motivational variables that, when combined into a naturalistic teaching paradigm, can positively influence the effectiveness of interventions for children with autism spectrum disorder (ASD). The purpose of this study was to compare two applied behavior analysis (ABA) intervention procedures, a naturalistic approach, pivotal response treatment (PRT) with a structured ABA approach in a school setting. A randomized clinical trial design using two groups of children, matched according to age, sex and mean length of utterance was used to compare the interventions. The data showed that the PRT approach was significantly more effective in improving targeted and untargeted areas after 3 months of intervention. The results are discussed in terms of variables that produce more rapid improvements in communication for children with ASD.

Keywords Pragmatic skills · Naturalistic approach · Analog approach · Autism · Pivotal response treatment · ABA

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Introduction

Milestones in language and social communication play a major role at almost every point in development. However, for children autism spectrum disorder (ASD) a defining characteristic of the disability is difficulty with social communication across contexts. In fact, most parents of children with ASD first become concerned about their child's development because of early delays or regressions in the acquisition of verbal communication (Locke et al. 2010; Short and Schopler 1988). Children with ASD may experience delays in the onset of verbal expressive language, and some may remain nonverbal throughout life (Prizant et al. 2003; Koegel and Koegel 2006). For those who do learn to use expressive verbal communication, many have difficulty using communication effectively to accomplish social interactive goals (Donno et al. 2010).

In addition to social goals, interventions for communication delays are critical, as a myriad of other challenges are correlated with language difficulties (Landa 2007), including increased disruptive behaviors (Carr and Durand 1985), academic difficulties (Catts 1996), reduced levels of play (Ungerer and Sigman 1984), and so on. In contrast, functional language use by school age has been shown to relate to better long-term outcomes in individuals with autism (DeMyer et al. 1981; Lovaas 1987). Thus, the need for effective and efficient interventions that address communication is essential.

A variety of treatment approaches have been developed to address the social communication of children with (ASD). The most commonly used treatment options for ASD are derived from the field of behavior analysis (ABA) based on theories of learning and operant conditioning (Lovaas 1987), as they are evidence-based (National Research Council 2001; National Standard Project 2009;

Simpson 2005). Structured ABA approaches define discrete intervention targets, which are addressed through massed trials of antecedent-behavior-consequence chains. They use adult-selected materials that are presented repeatedly to promote success. Tight control over the antecedent stimuli, prompt hierarchy, and consequences are maintained and tokens or edibles paired with verbal praise are provided contingent upon correct responses (see detailed description in Landa 2007).

The increase in the prevalence of ASD (Blumburg et al. 2013) along with the documented effectiveness of ABA has led to the development of several comprehensive treatment programs and curricula (Leaf 1999). Many programs that utilize discrete trial training teach individual skills one at a time through drill-based repetition of learning trials (e.g., Lovaas 1987). These approaches require as many as 40 h per week, but boast success rates of almost half of the children being indistinguishable from their peers following intensive early intervention (Lovaas 1987).

While the structured ABA procedures are very effective in producing behavioral changes in a wide variety of areas, the literature has discussed three major difficulties encountered with the intervention: (a) gains are extremely slow (often requiring many thousands of trials to teach a single word); (b) when gains occur they often do not generalize; and (c) the children typically are often unmotivated to be involved in the teaching sessions, frequently exhibiting escape-motivated disruptive behaviors (Koegel et al. 1998). Consequently, the ABA approaches to intervention often require massive numbers of trials presented repeatedly in an analog teaching paradigm for the children to show success. This can be extremely time-consuming for all involved.

In response to the slow acquisition of target behaviors and high levels of disruptive behaviors, a body of research has focused on variables that increase the child's responsiveness to the task. An outgrowth of these structured ABA approaches are more child-directed naturalistic behavioral methods (Hancock and Kaiser 2002; Koegel et al. 1999a, b) and social-pragmatic interventions that use developmental theory as a guide (Dawson et al. 2010; Greenspan et al. 1998; Greenspan and Wieder 1999; Mahoney and Perales 2003; Prizant et al. 2003; Salt et al. 2002). Naturalistic models, such as pivotal response treatment (PRT) (Ingersoll and Schreibman 2006; Koegel et al. 1999a) target specific skills as well as core pivotal areas (e.g., motivation) which result in widespread gains in untargeted areas, such as joint attention (Matson et al. 1996), affect (Koegel et al. 1996a, b), and decreases in untreated disruptive behavior (Koegel et al. 1992). PRT relies on operant teaching principles and has been used to target a wide range of deficits, including social skills and communication (Handleman and Harris 2001).

