

SUPPORTING PRACTITIONERS' USE OF PIVOTAL RESPONSE TRAINING  
WITHIN EDUCATIONAL CONTEXTS

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by

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WITHIN EDUCATIONAL CONTEXTS

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## DEDICATION

For my husband, Ben, who put my needs above his own: Thank you for picking me up and encouraging me onward time and time again. You helped me to achieve my dream., now it's your turn. Thank you also to my friends and family for cheering me on, especially my mother and sister for providing emotional support. And finally, thank you Diane and Dan for being so generous with your time. Knowing that Miles was in the loving embrace of his grandma and grandpa made focusing on my studies easier.

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ABSTRACT

The purposes of this study were to: 1) determine if consultative support was necessary for practitioners maintained the use of PRT, 2) evaluate the degree to which practitioners generalized PRT to untrained educational contexts, and 3) examine the degree in which students with ASDs social-communication and play behaviors were affected by their practitioners' implementation of PRT within naturally occurring educational contexts. A concurrent multiple baseline design across 4 practitioner-student dyads consisting of phases baseline, training, follow-up and consultative probes was utilized. Data was collected on the practitioners' levels of fidelity of implementation and on the students' social-communication and play behaviors across three educational contexts.

The results of the study indicate that once practitioners were trained as intervention agents to implement PRT: 1) there was variability among the practitioners' maintenance of the fidelity of implementation over time, 2) there was variability among the practitioners' generalization of PRT with fidelity across untrained educational contexts and, 3) the use of PRT by the practitioners had a positive effect on the students' social-communication and play behaviors of appropriate engagement, responses, and

verbal initiations within naturally occurring educational contexts. Additionally, the results of the study indicate that in spite of the lack of consistent treatment fidelity at the rate of 80% as proposed in previous literature on PRT, the students with ASDs still achieved social-communication and play behavioral benefits across untrained educational contexts. Considerations for interpretation of the current study's specific research questions are presented, and are followed by a discussion of the implications for practice and future research.

## CHAPTER I

### INTRODUCTION AND REVIEW OF LITERATURE

The purpose of this study was to examine the viability of Pivotal Response Training (PRT) within educational contexts. This chapter first presents a discussion of the importance for school districts to provide programming to address the social competence deficits of students with autism spectrum disorders (ASDs). Then, an overview of the literature on practitioner training variables that make the maintenance and generalization of trained skills more likely is presented. Next, the literature on PRT is reviewed. Finally, specific research questions are presented.

#### Statement of the Problem

##### *Prevalence of Autism Spectrum Disorders*

The dramatic rise in incidence, and the varied and complex needs of students with ASDs presents challenges for school districts to provide a free, appropriate public education (FAPE) as mandated in the Individuals with Disabilities Act (IDEA, 2004). Autism is defined as a developmental disorder that includes impairment in social interaction, communication, and stereotyped patterns of behavior (American Psychiatric Association [APA], 2000). According to the DSM-IV, diagnosis specifically includes the presence of at least six behavior impairments, with a minimum of two in the area of social interaction, one in the area of communication, and one in the area of restricted repetitive stereotyped behaviors, with the onset of impairment prior to 3 years of age (APA, 2000). Although it is a relatively new category of disability, the rate of occurrence of ASD has dramatically increased over the past decade. Current estimates indicate that

the disability affects an estimated 1 out of every 150 children born (Center for Disease Control and Prevention, 2007).

### *Importance of Social Competence*

Social deficits, one of the hallmark features of ASDs (APA, 2000), impacts individuals with ASDs' abilities to access their environments, and presents challenges for school districts to provide effective interventions to address such needs. Social competence refers to one's ability to fluently use social skills (Elliot & Gresham, 1993). There is a clear need for services to support the development of social competence for individuals with ASDs, as it is a core deficit of ASDs (APA, 2004) that requires specialized intervention. The significance of the impact of social deficits for individuals with ASDs is apparent in bleak outcomes, such as social withdrawal and aversive social behaviors (Eaves & Ho, 2008; Weiss & Harris, 2001). Additionally, peer rejection resulting from social deficits can further lead to isolation and limited opportunity to obtain access to naturally occurring opportunities for social interactions (Ochs, Kremer-Sadlik, Solomon, & Sirota, 2001). Yet, strategies for teaching social competence are often not targeted in individualized programming (National Research Council [NRC], 2001).

In order to prevent the deleterious effects of deficits in social competence, it is recommended to target social interventions regularly, throughout the day, and to embed the instruction within naturally occurring contexts to directly link social instruction to individual student's needs (Gresham, Sugai, & Horner, 2001). In a review of the literature of interventions that facilitate social interactions, McConnell (2002) identified

essential components recommended for effectively targeting social competence, including supporting interactions for children with ASDs with both adults and children. The recommendations for targeting social competence also included providing instruction in natural settings and designing instructional opportunities that have naturally occurring reinforcing consequences. Furthermore, effective instruction was identified as being targeted throughout the day, and not limited to isolated scheduled therapeutic times (McConnell, 2002).

Over the past decade, research has moved away from the trend of targeting isolated social behaviors, and toward targeting pivotal behaviors, defined as behaviors that have widespread effects across developmental domains (Matson, Benavidez, Compton, Paclawsky, & Baglio, 1996). Social initiations are one pivotal behavior that has been identified to have such effects (Koegel & Frea, 1993). An individual's ability to initiate social and language interactions has been associated with their perceived social competence by teachers and peers. One study assessed the long-term outcomes of targeting language and social initiations in relation to overall disability prognosis (Koegel, Koegel, Harrower, & Carter, 1999). The outcomes of the study indicate that gains in social and language initiations concurrently resulted in more widespread favorable effects as determined by: school placement, academic achievement, social circles, living situations, extracurricular activities, and measurement of social, adaptive, and language abilities on the Vineland Adaptive Behavior Scales assessment. Furthermore, an inability to consistently initiate interactions with others resulted in less desirable outcomes.

*Role of play in the development of social competence.* Play provides a context for early social development. Interactive play also performs an important role in the development of language (e.g. Lewis, Boucher, Lupton, & Watson, 2000) and can have a positive impact on academics (e.g. Neuman & Roskos, 1990; Vukelich, 1994). The natural structures of interactive play provide opportunities to practice social-communication skills essential to the development of social competence (Stone & La Greca, 1986). However, there are differences in the nature of play engaged in by children with ASDs compared to typically developed peers (Lantz, Nelson, & Loftin, 2004). Specifically, children with ASDs spend significantly less time engaged in functional play compared to peers (Jarrold, Boucher, & Smith, 1996). Instead, their play is described as restricted in interest, and repetitive in nature (Koegel & Koegel, 2006). These limitations are thought to significantly impact the potential social developmental benefits of engaging in play (Koegel & Koegel, 2006; Lantz, Nelson, & Loftin, 2004). The importance of targeting play for children with autism is underscored by research indicating that the presence of functional play skills in early development of children with autism has been found to be a predictor of language ability in adolescence (Sigman & McGovern, 2005).

#### *Barriers to targeting social competence in the schools*

The passage of No Child Left Behind (NCLB) in 2002 emphasized educator accountability and called for the use of empirically supported instruction methodology (Yell, 2005). Choosing interventions that meet this criterion to specifically target the development of social competence is a critical component of educational programming

for students with ASDs (NRC, 2001), but intervention selection is complex. There is not a clear understanding of how individual and environmental variables affect the treatment and outcomes of individuals with ASD (Bryson, Rogers, & Fombonne, 2003; Sherer & Schreibman, 2005). There is, however, consensus among the field that there is not one intervention that fits the needs of all children (Gresham, 2004; Walker et al., 1996). Selecting appropriate, empirically supported interventions from the vast array of intervention possibilities is made difficult by the fads and testimonials that dominate media coverage, and the tendency for educators to select interventions based on personal appeal and ease of implementation (Gottfredson & Gottfredson, 2001). Furthering the complexity of selecting interventions that are based in empirical support are reports of criticisms that research in the field of special education has not been implemented with rigorous methodological standards (Bryson et al., 2003 & Volkmar, Lord, Bailey, Schultz, & Klin, 2004).

To address these criticisms, leaders in the field have recently critically analyzed the literature to propose methodological standards for research (Horner et al., 2005; Odom et al., 2005; Smith et al., 2007), and to identify sound, empirically supported practices for children with ASDs (Iovanne, Dunlap, Huber, & Kincaid, 2003; Lord & McGee, 2001; National Research Council [NRC], 2001; Odom et al., 2003; Simpson, 2005; Volkmar et al., 2004). Such reviews of the literature have led to a better understanding of empirically supported treatment options. Yet, despite the application of more rigorous standards of research and the identification of best practices based on those standards, the gap between research and practice persists (Reichow, Volkmar, &

Cicchetti, 2008). Training practitioners to implement effective practices within educational contexts necessitates attention in order to begin to address one component of the gap between research and practice (NRC, 2001).

### Review of the Related Literature

#### *Training Practitioners to Address the Research to Practice Gap*

Traditional in-service training using lecture-based instruction remains a heavily relied upon method of practitioner training (Knight, 2009; Corcoran, 1995), yet there is research that demonstrates the limitation of this model as a training protocol for the acquisition and implementation of new skills (Han & Weiss, 2005; Noell, Witt, Gilbertson, Ranier, & Freeland 1997; Rose & Church, 1998). Further, the quality of training provided to practitioners has been linked with the quality of treatment implementation (See Han and Weiss, 2005 for a review).

This section provides an overview of what we know about effective practitioner training and the variables that make implementation of trained skills more likely to occur. First, a brief overview of the role of practitioners' characteristics on service provision is provided. Then, the majority of this section summarizes the literature as it pertains to characteristics of training protocols that support practitioners' maintenance and generalization of trained skills. Finally, the specific need of training practitioners to implement effective practices for the development of social competence in children with ASDs is addressed.

*Teacher Characteristics.* A body of research is available on the influence of teacher characteristics, such as level of degree held (e.g. Goldhaber & Brewer, 2000),

specific subject of degree held (e.g. Monk, 1994), ranking of education institution (e.g. Murane & Phillips, 1981), and teacher licensure examination scores (e.g. Ferguson, 1991) on the achievement outcomes of students. Specifically, these characteristics have been linked with such variables as students' standardized test scores, graduation rates, and post-secondary educational pursuits (see Wayne & Youngs, 2003 for a review). The outcomes from this body of research have been primarily used for the purpose of creating programming for teacher preparation, hiring teachers, and implementing salary schedules (Wayne & Youngs, 2003). Although these same characteristics may play a role in practitioners' acquisitions, use, maintenance, and generalization of trained skills, they have not been linked with such outcomes in the literature available.

In general, teacher attitude is one characteristic that has been identified as a variable that may play a critical role in the maintenance and generalization of trained skills (Han & Weiss, 2005). Specifically, teachers' acceptance of the program or skills being trained (Reimers, Wacker, & Koepl, 1987), perception of the anticipated student outcomes (VonBrock & Elliot, 1987), and perceived support of the training by the school principal (Gottfredson & Gottfredson, 2002) have all been linked with teachers' acquisition and maintenance of trained skills.

*Maintenance and generalization of trained skills.* The maintenance of treatment integrity and generalization of trained skills by practitioners after training is an essential component of bridging the research to practice gap in order to uphold the positive effects of treatment over time, yet is a problem that is often not attended to (Noell, et al., 2005). It has been noted, however, that little is known about the variables that make the

maintenance and generalization of treatment likely after the completion of training, mostly because of the lack of measurement of treatment integrity in the literature (Noell & Witt, 1999). It is evident in the literature however, that there is almost an immediate deterioration of practitioners' trained skills, and the resulting student behaviors once training ends (See Rutherford & Nelson, 1988 for a review).

Training alone does not appear to support practitioners' continued use of the skills acquired during training (Han & Weiss, 2005; Noell et al., 1997). Specifically, it has been noted that although components of the training may continue to be implemented, the level of fidelity by which the skills are implemented decreases dramatically (Han & Weiss, 2005). Some studies have reported an almost immediate deterioration of practitioners' fidelity of acquired skill implementation following the end of training services (Noell et al., 1997).

The use of performance feedback to maintain skill acquisition has long since been reported (Bowles & Nelson, 1976), and has since been supported as an effective strategy in practice sustainability, as reflected by measures of treatment fidelity (Alvero, Bucklin, & Austin, 2001; Noell & Witt, 1999; Noell et al., 2005). Research in this area is limited, but it suggests that without consultative services, and more specifically, without performance feedback, practitioner implementation of treatment integrity is likely to decline (Noell et al., 2005). Although there is not yet a clear understanding of how often, or for how long performance feedback is necessary, some studies indicate that sustaining a feedback cycle is critical to the on-going maintenance of trained skills (See Hans & Weiss, 2005 for a review).

Other training variables identified that help support the sustainability of the trained skills by practitioners include: 1) training within the context in which skills will be implemented, specifically within the teacher's classroom (Hans & Weiss, 2005; Rose & Church, 1998), and 2) including practice with feedback in the training (See Rose & Church, 1988 for a review).

Over thirty years ago, Stokes and Baer (1977) noted the need to actively program for generalization. Based on their review of the literature available on the use of generalization procedures, they cataloged generalization programming into the nine categories of: 1) Train and Hope, 2) Sequential Modification, 3) Introduce to Natural Maintaining Contingencies, 4) Train Sufficient Exemplars, 5) Train Loosely, 6) Use Indiscriminable Contingencies, 7) Program Common Stimuli, 8) Mediate Generalization, and 9) Train to Generalize. For a set of complete descriptions, refer to the "Definitions of Terms" section at the end of this chapter. Based on their review of the literature, they concluded that most studies unsuccessfully relied on the generalization procedures categorized as Train and Hope and Sequential Modification.

Since then, reviews of the literature have reported little to no change in the overall generalized effects of trained behaviors (Scruggs & Mastropieri, 1994; Rose & Church, 1998; Scheeler, 2008). However, some training procedures, including the use of some of the procedures categorized by Stokes and Baer (1977) have been noted as more likely to result in the generalization of trained behaviors. For example, programming common stimuli, achieved by using sufficient common stimulus components across contexts, providing multiple exemplars, and ensuring naturally maintaining contingencies have all

resulted in successful generalization (See Scruggs & Mastropieri, 1994; Scheeler, 2008; Stokes & Osnes, 1989 for reviews ). Additionally, Rose and Church (1998) noted that training to mastery, or skill fluency, as opposed to providing a fixed amount of training had a notable impact on the potential generalization of the trained skills.

*Need for practitioner training to support social competence in children with ASDs.* There is a lack of research specifically concerned with practitioners' maintenance and generalization of trained skills to promote social competence for children with ASDs. Yet, given the specific deficits in social competence of children with ASDs, and the lack of programming for social competence development present in educational plans for children with ASDs (NRC, 2001), it is especially critical to utilize the training components highlighted in this literature review to train practitioners to implement effective practices specific to the development of social competence for children with ASDs.

As presented previously, a number of reviews of the literature have identified essential components of programming for the social development of children with ASDs, including targeting social interventions within naturally occurring contexts (Gresham, Sugai, & Horner, 2001, McConnell, 2002; NRC, 2001), and more specifically for young children, within the context of play (McConnell, 2002; Stone & LaGreca, 1986). Additionally, programming for naturally occurring reinforcing consequences is essential for the maintenance and generalization of acquired social skills (Gresham, Sugai, & Horner, 2001, McConnell, 2002; NRC, 2001). Pivotal Response Training (PRT) is one treatment that utilizes these essential components, and has been identified as a

comprehensive intervention that effectively promotes social-communication and play behaviors of children with ASDs (Simpson, 2005).