To be specific, PRT is an intervention approach based on behavioral principles of ABA that focuses on incorporating variables known to improve responsiveness, rate of responding, and positive affect. These variables include child choice (Koegel et al. 1987), task variation (Dunlap 1984), interspersing maintenance and acquisition trials (Dunlap 1984), reinforcing attempts (Koegel et al. 1988), and using direct natural consequences (Koegel and Williams 1980; Williams et al. 1981). As a package, these variables have been shown to be extremely effective, when compared to structured ABA approaches. Most of the studies comparing the two procedures have used single subject designs (Koegel et al. 1987). Thus, there is a need for randomized clinical trial (RCT) designs that compare PRT with structured ABA (which is currently the standard of care in many clinics and schools) as a treatment as usual control. Therefore, we conducted the current study to examine the effectiveness PRT compared to structured ABA to improve communication deficits in 6–11 year old children with autism using a RCT design. The specific questions asked in this study were: (1) Would PRT or structured ABA result in greater gains in targeted language areas (mean length of utterance); and (2) Would PRT or structured ABA result in greater generalized gains in untreated areas as measured by a standardized communication checklist (the Children's Communication Checklist, Bishop 2006) completed by each participant's teacher and parent.

Methods

Participants

Thirty children, 18 boys and 12 girls, ranging in age from 6 to 11 years, participated in this study. Each child: (1) was diagnosed with autism by a child psychiatrist according to the DSM-IV-TR (American Psychological Association 2000) and was referred to the Hamedan University of Medical Sciences and Health Services, Iran, for intervention. In addition, the first author screened each child for symptoms of ASD prior to the start of the study. As well, each child was screened by the public school system and placed in special education classrooms for children with ASD; (2) used expressive verbal communication with a mean length of utterance (MLU) of at least two words; (3) had no vision or hearing loss; (5) had no other co-morbid psychiatric disorders; (6) was not bilingual; and (7) had an Intelligence Quotient (IQ) of at least 50 indicating that they exhibited mild to moderate intellectual impairments. To be specific, in the traditional ABA group thirteen of the fifteen children had a reported IQ between 50 and 60 and two children had a reported IQ of 60–70. In the PRT group twelve of the fifteen children had a reported IQ between 50

Table 1 Participant characteristics

Characteristics	ABA group		PRT group		
	n	%	n	%	
Gender					
Male	9	60	9	60	
Female	6	40	6	40	
Ethnicity					
Iranian		100		100	
	ABA group		PRT group		
	M	SD	M	SD	*p*
Age (in months)	110.47	18.62	110.67	18.71	ns
MLU	2.77	.49	2.76	.50	ns

and 60 and three children had a reported IQ between 60 and 70. All of the children attended self-contained special education classrooms. The present study was implemented during the summer when the typical full school day was not in session, however the students spent 2 h per day, 4 days per week, for a total of 8 h per week in school. 2 of the 8 h were spent participating in the present study and the students spent the remaining 6 h with their teacher previewing academic material that would be presented during the upcoming school year. An outside treatment record indicated that none of the children received any other type of intervention during the entirety of this study. Participant information is listed in Table 1.

Randomization

This study was interested in a subpopulation of verbal children with autism. Therefore, prior to the start of intervention, teachers were asked to nominate students that fit a predetermined list of criteria that was necessary for inclusion in the study. Based on this list, a total of 15 dyads were conveniently selected who were matched by age, sex, and MLU. Each participant in each dyad was then randomly assigned to one of two treatment groups. This resulted in 15 participants being randomly assigned to an ABA treatment group and their matched counterparts being randomly assigned to a PRT treatment group. None of the participants (teachers or parents) completing the assessments were aware of the intervention to which they were assigned, nor did they have access to the randomization list.

Implementer Training and Setting

All sessions were conducted in a small (10′ by 15′) treatment room at the public school site using a one-to-one teacher-child format. The treatment rooms contained a table, chairs, and stimulus materials relevant to each intervention. One of the treatment providers for each intervention was a speech/language specialist who held a master's degree. Additionally, five advanced graduate students in speech and hearing sciences assisted with the intervention (three for the ABA group and two for the PRT group). In total, four individuals implemented the sessions for the structured ABA group and three different individuals implemented the sessions for the PRT group. The treatment providers had previous experience teaching children with autism using structured ABA procedures, which was the standard of care when this study was implemented. Prior to the start of the study, the implementers met with individuals with experience in the interventions and were provided with specific methodologies for

Table 2 Definitions for fidelity of implementation

Child attending
The interventionist must have the child's attention prior to presenting an opportunity
Clear opportunity
The question/instruction/opportunity (SD) to respond must be clear and appropriate to the task
*Child choice**
For PRT groups the interventionist should follow the child's choice with tasks and activities. However, the interventionist must always assume control should the child engage in hazardous (i.e. self-injury) or inappropriate (i.e. self-stimulation) activities. If child is not showing interest in the current task, interventionist should attempt to change the activity
For the ABA group the interventionist should choose the materials or activity that is relevant to the target behavior
*Maintenance tasks**
For the PRT intervention, the interventionist should intersperse tasks the child can already perform with acquisition (new) tasks. For ABA groups the target behavior should be worked on exclusively
Contingent
Reinforcement must be contingent upon child's behavior. The interventionist's response (i.e. giving the child a reinforcer) must be dependent upon the child's response (i.e. saying "little toy")
*Natural**
For the PRT intervention reinforcement should be natural or directly related to the desired behavior. For ABA intervention reinforcement should include food items, activities, or items (stickers) that the child enjoys but are unrelated to the intervention
*Contingent on attempts**
For PRT any goal-directed attempt to respond to questions, instructions, or opportunities should be reinforced. Although an attempt does not necessarily need to be correct, it has to be reasonable. For ABA intervention a strict shaping paradigm must be used wherein each rewards are provided upon correct responses or responses that are at least as good or better than the previous response

An asterisk (*) indicates differences between the two conditions

their respective intervention. Specifically, the clinicians in the PRT group read *How to teach pivotal behaviors to children with autism: A training manual* (1989) and the clinicians in the structured ABA group read the Lovaas ebook (1981). Both groups emailed consultants in California with expertise in each methodology, who provided input on the use of the procedures with regard to specific students, approximately once weekly throughout the study. Since structured ABA was being used with the students, treatment continued as usual but procedures were discussed to assure that Fidelity of Implementation would be met. For the PRT sessions, the treatment providers were taught to incorporate motivational strategies into the ABA intervention. Each child was observed during at least four separate sessions and fidelity of implementation was scored for correct/incorrect implementation of the procedures by the first author. Observations were either in vivo or by videotaped and scored following the session. For each observation a total of 10 min was scored in 1-min intervals, and each of the 7 points were scored as correct (+) or incorrect (−) according to each of the variables outlined in Table 2 and in accordance with previous publications (Bryson et al. 2007; Koegel et al. 1988). Specifically, in both interventions the teacher had to obtain the child's attention, provide a clear opportunity, and provide contingent consequences. Four areas differentiated the interventions (see below). Fidelity of Implementation averaged 85 % (range 80–90 %) and never fell below the required minimum 80 % level throughout the study (Bryson et al. 2007).

Materials and Target Behavior

All sessions focused on improving verbal expressive communication by expanding the child's Mean Length of Utterance (MLU). For children that participated in the structured ABA intervention, task materials included commercially purchased picture cards to evoke the target response. Each child's favorite foods, toys, and other desired activities were provided for rewards. For the children that participated in the PRT intervention, a variety of child-chosen foods, toys, and activities were provided for rewards.

Procedures

Baseline

Prior to the implementation of treatment, each child was given a series of six pictures that they were asked to describe. Language samples were collected on the children's responses and later analyzed for MLU. Utterance segmentation was based on pause or change of topic (Miller 1981). For each child, the total number of words emitted for the six cards was divided by the total number of utterances to yield an MLU. Following the determination of MLU, each child was matched according to age, gender, and MLU and randomly assigned to one of two groups: (1) a control (treatment as usual) group consisting of 15 children that received structured ABA intervention, or (2) an experimental group consisting of 15 children that received PRT intervention. In addition, prior to the start of intervention, each child was given the (CCC) by a speech-language specialist (see below).