### *Overview of Pivotal Response Training*

*Foundation in applied behavior analysis.* The PRT model, which reflects a developmental approach to learning, is based in the principles of applied behavior analysis (ABA) (Koegel & Koegel, 1988). ABA is a comprehensive set of behavioral principles built from the foundation of earlier work on behavior modification (Skinner, 1938). A common application of ABA principles to teaching methodology is through the use of discrete trial teaching. This method targets individual, task analyzed skills typically through a one-to-one method in an isolated setting until skills are mastered, at which time they are systematically generalized into the natural setting (Heflin & Simpson, 1998). In a basic description, behaviors and skills are analyzed and broken down into antecedents, responses, and consequences. Systematic intervention utilizing, for example, environmental manipulation, shaping, prompting, fading, and task-analysis are used to increase and maintain desired behaviors/skills. Systematic teaching is paired with high rates of reinforcement to motivate responsiveness (Lovaas, 1987). Despite its effectiveness, however, research is moving away from such a narrowly targeted instruction, to support a more contemporary approach to ABA that utilizes a more time-efficient delivery of treatment by targeting behaviors that have demonstrated widespread effects on developmental functioning (Prizant & Rubin, 1999). Many pivotal behaviors have been identified, including motivation, self-management, responsiveness to multiple cues, and empathy. Pivotal Response Training (PRT) is a reflection of this more

contemporary approach to ABA, in which the specific pivotal behaviors targeted are motivation and responsiveness to multiple cues (Koegel, Koegel, Shoshan, & McNerney, 1999).

The PRT model is a naturalistic approach to treatment that is often embedded within the context of play. Its primary purpose is to increase social-communication and play behaviors for children with ASD (Koegel, Carter, & Koegel, 2003). This is accomplished by following the child's lead, providing opportunities for choice, and using naturally occurring reinforcement (Koegel & Koegel, 2006). However, the potential use of PRT for the purpose of acquiring academic skills and gains in broader adaptive functioning has also been noted (Koegel & Koegel, 2006). The PRT model was originally designed to provide comprehensive programming through the use of parents as primary change agents, while emphasizing the importance of intervention being implemented across all environments, including home, therapy, and school settings. The following section summarizes the research on motivation and responsiveness to multiple cues as it pertains to PRT.

*Motivation.* Children with ASDs often do not exhibit the general desire or willingness to respond to social and environmental stimuli (Koegel, Koegel, Frea, & Smith, 1995; Schreibman, 1988). This lack of motivation may have a detrimental influence on the effectiveness of treatments and skill acquisition. In PRT, a cornerstone of the treatment is the connection between motivation and social engagement, indicated by responsiveness and initiations. Motivation is encouraged in PRT by presenting opportunities for choice making, utilizing natural contexts, and using natural, contingent

reinforcement (Koegel et al., 1989). The role of choice and reinforcement as they pertain to PRT are presented.

In a recent review of 41 studies examining the effect of choice on motivation, opportunity for choice was linked with improved motivation, and more specifically with increased effort, task performance, and perceived competence (Patall, Cooper, & Robinson, 2008). The effects of choice on motivation were found to be even greater when 2 to 4 successive choices were provided, and when choice was provided between 3 and 5 options (Patall, Cooper, & Robinson, 2008). In PRT, whenever possible, the child is provided opportunities to determine what materials to use, how to use the materials, and when to end or change activities (Koegel et al., 1989).

The relationship between choice and motivation is confounded by the types of choices, and contexts in which the choices are provided (See Patall, Cooper, & Robinson, 2008 for a review). In other words, if choices are meaningful to the individual, that is to say if they are embedded within contexts that are meaningful and use materials that are meaningful (Anand & Ross, 1987; Cordova & Lepper, 1996), then they will have a greater impact on motivation as compared to choices that the individual is ambivalent about. For this reason, it is critical that opportunities for choice be embedded within natural, meaningful contexts. In the PRT literature, play is the primary context that has been utilized to progress the early development of social and communication. However, the literature on PRT has also suggested that other naturally occurring, everyday routines also promote meaningful contexts in which PRT could easily be implemented.

Reinforcement, another factor in establishing motivation, is the most commonly applied principle of applied behavior analysis (Cooper, Heron, & Heward, 2006). It is based on the early works of B.F. Skinner, in which his experimentation led to the understanding of operant behaviors, defined as behaviors that are not influenced by antecedents but are instead influenced by stimulus following the same behavior in the past (Skinner, 1938). In PRT, the reinforcement paradigm plays an integral part in establishing motivation to socially engage with others. Specifically, because the use of unnatural reinforcement paired with choice has been found to have a negative effect on internal motivation (See Patall, Cooper, & Robinson, 2008 for a review), natural reinforcement is instead paired with choice to increase motivation. Natural reinforcement refers to reinforcement that has a direct relationship to the behavior being reinforced (Koegel et al., 1989). For example, if the student says “book”, the natural reinforcement would be to allow the student to look at the desired book, as opposed to providing a piece of candy as reinforcement for the student’s use of words to make a request. In PRT natural reinforcement is a cornerstone, not only in connection with individual choices, but also in connection with any social-communicative responses and initiations.

Another principal of reinforcement, the use of contingent reinforcement, also plays a role in establishing motivation in PRT. Contingent reinforcement is defined as reinforcement that is delivered only after the desired behavior has occurred (Cooper, Heron, & Heward, 2006). The PRT manual specifies that reinforcement must be: 1) provided as immediate as possible following the desired social-communicative behavior, 2) appropriate to the desired social-communicative behavior, and 3) dependent upon the

social-communicative behavior (Koegel et al., 1989). Furthermore, the manual (Koegel et al., 1989) instructs that incorrect responses must never be reinforced, while any goal-directed attempt at social-communication should be reinforced. The principle of reinforcing social-communicative attempts of children with ASDs to motivate, or increase future responsiveness, is supported in the research (e.g. Koegel, Bimbela, & Schreibman, 1996; Koegel, Carter, & Koegel, 2003; Pierce & Schreibman, 1997a;b).

*Responsiveness.* Individuals with ASDs often narrowly select the stimuli to which they attend (Lovaas, Schreibman, Koegel, & Rehm, 1971; Schreibman, Charlop, & Koegel, 1982). This is coupled with their tendency to attend to irrelevant environmental stimuli (Lovaas, Schreibman, Koegel, & Rehm, 1971). Over-selectivity and irrelevant stimuli selection are thought to prevent efficient acquisition of new behaviors (Rosenblatt, Bloom, & Koegel, 1995). This may be especially significant in the acquisition and use of social-communication skills because of the complex nuances of social interactions. By systematically teaching individuals with ASDs to respond to multiple, complex cues within the environment, stimulus over-selection is diminished (Dunlap, Koegel, & Burke, 1981; Schreibman, Charlop, & Koegel, 1982 ), resulting in a greater capacity for learning in the natural environment (Burke & Cerniglia, 1990).

In PRT, the environment is structured to promote increased opportunities for the inclusion of multiple cues into instructions and tasks. This is typically done through conditional discrimination, described as arranging the environment so that the child must respond to multiple cues in order to respond correctly (Burke & Cerniglia, 1990). For example, a child may be asked to get the green truck, when green cars and red trucks are

also available. In this example the child has to respond to both the cue “green” and the cue “truck” in order to respond correctly.

*PRT components.* Implementation of PRT is dependent on the consistency in which implementers utilize the following core interaction behaviors within the natural environment: gaining attention, sharing control, using multiple cues, building in maintenance tasks, contingently reinforcing behaviors, providing a direct reinforcer-response relationship, and reinforcing attempts (Koegel et al., 1989). The following section presents the components of PRT broken down into discriminative stimuli and responses, as they are in the PRT manual (Koegel et al., 1989).

The discriminative stimuli, or presentation of the opportunity to respond by the implementer includes the components gaining attention, sharing control, presenting multiple cues, and interspersing maintenance tasks. Gaining attention refers to having the child focused on the task or communicative partner before delivering a clear instruction that requires the child to respond. Emphasis is placed on implementer presentation of a question or instruction that is applicable to what is occurring within the natural environmental context in which they are engaged. Sharing control refers to utilizing turn-taking and child choice within interactions. Implementing the components of shared control promotes child motivation to participate in social exchanges, including participation that promotes acquisition of new skills. It should be noted however, that in PRT there are limitations on the child’s control of the environment. For example, at no time is the child permitted to engage in aggressive, self-injurious, or self-stimulatory behaviors. Instead, such behaviors are redirected by regaining control of materials, if

there are any, and by presenting a choice between activities of appropriate engagement. The use of multiple cues refers to the presentation of instructions that have multiple components or multiple descriptors that require discrimination. Finally, interspersing maintenance tasks refers to providing opportunities for mastered skill practice in order to ensure the child's success and to provide a foundation from which to scaffold new and emerging skills.

In PRT, implementers respond to behaviors by using contingent, natural reinforcement, and by reinforcing attempts to respond. Contingent reinforcement refers to only reinforcing correct behavioral responses, immediately following the response. Providing a direct reinforce-response relationship refers to providing a consequence that is natural within the context of the interaction to promote the likelihood that the same behavior would be naturally reinforced in a similar manner in other contexts. Finally, attempts to respond are reinforced. It is important when building on previously learned knowledge to provide reinforcement for more than just "perfect responses", but to instead reinforce attempts to respond that are on-topic and exhibit a reasonable amount of effort. By reinforcing communicative and social attempts the notion that the child's "words" are meaningful is promoted, and the child's effort is rewarded.

#### *Review of the Pivotal Response Training Literature*

There is a paucity of research available on the supports necessary for the fidelity of PRT to be maintained and generalized after training. In fact, much of the research on PRT fails to report on the fidelity of implementation, but instead focuses on the benefit achieved by the treatment recipients. The following review first examines the rigor of the

research available on the use of PRT as an effective treatment strategy. Then, the research specifically addressing training others to use PRT is discussed. Finally, the limitations to the current literature base are outlined.

*Analysis of the rigor of the existing research base.* PRT has shown clinical improvements in social, communication, and play behavior outcomes for children with ASDs (Simpson, 2005). However, its use within naturally occurring school settings utilizing practitioners as implementers is just beginning to emerge (Bryson et al., 2007). In order to determine the rigor of the research available on PRT and to identify areas of need for additional research, the following review utilized a three-tier coding strategy (Hudson, 2006). Since the standards mandated by No Child Left Behind (2002), many similar evaluative models have been proposed (e.g., Reichow, Odom, et al., 2005; Volkmar, & Cicchetti, 2008). For the current review, literature searches of ERIC and PsychInfo databases using keywords: Pivotal Response Training, Pivotal Response Teaching, and Pivotal Response Treatment were conducted. The initial search resulted in 29 articles.

Tier 1, based on Hudson's (2006) coding system, consists of the general inclusion criteria: 1) published between 1985 and present, 2) written in English, 3) peer reviewed, 4) an original research report, 5) design of the research was identified, and 6) at least one participant in the study met the criteria for autism. Out of the 29 studies initially identified, 17 studies were excluded for not being original research reports.

Tier 2 of the coding system consists of the following mandatory quality indicators: 1) dependent variable had operational precision, 2) interobserver agreement

of the dependent variable was conducted for at least 20% of data collection, at a level of at least 80% interobserver agreement, 3) dependent variable was assessed repeatedly, 4) measurement process was described with precision, 5) independent variable had operational precision, 6) independent variable was systematically manipulated, 7) baseline condition was completed with replicable precision if applicable, 8) a functional relationship was present between the independent and dependent variable, and if multiple baseline design, at least 3 intervention effects were demonstrated. To be included, studies had to meet at least 7 of the 8 mandatory quality indicators. Additionally, to be included studies had to utilize PRT as defined in Koegel and colleagues' (1989) manual, and not just examine isolated pivotal behaviors. One study was excluded because dependent measures were only reported for one participant (Bryson et al., 2007). Three additional studies were excluded, as the interventions did not utilize PRT as a comprehensive treatment, but instead focused on select pivotal behaviors (Koegel and Frea, 1993; Koegel, Koegel, Shoshan, et al., 1999; Koegel, Carter, & Koegel, 2003). Another study was excluded because it reported on the same participant data as another study (Pierce & Schreibman, 1997a, b). In total, seven of the twelve studies examined met the criteria of tier 2, and moved on to tier 3.

Tier 3 of the coding system consists of the desirable quality indicators: 1) setting was described with replicable precision, 2) thorough participant descriptions were included, 3) fidelity of the independent variable was measured and reported, 4) social validity of dependent variable was assessed, 5) evidence of social validity of the dependent variable was presented, 6) social validity of the independent variable was

assessed, and 7) there was evidence of social validity of the independent variable. To be included, studies had to meet 2 of the 7 desirable quality indicators. All seven of the studies examined met the criteria for tier 3. The following is a summary of each of these studies that support the efficacy of PRT as an intervention for children with ASD. Table 1 summarizes the seven studies that met tier 3 criteria.

Table 1

*PRT Studies Meeting Hudson's (2006) 3-Tier Criteria*

Study	Design	Setting	Behaviors	Change Agents	N
Pierce & Schreibman (1995)	Multiple Baseline	Empty Classroom	Social, Language, Attention	Typical Peers	2
Stahmer (1995)	Multiple Baseline	Homes, Empty Classroom, Clinic	Play, Language	Clinical Therapists	7
Koegel, Bimbela, & Schreibman (1996)	Between Subjects	Homes	Happiness, Interest, Stress, Communication	Parents	17
Pierce & Schreibman (1997)	Multiple Baseline	Empty Classrooms	Social, Play, Language	Typical Peers	2
Sherer & Schreibman (2005)	Multiple Baseline	Clinic	Social, Play, Language	Clinical Therapists	6
Baker-Ericzen, Stahmer, & Burns, (2007)	Large-scale	Clinic	Social, Language, Daily Living, Motor	Parents	158
Kuhn, Bodkin, Devlin, & Doggett (2008)	Multiple Baseline	Empty Classroom	Social	Special Education Peers	2

*Note.* Behaviors = dependent variables measured.

Initial research (Pierce & Schreibman, 1995) utilizing the strategies outlined in the PRT Training Manual (Koegel et al., 1989) focused on the use of PRT during partner

play times with peers. A multiple baseline design across two 10-year-old males with ASD was used to examine the potential of using PRT as a peer-mediated model. The participants had limited expressive (3 years, five months and 3 years, 2 months) and receptive (5 years, 5 months and 3 years, 1 month) language abilities as measured with the Expressive One-Word Picture Vocabulary Test (EOWPVT) (Gardner, 1990) and the Peabody Picture Vocabulary Test (PPVT) (Dunn & Dunn, 1981) respectively. Two male peers, also 10 years of age, were trained directly by the authors to implement PRT strategies during partner play times that took place in an empty classroom within their school. The results of the study indicated significant improvement in the students with ASDs' abilities to maintain interactions with the trained peers, and moderate increases in the students with ASDs' initiations of play with the trained peers. Additionally, gains in the participants' frequency of verbalizations and length of utterances during the play interactions were also reported. Also of significance, the results indicated improvement in joint attention, which was not specifically targeted by the intervention. It should be noted, however, that treatment fidelity was not reported, thus limiting the conclusions that can be drawn from the effectiveness of PRT as a peer-implemented model.

Later, Pierce & Schreibman (1997a,b) expanded on the results of their earlier study (Pierce & Schreibman, 1995) and included training multiple peers. A multiple baseline design across trained peers was used to examine the effect of peer implemented PRT for two male children with ASDs, ages 7 and 8. The reported non-verbal IQs for the participants were 76 and 50, and it was noted that they had limited language, which was used primarily to make requests. Individual social, language, and play outcomes were

measured. Results of the study indicated that the students with ASD increased their ability to maintain social interactions and initiate social-communication across trained peers. This study was important as it replicated the effectiveness of using PRT as a peer-mediated strategy. However, treatment fidelity on the peers' implementation was not reported. The authors also stated that the amount of time to train peers was a limitation of PRT as a peer-based model. Although this study took place in a school setting, it is important to note that implementation occurred in an empty classroom, and the peers were trained directly by the authors. Practitioners were not used as trainers or as intervention change agents.

Kuhn, Bodkin, Devlin, and Doggett (2008) expanded the literature base on the use of peers as implementers of PRT by investigating the use of peers in special education as change agents. Two children with learning disabilities, one child with mild cognitive deficits, and one child with developmental delays were grouped and trained to implement PRT with two of their peers with ASDs during unstructured play. The training and implementation occurred in empty classrooms. The participants, both the students' with ASDs and the trained peers, were between the ages of 6 and 8 years. Specific, recent measures of cognitive and language abilities were not reported for the participants. However, the results of the study indicated that limited cognitive ability of the peer implementers was correlated with limited treatment outcomes. It should be noted however, that this conclusion was drawn from data on the social behaviors of the targeted children with autism, and not based on measures of fidelity of treatment implementation.