Intervention

Following baseline assessments, one of the treatments (structured ABA or PRT) was implemented. Treatment sessions were conducted twice weekly for 60 min per session over a 3 month period. Thus, each child received a total of 24 h of intervention. Parents and teachers were informed that their children/students would receive speech and language services, but were naïve to the specific target behavior (expanding MLU) and the treatment group to which their child was assigned. None of the parents or teachers was present during the intervention sessions. For all children, the target behaviors were the same and involved expanding the children's MLU using recast procedures (Nelson et al. 1996). All sessions followed the prescribed interventions. During both treatments the speech-language specialists required the child to be attending, provided a clear opportunity for the target behavior, and provided contingent consequences. Four procedures distinguished the two interventions, as follows. First, the materials in the structured ABA session consisted of teacher chosen materials (pre printed picture cards) and the materials in the PRT intervention consisted of child-chosen items and activities. Second, in the structured ABA sessions target behaviors were worked on exclusively, while in the PRT sessions target behaviors were interspersed with previously mastered (maintenance) tasks. Third, in the structured ABA sessions favorite foods and toys were used as rewards along with verbal praise, independent of whether they were related to the target behavior. In the PRT intervention natural rewards that were connected to the target behavior were provided. For example, if the child requested a stuffed animal, the natural reward of being given the stuffed animal was provided contingent upon the longer utterance (or attempt). Fourth, in the structured ABA sessions reinforcement was provided based on a shaping paradigm and in the PRT sessions all attempts were rewarded. Thus, children were rewarded for successively longer utterances in the structured ABA intervention and the length of their responses had to be at least as long as the previous response to be provided with a reinforcer. In the PRT intervention the child was rewarded for both longer utterances in addition to shorter utterances. Specific definitions are listed in Table 2. In order to assess for fidelity of

Table 3 Examples of the differentiation between structured ABA and PRT intervention sessions

	Structured ABA	PRT
Stimulus materials	Commercial flashcards	Child-preferred toys
Instruction	"What's that?"	"What's that?" (when child reaches for a toy)
Child response	"Car"	"Car"
Recast	"Red car"	"Red car"
Child response to recast	"Red car"	"Red car" or "Red Ca"
Consequence to play with	1. Child given treat or sticker to play with	1. Child given the red car to play with
	2. Shaping paradigm used	2. Child rewarded for attempts to use 2 word combinations
Task variation	Flash cards presented repeatedly/serially	Toys varied during session

implementation (FoI) supervision was conducted at least once weekly. If a teacher did not meet FoI in a particular area feedback was provided before the subsequent session. However, the overall FoI was achieved at or above the required 80 % for both interventions.

Structured ABA (Treatment as Usual) Intervention

The structured ABA intervention was based on the procedures described in Koegel et al. (1987). During the structured ABA sessions stimulus materials were chosen by the clinician and consisted of a variety of printed commercial cards depicting various age-appropriate vocabulary items. Trials consisted of attempting to evoke responses through the use of successive trials, with each item presented serially by the clinician. Correct responses or successive approximations were reinforced. Edible reinforcers paired with social reinforcers were provided contingent upon a correct response or successive approximation. These procedures were the standard of care provided to children with autism in the Iranian special education classrooms.

PRT Intervention

The PRT intervention was based on the published manual, PRT: Using Motivation as a Pivotal Response (Koegel 2011). In this intervention instead of the clinician arbitrarily selecting a stimulus item, items were selected according to the child's preference for any given item for any given trial. The task was varied so that the reward was provided both for responses that had previously been mastered (in this case, shorter utterances) interspersed with rewards for acquisition tasks (in this case, longer utterances). The reinforcement contingency was broadened so that if the child imitated either the exact correct response or a successive approximation, or made any clear verbal attempt to respond, the child was reinforced. Instead of the child being reinforced with edibles and praise, the child was reinforced with the opportunity to play with the instructional stimulus, paired with verbal praise. An example of the intervention procedure is presented in Table 3.

Dependent Measures and Data Collection

Data were collected on two measures. In order to assess each child's gain on the behavior that was targeted (MLU) during the intervention sessions, language samples were collected both prior and following intervention using the same procedures (described above). Each response to the pictures was written down. Then, the total number of words the child emitted was divided by the total number of utterances, to yield an MLU.