Stahmer (1995) conducted research on therapist implemented PRT and collected data on the generalization of language and play interactions to peers who were matched by expressive language ability. A multiple baseline design was used across seven children with ASDs. The participants were between the ages of 4 years, 3 months and 7 years, 2 months. They had a mean receptive vocabulary of 2 years, 7 months (range 2 years, 5 months to 3 years, 7 months) and a mean expressive vocabulary of 3 years, 5 months (range, 2 years, 7 months to 4 years, 10 months) as reported from results of the PPVT and EOWPVT respectively. The mean reported non-verbal IQ for the participants, as measured with the Leiter International Performance Scale, was 79 (range, 64-111). Treatment sessions occurred in six of the participants' homes, and in an empty classroom at one participant's school. Individual measures on language behaviors, including responses and initiations, and play behaviors, including symbolic play and play complexity, were collected. Data on generalization to a clinical setting, to peer partners, and with different toys were also obtained. Results indicated significant increases in play behaviors, interactions, and responses with adults. However, these results did not generalize to interactions with the untrained peers. It was also noted that rates of initiations remained low after intervention. Further analysis of the results indicated that IQ scores on the Stanford-Binet and Leiter did not correlate with the outcome measures for the participants.

Koegel, Bimbela, and Schreibman (1996) examined the social validity of the use of PRT as compared to teaching individual target behaviors. The parents of 17 preschool and elementary age children with autism were randomly assigned to one of two groups.

One group of parents received training on how to implement PRT with their children, while the other group received training on how to target individual behaviors through the use of discrete trial teaching. The mean demographics for the children in each group were reported as being similar across age and adaptive functioning levels. Each family's happiness, interest in their child, stress, and communication style with their child were rated by trained coders using a Likert-style scale. The ratings occurred during the families' mealtimes, one time each pre and post intervention. The results of the study indicated that the parents who received training in PRT were rated as having significant positive changes across all four behaviors observed, while the parents who received training in discrete trail training did not experience any significant positive behavioral changes.

Recently, Backer-Ericzen, Stahmer, and Burns (2007), presented data on a preliminary, large-n study involving 158 families of children with ASD. The participants varied in terms of age and race, and were categorized based on these features for results interpretation. Specifically, 83% of the participants were male, and 17% female. Age categories consisted of children under 3 years of age (55% of the participants), between 4 and 5 years of age (35%) and six years of age or older (10%). Categories of ethnicity represented included Hispanic (35.4%), Caucasian (27.4%), Asian Pacific Islander (19.5%), African American (4.4%), and Native American (2.7%), with the remainder of the participants not reporting their race. The families were trained on the core implementer behaviors of PRT in a clinical setting over a 12-week period. Analysis of the child outcomes was based on the comparisons of pre and post scores on the Vineland

Adaptive Behavior subscales for communication, daily living, socialization, motor skills, and adaptive behaviors. The results of the study indicated that PRT made a positive difference in the areas of communication, daily living, social, and adaptive behavior skills. The results also indicated that the significant differences on the improvement gains were not due to age, gender, or race. These preliminary results have implications that training families in PRT may be an effective tool to promote growth across communication, daily living, social, and adaptive behavior domains for children with ASD. However, the conclusions of the effectiveness of training parents to use PRT on child outcomes is limited by the lack of comparison treatment groups, and lack of fidelity of implementation measures and reported parent use after training ended.

Perhaps most significant in the recent literature available on the use of PRT was the identification of core participant characteristics to determine intervention effectiveness (Sherer & Schreibman, 2005). Studies prior to this presented a minimum IQ, typically between 50 and 70, and a minimum language ability, typically of 2 to 2.5 years, as inclusionary criteria for PRT. Using a multiple baseline design across six participants with ASD, individual data was collected on language, play, and social behaviors of three students hypothesized as responders, and three students hypothesized as non-responders based on the characteristics: object manipulation, approach behaviors, avoidant behaviors, verbal self-stimulatory behaviors, and nonverbal self-stimulatory behaviors. Results of the study confirmed that the screening behaviors used to distinguish responders from non-responders are more critical in treatment effectiveness than IQ or language ability. Specifically, moderate to high rates of object manipulation,

approach, and verbal self-stimulatory behaviors with low rates of avoidance and nonverbal self-stimulatory behaviors at baseline were found to be characteristics of responders to PRT.

*Training others to implement PRT.* In a majority of the research, PRT has been directly implemented to the participants with ASD by clinicians, however, a few studies have examined the utility of training others to implement the intervention. Three studies, discussed previously, have examined the effects of training peers to implement PRT (Kuhn et al., 2008; Pierce & Schreibman, 1995, 1997a,b). Although the studies utilizing peers as PRT interventionists resulted in increased social-communication and play behaviors in children with ASDs (Kuhn et al., 2008; Pierce & Schreibman, 1995, 1997a,b), consistent response-generalization with untrained peers did not occur (Pierce & Schreibman, 1997; Stahmer, 1995). Additionally, all training and intervention sessions occurred in contrived settings, often isolated classrooms, instead of within naturally occurring educational contexts, and no indication was provided on the amount of natural social engagement that occurred between trained peers and the children with ASDs outside of the contrived settings. The social validity of the use of peers as the primary trained interventionists, in light of the limited support for response-generalization, may be further limited given the extreme fluidity of social peer networks, which reportedly change as often as weekly (Kasari, 2008).

Because adult relationships with children with ASD remain static in comparison to peer relationships, perhaps a more efficacious use of PRT, especially within educational contexts, is to first train adults as implementers. With successful adult

training, and maintenance of the integrity of the intervention, the capacity for maximizing the intervention's effectiveness may then be established through subsequent peer training.

Two studies have outlined procedures for training parent implementers to provide PRT for large-scale community-based training (Baker-Ericzen, Stahmer, & Burns, 2007; Bryson et al., 2007). Baker and colleagues (2007) implemented training to 158 parents of children with ASD for a total of 12 hours over the course of 12 weeks. The training encompassed both the strategies of PRT and functional assessment. Topics for each session were guided by the PRT manual (Koegel et al., 1989) and included: providing clear instruction, interspersing maintenance tasks, providing shared control, using direct and natural reinforcement, and reinforcing attempts. Other features of the training process included having the parents complete the activities in the training manual and giving them assignments to practice the targeted strategies at home or in the community between sessions. Although child improvement gains were noted by comparing pre and post measures on the Vineland Adaptive Behavior Scales, fidelity of implementation by parents was not monitored.

Bryson and colleagues (2007) also recently outlined procedures that were employed for a train-the-trainer model to build capacity for early childhood services through parents and educators in Nova Scotia. This has been the only study to date to include practitioners as agents of change. Initially, to train the trainers, in vivo training was provided, and included an overview of PRT, and instruction on how to train others including, how to: 1) model the behaviors, 2) utilize coached modeling, and 3) provide feedback on independent practice. Once trained, the new trainers provided instruction to

parents and educators in a group format utilizing the skills they had been taught.

Preliminary data is currently only available for one child and implementer pair, but indicates the promising potential for implementing a train-the-trainer model to build capacity of services for children with ASDs.

*Limitations in the existing literature base.* Although the theoretical and empirical support for PRT as an efficacious strategy to increase social competence in individuals with autism is documented, there are limitations to the extent in which the outcomes from this foundation of research can be generalized. For instance, until recently all of the research had come from the same region of the country, either in connection with the research teams at the University of California in San Diego or the University of California in Santa Barbara. Furthermore, only one of the studies meeting the criteria of rigorous research from the standards outlined by Hudson (2006) measured treatment fidelity (Sherer & Schreibman, 2005).

Limitations specific to generalizing PRT into educational contexts include: 1) a lack of data on practitioner fidelity of implementation and the maintenance of treatment integrity, and 2) implementation of PRT has not occurred within the structures of naturally occurring school contexts. These limitations to the research base on PRT must be addressed before school districts can begin to advocate for the resources necessary to support PRT as an effective intervention within educational institutions.

### Summary

To meet the complex needs of the increasing number of students with ASDs, school district personnel must be trained to implement efficacious treatments. Of

particular interest in practitioner training models is the feasibility of the maintenance and generalization of treatment after the completion of training. The available research on practitioner training suggests that on-going consultation, and more specifically, consultation in the form of performance feedback (Noell et al., 2005) is necessary for the maintenance of the integrity of trained skills. Moreover, research suggests that providing multiple exemplars and training to mastery are essential for practitioners' generalization of trained skills (See Scruggs & Mastropieri, 1994; Rose and Church, 1998; Scheeler, 2005; Stokes and Osnes, 1989 for reviews ).

PRT is one treatment that has a solid foundation of empirical support for promoting social-communication and play behaviors for children with ASDs. However, much of the research supporting the use of PRT with children with ASD has been implemented by clinicians or peers in isolated or contrived settings. The research available on training other care providers, specifically parents and practitioners, to implement PRT is limited, and has not reported on the fidelity of implementation by the caregivers. Additional research is needed to understand the potential of the use of PRT by practitioners within naturally occurring educational contexts.

#### Statement of Purpose

The purpose of this study was to explore the viability of PRT for delivery in educational contexts. Specifically, this study examined the maintenance and generalization of treatment integrity after the completion of training, and the impact of practitioner implementation of PRT on students' social-communication and play behaviors.

### *Research Questions*

The following research questions were investigated:

1. Do practitioners maintain the fidelity of implementation of PRT once they are trained, or is consultation necessary?
2. To what extent do practitioners' generalize the implementation of PRT to additional educational contexts once they are trained?
3. To what extent does the level of fidelity in which PRT is implemented by practitioners positively impact social-communication and play outcomes for students with ASD in educational contexts?

## Definitions of Terms

Applied Behavior Analysis (ABA) refers to the science based in the principles of behavior as applied to identify the variables responsible for the improvement of socially significant behavior (Cooper, Heron, & Heward, 2006).

Autism Spectrum Disorder refers to the presence of the behavioral symptoms of, 1) qualitative impairment in reciprocal social interaction, 2) qualitative impairment in the development of communication and language, and 3) restricted range of interests or activities, according to the criteria presented in the Diagnostic Statistical Manual, fourth edition (APA, 2000). See Appendix C for the specific diagnostic criteria for Autistic Disorder.

Contingent Reinforcement refers to reinforcement that is delivered only after the desired behavior has occurred (Cooper, Heron, & Heward, 2006).

External Reinforcement refers to any stimulus used to reinforce a behavior that would not naturally occur within the context. (i.e. giving a child a piece of candy for asking to use the bathroom would be an external reinforcement, where as allowing the child to use the bathroom when they ask to would be a natural reinforcement).

Generalization refers to situations in which behaviors are demonstrated in contexts other than those in which they were originally taught.

Introduce to Natural Maintaining Contingencies refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to the transfer of control of the desired stimulus over to contingencies that will predictably, naturally occur in the environment, also termed naturally maintaining reinforcement.

Maintenance refers to practitioners' continued use of the skill acquired during training without the feedback or other consultative services being provided.

Mediate Generalization refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to training a response that is likely to be appropriate for multiple situations. This approach is described as most commonly associated with the acquisition and generalization of language.

Motivation refers to the general desire or willingness to do something, as observed through responsiveness to social and environmental stimuli (Koegel et al., 1999).

Multiple Baseline refers to a single-subject design treatment model in which treatment is introduced to different baselines at different points in time (Kazdin, 1982).

Natural Reinforcement refers to reinforcement that has a direct relationship to the behavior being reinforced (Koegel et al., 1989).

Open-communication refers to permission for the students to speak, or otherwise engage interactively to communicate, and the absence of contextual restrictions on communication such as needing to sit quietly or work independently.

Pivotal Behaviors refers to behaviors that have been identified to have a widespread effect on overall developmental functioning.

Pivotal Response Training (PRT) refers to the specific treatment package that includes the components: gaining attention, sharing control, using multiple cues, interspersing maintenance tasks, using contingent, natural reinforcement, and reinforcing attempts (Koegel et al., 1989).

Pivotal Response Treatment refers to the general principles of applied behavior analysis

that are used to target identified “pivotal” areas of functioning, such as motivation, responsiveness, initiations, and self-management.

Practitioner refers to individuals providing services to children in an educational institution, including both teachers and paraprofessionals.

Program Common Stimuli refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to ensuring that sufficient common stimulus components are present in both the trained and untrained settings.

Reinforcement refers to a stimulus that (1) immediately followed a behavior, and (2) increased the likelihood of the behavior occurring again under similar contextual variables (Cooper, Heron, & Heward, 2006).

Sequential Modification refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to systematically modifying variables such as responses, subjects, settings, or experimenters in order to train generalization.

Social Competence refers to one’s ability to fluently use social skills (Elliot & Gresham, 1993)

Social Validity refers to whether the treatment and behavior outcomes are acceptable to the community in which they are present (Wolf, 1978).

Train and Hope refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to noting and observing for generalization, but not programming for it. This is not supported as an effective method of generalization.

Train to Generalize refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to applying a reinforcement contingency to

behaviors that are generalized. This is not supported as an effective method of generalization.

Train Loosely refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to training that exhibits limited control over the stimuli presented.

Train Sufficient Exemplars refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to providing multiple examples of lessons or skills until the desired lesson or skill is generalized.

Use Indiscriminable Contingencies refers to one of Stokes and Baer (1977) classifications of generalization. Specifically, it refers to the use of intermittent schedules of reinforcement for the desired behavior. The idea is that if a behavior is not continuously reinforced in one context, it may then appear in additional contexts where it would not be reinforced.

## CHAPTER II

### METHOD

#### Overview

This study investigated the degree to which technical assistance is needed for practitioners to effectively implement PRT in schools with fidelity. A single subject, concurrent multiple-baseline design across participant dyads was employed in order to examine practitioners' implementation of PRT and students' social-communication and play behaviors. The present chapter provides a description of the procedures employed in the investigation. Specifically, the process used to screen and select the practitioner and student participants, and the contexts in which data were collected are described. Definitions of the independent and dependent variables are provided. Then, the experimental procedures, including the data decision rules to progress through the phases of the study, are presented. Finally, the direct-observation and social validity measurement procedures are outlined.

#### Participants and Settings

Four practitioner-student dyads were recruited from a school with a specialized program designed for students with intensive needs, primarily students eligible for services under the criteria for ASD, within a mid-sized school district in the Mid-West. The following section presents the participant inclusion criteria for both practitioners and students, the screening procedures employed, and provides descriptions of the 4 practitioners and their students, Vincent, Benton, Isaac, and Omar.

### *Practitioners*

Two certified public school teachers and two paraprofessionals participated in the study. In order to be eligible for participation, the practitioners had to have opportunity for engagement with a student participant across a minimum of three educational contexts. Additionally, once potential practitioner participants consented to participate (Appendix B), they were screened for natural rates of PRT implementation behaviors. During the screening, the practitioners were asked to engage with the student in play to elicit communication and social interaction. Two coders simultaneously but independently coded 75% of the practitioner screenings with a mean rate of 94% (range, 88 – 100) inter-observer agreement for the behaviors: 1) gained attention prior to presenting a bid for communication; 2) shared control through student opportunity for choice or turn taking; 3) used of multiple cues; 4) used contingent, natural reinforcement; and 5) reinforced student's communication attempts. Practitioners were excluded from participation if the five implementer behaviors naturally occurred across 40% or more of 2-minute intervals across a 10-minute sample. Refer to the Dependent Measures section of this chapter for specific operational definitions of the PRT implementation behaviors.

The practitioner participants varied in terms of level of education, years of experience with students with ASDs, years of experience with the student they were paired with for the study, and previous knowledge of PRT. Table 2 outlines these characteristics.

Table 2

*Practitioner Participant Descriptions*

Descriptors	Benton's	Isaac's	Vincent's	Omar's
Level of Education	B.S.	M.A.	H.S. diploma	M.A.
Degree Content	Special Ed	Business	---	Elementary Ed
Position Held	teacher	para	para	teacher
Years of Experience	9y	6m	2y, 6m	6m
Years with Student	3y, 6m	6m	1y, 6m	6m
Previous Knowledge of PRT	overview	none	overview	none

*Note.* B.S. = Bachelor of Science degree; M.A. = Master of Arts degree; H.S. diploma = high school diploma; Special Ed = Special Education; Elementary Ed = Elementary Education; y = year(s); m = month(s); overview indicates a presentation of general components of pivotal response training.