In order to assess any generalized gains, prior to intervention and following the completion of the 3-month intervention, each child's parent and teacher (who were naïve to the experimental hypothesis, the target behavior, and the child's treatment type) were given the Children's Communication Checklist (CCC). The CCC is norm-referenced and is recommended for children age 4;0–16;11 years of age. It consists of 70 items that are grouped to 9 subscales. The first two include the structural characteristics of a verbal interaction; (a) speech; and (b) syntax. The pragmatic domain includes five subscales: (c) inappropriate initiation, (d) coherence, (e) stereotyped language, (f) use of context, and (g) rapport. The sum of these scales is called the "pragmatic composite". The last two scales are (h) social relationship; and (i) interests that present the child's nonverbal skills in everyday situations. The scale is especially sensitive to children with ASD as it detects deficits not identified by other communication assessments, as it identifies pragmatic language deficits that are not assessed by language tests that focus exclusively on language fundamentals (Bishop 2006; Volkmar et al. 2004).

Reliability

Two separate reliability measures were calculated. First, twelve of the 30 protocols (six from the PRT group and 6 from the ABA group) were scored by an independent observer who was naïve to the experimental hypothesis. This consisted of having a total of 60 subtests scored by the reliability observer. Reliability was considered to occur when the subtest score was identical for both recorders. For individual subtests, reliability was 99 % for the PRT group

Table 4 MLU and CCC scores for the structured ABA versus PRT groups

	ABA group		PRT group		
	MLU	SD	MLU	SD	*p*
Pre-intervention	2.77	.5	2.76	.49	ns
Post-intervention	2.79	.5	3.20	.78	.01*
	CCC mean score	SD	CCC mean score	SD	*p*
Pre-intervention	118.83	7.53	118.96	6.99	ns
Post-intervention	120.53	6.99	133.70	5.93	.01*

and 99 % for the structured ABA subtests. Specifically, the scores differed for one of the 30 subtests for the PRT group (a one point difference) and two of the 30 subtests for the ABA group (a one and two point difference). A second reliability measure was calculated wherein a naïve observer averaged the parent and teacher scores for 25 % of the tests. Reliability was considered to occur if the averaged score was identical for both recorders. Reliability was 100 % on this measure (Table 4).

Results

An analyses of demographic and outcome data were conducted to assess for possible differences between the ABA and PRT groups. An independent samples test indicated no significant difference between the two groups in regard to age ($t(28) = 0.03$, $p = .97$) and MLU ($t(28) = 0.02$, $p = .98$) prior to the start of intervention. Each group consisted of 60 % boys and 40 % girls. Mean scores were computed for both the teacher and the parent for each measure of the CCC, and then averaged to yield a single composite score. There were no significant differences between the groups on the CCC prior to the start of intervention ($t(28) = 0.05$, $p = 0.96$).

In regard to targeted behavior (MLU), pre-intervention analysis showed no significant differences between the two groups prior to the start of intervention, $p > .05$. Specifically, the MLU score was 2.77 for the children in the structured ABA group and 2.76 for the children in the PRT group. Following the 3-month intervention, an analysis of covariance (ANCOVA) yielded significant differences between the two groups. Specifically, the MLU of the structured ABA group improved slightly following intervention, but non-significantly, to 2.79. On the other hand, significant improvements were seen in the PRT group, with a mean of 3.20 F (1, 27) = 6.97, $p = .01$. Thus, the PRT group showed significantly greater gains in MLU following the 3-month intervention.

Furthermore, the ANCOVA also revealed significant differences between baseline and post-treatment measures of the CCC between the two groups, F (1, 26) = 6.38, $p = .01$, with the PRT group showing greater overall gains on this measure as well. Prior to intervention, the average score on the CCC was 118.83 for the structured ABA group and 118.96 for the PRT group, $p > .05$. However, following intervention the structured ABA group improved slightly, with an average score of 120.53 while the PRT group made larger gains with an average score of 133.70 on the CCC. In summary, the PRT groups showed significantly greater general (non-treatment) improvements following intervention.