*Students*

Four male students between the ages of 5 and 9 participated in the study. All four participants had medical diagnoses of autism spectrum disorders as determined by meeting the criteria for autistic spectrum disorders. Refer to Appendix C for the diagnostic criteria of autism as presented in the Diagnostic Statistical Manual, fourth edition (APA, 2000) criteria for ASDs. Vincent, a 9-year-old, had high rates of echolalic speech, but infrequent responses and initiations. Vincent was included in his third grade general education class 17 % of the time. Benton, a 7-year-old male was in the second

grade. Because Benton was small for his age, his time included with general education peers (22 % of the time) was split between inclusion with same-age peers in a second grade classroom (11 % of the time) and with peers of similar physical and cognitive development in a kindergarten classroom (11 % of time). Although Benton was verbal, his speech was described by his teacher as primarily consisting of echolalia. The third student participant, Isaac, was 5-years-old at the start of the study. He spent approximately 32% of his day in his kindergarten class with paraprofessional support. Isaac was described by his teacher as primarily a non-verbal communicator, although he did approximate words of familiar items. Omar, an 8-year-old, was described by his teacher as rarely responsive to communicative partners at the start of the study. He was included with his third grade general education class 27 % of the time. His teacher reported that Omar exhibited impulsive behaviors and significant distractibility that prevented him from being able to focus on the most important instructional aspects. None of the students had comorbid psychiatric diagnoses, nor were they physically aggressive or self-injurious.

Additionally, the *Psychoeducational Profile, Third Edition* (PEP-3) (Schopler, Lansing, Reichler, & Marcus, 2005) was administered to the student participants to provide detailed descriptions of student characteristics for use in the analysis of treatment outcomes. The PEP-3 was designed to provide descriptions of ability across domains for individuals with developmental ages between 6 months and 7 years. Table 3 provides the developmental age ranges of the student participants for the domains of cognitive-verbal, receptive language, expressive language, and visual motor imitation as indicated by the

results of the PEP-3. A discussion of the potential effect of the reported characteristics on the benefits achieved from the treatment is presented in chapter four.

Table 3

*Participant Ages of Developmental Functioning Across Domains*

Domains	Benton	Isaac	Vincent	Omar
Cognitive Verbal	51 m	32	43	46
Expressive Language	30	21	52	25
Receptive Language	31	26	31	26
Visual-Motor Imitation	32	27	12	40

*Note.* The results are reported in months from the Psychoeducational Profile, third edition.

To be considered for inclusion, students had to: 1) be between the ages of 5 and 10 at the onset of the study, 2) be receiving at least 60% of their education services in a special education setting, 3) have met the criteria for eligibility of special education services for autism, as determined by education personnel, according to the state board of education criteria, 4) have parent permission to participate (Appendix D), and 5) had to have met at least 4 out of 5 of the “PRT responsive participant” behaviors outlined by Sherer and Schreibman (2005) of having: 1) a moderate-to-high interest in toys; 2) tolerance of another person in close proximity; 3) low-to moderate rates of non-verbal self-stimulatory behaviors; and 4) moderate to high rates of verbal-stimulatory behavior.

Attainment of the fifth criterion for participant inclusion was determined by the participant meeting the cutoffs of percentage of intervals of occurrence of “responders” (Sherer & Schreibman, 2005) for at least four out of five of the screened behaviors. Specifically, the cutoffs of the screened behaviors included meeting at least the minimum desired percentage of interval occurrence of responder characteristics of appropriate toy play (61 percentage of intervals [PI]), approach (15 PI), and verbal self-stimulation (17 PI) behaviors, and no more than the maximum percentage of interval occurrence of responder characteristics for avoidance (13 PI) and non-verbal self-stimulation behaviors (34 PI). Table 4 presents the means and ranges of the percentage of intervals of occurrence of the screened behaviors for participants identified as responders and non-responders by Sherer and Schreibman (2005).

Table 4

*Mean Percentage Interval of Occurrence of Screening Behaviors*

Participant	Toy Play	Avoidant	Approach	Non-verbal Self-Stim	Verbal Self-Stim
Responders	70.8 (61-80)	10 (7-13)	23.3 (15-32)	23.3 (13-34)	25 (17-33)
Non-Responders	27 (17-37)	36 (25-47)	17 (8-26)	32 (19-49)	18 (14-22)

*Note.* Stim = Stimulation. Data from Sherer and Schreibman (2005).

The participant screening procedures outlined by Sherer and Schreibman (2005) were modified slightly by using practitioners as the primary interaction agents instead of parents. In accordance with Sherer and Schreibman’s (2005) procedures, percentages of

intervals of occurrence and non-occurrence of the screener behaviors were obtained by using partial interval coding for the five behaviors (appropriate toy play, avoidance, approach, non-verbal self-stimulatory behavior, and verbal self-stimulatory behavior) in 30-second intervals across a 20-minute observation period while the target student interacted with the assigned practitioner participant. Table 5 presents the definitions of the screened behaviors (Sherer & Schreibman, 2005).

Table 5

*Student Participant Screening Behavior Definitions*

Behavior	Definition
Toy Play	The child interacted with a toy appropriately for 5 consecutive seconds or more.
Avoidant	The child moved away from the adult, out of arms reach (only those intervals in which the child physically moved away to avoid contact). These behaviors included instances in which the child pulled part of his/her body away from the adult's touch, resisted looking at the adult's face when the adult initiated looking, or covered eyes or ears in response to the adult speaking.
Approach	The child moved to within arms reach of the adult or closer (only those intervals in which the child physically moved closer). These behaviors also included spontaneous looking at the adult's face or reaching to the adult (with or without looking at the adult) and approaching to take a toy.
Non-Verbal Self-Stimulatory	Repetitive behaviors. These varied from child to child. Examples included, but were not limited to: hand flapping, rocking, head shaking, body posturing.
Verbal Self-Stimulatory	These behaviors are defined as non-sensical sounding utterances that were not associated with a tantrum. This included repetitive sounds.

*Note.* Definitions from Sherer and Schreibman (2005).

The specific screening procedures included 5 minutes of free exploration of toys, 5 minutes of the practitioner attempting to elicit language, 5 minutes of the practitioner attempting to obtain compliance with requests, and 5 minutes of attempted interactive play. Two coders simultaneously, but independently recorded the occurrence of the screened behaviors (Appendix E) with 98% inter-observer agreement, as calculated by dividing the number of intervals of agreement for each behavior, by the total number of intervals coded, multiplied by 100. Table 6 presents the student participants' percentages of intervals of occurrence of the screened behaviors.

Table 6

*Percentages of Intervals of Occurrence of Screened Behaviors*

Behaviors	Vincent	Benton	Isaac	Omar
Toy Play	85*	43	58	58
Avoidant	8*	8*	3*	13*
Approach	33*	20*	15*	15*
Non-Verbal Stim	23*	20*	10*	13*
Verbal Stim	68*	50*	53*	23*

*Note.* Stim refers to self-stimulatory behaviors. The behaviors are based upon the screened behaviors identified by Sherer and Schreibman (2005). Behaviors meeting the criteria of “responders” to PRT are denoted with an asterisk (\*).

*Settings*

All sessions took place within a typical mid-sized elementary school. The school

contained two classrooms that specialized in programming for students with ASDs.

Vincent and Omar were in one of the classrooms, and Benton and Isaac were in the other.

Three educational contexts were utilized for each participant dyad during the study.

The primary educational context utilized for all for participant dyads was during unstructured playtimes within the students' special education classrooms. Toys typically found in classrooms for students with disabilities, such as books, blocks and other building materials, cars, toy animals, art supplies, etc., were readily available to the student participants.