Discussion

The results of this study showed that the PRT intervention was more effective at improving social communication skills for children with autism than the structured ABA treatment using an RCT research design. The children who participated in this study demonstrated greater gains in both the targeted area (MLU) as well as overall gains in pragmatic skills, including inappropriate initiation, coherence, stereotyped language, use of context, and rapport, as measured by the CCC. Thus, the motivational components of PRT were more effective in producing improvements in social communication (Koegel et al. 1987).

There are several potential reasons why the PRT intervention may have been more effective than the structured ABA intervention. First, the use of stimulus items such as preferred toys and activities rather than artificial stimuli such as picture cards used in the analog intervention, and the presentation of the teaching within the context of natural (play) interactions during the PRT sessions, may have created more interest in the teaching sessions, thereby resulting in greater improvements in communication skills. Previous single subject design (multiple baseline) studies have suggested that responsiveness and affect improve when variables such as child choice are considered (Yoder et al. 1993). Second, the literature suggests that children with ASD demonstrate lower levels of off-task and disruptive behavior when motivational components are

incorporated (Koegel et al. 1992). While the current study did not measure disruptive behavior, it is possible that the participants exhibited more avoidance and escape behavior during the structured ABA intervention, thereby receiving a less effective intervention. Next, research suggests that there is greater generalization using PRT when compared to structured ABA intervention (Koegel et al. 1987). While all children appeared to be making progress on their target goals in the clinic sessions, the parents and teachers may have noticed greater gains that occurred in the children's natural settings as a result of a more widespread generalization when the motivational components were incorporated, which is consistent with other research (Koegel et al. 1987). Finally, because PRT focuses on pivotal behaviors, rather than individual target behaviors, a more widespread effect may have occurred (Koegel and Koegel 2011).

The present study did not incorporate the parents. While this is not a desired or standard procedure, it was helpful to assess the effect of the intervention. That is, the parents were not informed of the target behaviors, and therefore they were unlikely to directly provide intervention or reinforcement in that area, which could have interfered with the study outcome. Further, the study was conducted in a country where few services are available for children with autism. While RCTs are often difficult because of multiple treatment interference when many interventions are available to families (Koegel et al. 2014), outside treatment records indicated that no other interventions for ASD were taking place while the present study was implemented. Therefore, it was likely that the effect was produced by the study's intervention. That is, the possibility of other variables, such as co-occurring treatments was minimized in the present study. Further, the children spent very few hours in school because of summer break while our interventions were implemented, which also reduced the possibility of multiple treatment interference. Therefore, we are fairly confident that the intervention gains were the result of the study conditions, and not other confounding variables, such as multiple treatment interference.

Future research may wish to focus on the relative weight of each variable of PRT rather than assessing the effectiveness of the package. Second, it may be interesting to look at disruptive and off-task behaviors, correct versus incorrect behaviors, and responsiveness, to assess areas that may have resulted differences between the groups. Because the groups were well matched, it would be interesting to make direct comparisons between them, such as analyzing the different domains of the CCC in future research. Also, it would be interesting to understand the children's trajectories by assessing their skill development at various points in time before the start of intervention as well as to evaluate the long-term follow-up of the interventions. Additionally, the children in this study received relatively few hours of intervention. Assessing outcomes with more intensive doses of the intervention would be interesting. Finally, this study focused on one target behavior (improving MLU). There have been studies showing that other areas are improved when motivational components are used, such as expressive vocabulary (Koegel et al. 1987), language (Koegel et al. 2010) and academics (Koegel et al. 2010), however all of these interventions have been conducted in multiple baseline design studies. Additional research using RCTs that address other target areas should be helpful.

These findings contribute to the overall body of literature supporting PRT, and other naturalistic interventions, as an effective intervention for remediating core symptoms of autism (e.g., language). Structured ABA interventions are widely used as a standard of care, as was the case in this study, despite the fact that incorporating motivational components may result in faster gains of targeted behaviors as well as generalized gains in untreated areas. This finding is consistent with previous studies, which have demonstrated the effectiveness of PRT on other areas, including conversation (Boettcher 2004), and social initiations (Koegel et al. 1999). In summary, the present study suggests that incorporating the motivational variables of PRT is more effective for improving MLU and pragmatic skills in children with autism when compared to structured ABA intervention. With large numbers of children being diagnosed with autism, intervention procedures that are more efficient are both time and cost effective. As well, procedures that speed up the habilitation process are important for children with ASD, particularly if they produce widespread gains beyond the specific treatment goals.

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