Secondary and tertiary contexts were used to analyze the stimulus generalization. The classroom teachers selected the additional stimulus-generalization contexts based on the following descriptions. Criteria for selection of both the secondary and tertiary contexts included: 1) it had to be a pre-established routine within the student's school day, and 2) the practitioner paired with the student for the study had to be with the student in the context. Additional selection criterion for the secondary context was based on its similarity to the primary context in its structure for opportunity for choice and materials available. The tertiary context was used to examine the ability of the implementers to incorporate PRT into everyday routines (Koegel & Koegel, 2006). Therefore, the tertiary educational contexts were selected based on having: 1) materials different from those in the primary context (not toys), 2) allowance of open-communication, meaning that it was permissible for students to communicate freely, and 3) more structure than the primary context, such as having a specific goal or activity that needed to be completed. It should be noted, however, that contexts in which curriculum

activities dictated the content and type of social-communication behaviors were excluded. Table 7 presents descriptions of three contexts.

Table 7

*General Context Descriptions*

	Primary	Secondary	Tertiary
Emphasis	Play	Play	Task Objective
Materials	Toys	Toys (Different Set)	Objective-based
Communicative Structure	Open Communication	Open Communication	Open Communication

The secondary contexts selected for the participants were kindergarten centers within the general education setting for Benton and Isaac, and recess for Vincent and Omar. For Benton and Isaac, kindergarten centers were structured to provide the students a choice between 6 to 8 stations (e.g. cars and blocks, puzzles, art). The stations were limited to having only 3-5 children. The stations had a variety of toys to choose among, similar to those in the primary context. Students had the freedom to choose to move among the stations that were not full throughout the center time. For Vincent and Omar, the materials available for choice during recess were limited to the playground equipment, balls, and jump ropes. However, the structure of recess was similar to that of the primary context in the freedom of choice to move among materials and activities and in the emphasis on play.

The tertiary contexts selected were special education art classes for Vincent and Isaac, and a daily chore time for Benton and Omar. During the art classes for Vincent

and Isaac, different materials were presented each week and the students were encouraged to explore the materials to create a project. For example, one week the materials presented included paint with a variety of tools to use with the paint (e.g. sponges, paint brushes, marbles), and the following week clay was presented with a variety of tools to manipulate the clay with (e.g. scissors, stamps, wooden knives). On occasion a specific project would first be modeled for the students, and then the students would be provided the materials to complete the project. On such occasions, data was not collected until after the modeling was completed, as this was the point the practitioner and student dyad would begin interacting. During Omar and Benton’s daily chore times, the students were provided an opportunity to select among the chores: washing tables, stacking chairs, washing dishes, vacuuming, collecting and crushing cans, organizing the lost and found, or cleaning up the toy area.

Table 8 portrays the educational contexts utilized for each participant dyad.

Table 8

*Primary and Stimulus Generalization Contexts*

Context	Vincent	Benton	Isaac	Omar
Primary	Play	Play	Play	Play
Secondary	Recess	Kindergarten	Kindergarten	Recess
Tertiary	Art	Chores	Art	Chores

## Independent Variables

### *Training*

Training procedures were established for a minimum of 12, 30-minute sessions. During the initial training session the participants were provided a copy of the PRT manual (Koegel, et al., 1989) and an overview of PRT was presented (Appendix F). Then, the following training sessions targeted one of the five implementer behaviors (gaining attention, providing opportunities for shared control, using multiple cues, using direct-reinforcement contingent on behaviors, and reinforcing of attempts to maintain previously learned skills). During the final training session all of the components of PRT were reviewed.

During the training sessions that focused on the core implementer behaviors, each behavior was targeted for two consecutive sessions during the student's structured playtime in their special education classroom. As each of the five implementer behaviors were introduced, the practitioner was provided a supplemental handout with an overview of the behavior (Appendices G-K) and the primary researcher, acting as a training coach, provided specific pointers on how to implement the targeted implementer behavior and previously learned behaviors. Additionally, the target implementer behavior was modeled by the training coach and practiced with the student while the training coach provided feedback during each training session. Each of these training sessions was broken down as follows: (1) performance feedback provided from the previous session, (2) 10-minutes of discussion to provide an overview of the targeted implementer behavior including exemplars on how to use the implementer behavior across educational contexts,

(3) 10-minutes of practice with feedback during the implementation, including modeling of the new behavior, and (4) 10-minutes of independent practice. Data were collected during the 10-minutes of independent practice of each training session. This data was used to provide performance feedback on the level of fidelity of the targeted implementer behavior and all previously learned behaviors as implemented by the practitioner at the beginning of the following session (Appendix L).

The training was completed when PRT was considered to be “implemented with fidelity” across two consecutive sessions. Fidelity of implementation was established when the practitioners: a) gained attention; b) shared control; c) used multiple cues; and d) provided natural reinforcement contingent on the behavior, occurred during 80% of the 2-minute intervals during the 10-minute coded segments (Koegel et al., 1989). It was not necessary for the implementer to provide reinforcement for attempts to respond across 80% of the 2-minute intervals during the 10-minute coded segments because this skill was dependent upon the level of the student’s response, and could not be controlled by the practitioner.

If fidelity of implementation was not achieved at this criteria level by the end of the twelfth training session, additional training sessions were to be conducted to target the specific implementer behaviors not meeting the criteria for fidelity of implementation. In such case, the training sessions would continue until fidelity was met.

To control for the potential affect of having more than one practitioner trained from the same classroom, all training sessions were provided individually, discussions regarding implementation and feedback occurred in a private setting, and practitioners

were asked to not discuss the intervention during the study.

### *Treatment Integrity*

Data was collected on the integrity of training on 39% of the training sessions by having a trained data collector mark a checklist for each training component present: 1) performance feedback from previous session, 2) target implementer behavior discussed, 3) guided practice with modeling, and 4) independent practice. Start and stop times were recorded to ensure that: 1) coached practice occurred for a minimum of 10 minutes, but no more than 15 minutes, and 2) the practitioner had at least 10 minutes to independently practice immediately following the coached practice (Appendix M). A percentage of the components of the training conducted with integrity was calculated by dividing the number of training components present by the total number of training components (4) and multiplying by 100. Training integrity data is presented in the chapter on results.

### Dependent Measures

#### *Practitioner Behaviors*

Practitioners were trained to implement PRT as determined by the presence of the five practitioner behaviors: 1) gained attention; 2) shared control; 3) used multiple cues; 4) used contingent, natural, and immediate reinforcement; and 5) reinforced attempts for the maintenance of skills (Koegel et al., 1989). The effect of training on practitioner implementation of PRT was monitored. Table 9 provides definitions of the core practitioner behaviors.

Table 9

*Core Pivotal Response Training Implementer Behaviors*

Behavior	Operational Definition
Gain Attention	having the student focused on the task or communicative partner before delivering a clear instruction that had an opportunity for the student to respond
Shared Control	utilizing turn taking or choice within interactions. For turn-taking, shared control was coded each time the adult and student had a turn, during the adult's turn. For choice, shared control was coded each time the student was presented a direct, clear choice between at least two objects or actions
Multiple Cues	<p>verbalizing multiple components of a stimulus included:</p> <ul style="list-style-type: none"> <li>• Using multiple cues to label and describe things while interacting with the child. "I have a big car." "You have a little car."</li> <li>• Using multiple cues in directives. "Sit in the red chair."</li> <li>• Using multiple cues in directives when there were multiple variables present. If a box of markers and crayons were on the table, "Give me the green crayon."</li> </ul>
Contingent, natural, immediate reinforcement	providing a consequence that was natural within the context of the interaction, within 3 seconds of the student's initiation or response. For example, when a student requested to look at a specific book during kindergarten center, the practitioner gave the student the book to look at within 3 seconds of the request, instead of giving the student a piece of candy to reinforce his use of words.
Reinforce attempts	reinforcing attempts to initiate or respond that were either directed to the communicative partner or on-topic for the current activity within 3 seconds of the student's attempted initiation or response. (The practitioners were taught to reinforce the attempt first, and then regain control to press for a "correct" communication)

*Note.* Definitions from Koegel et al., 1989.

### *Student Behaviors*

To determine if practitioner implementation of PRT positively impacted student behaviors, data was collected on the social-communication and play behaviors of the student participants. Table 10 provides the operational definitions that were utilized for coding purposes.

Social-communication behaviors included verbal responses, non-verbal responses, verbal initiations, and immediate echolalia. A percentage of the total of each student's responses was obtained by dividing the sum of the student's verbal and non-verbal responses by the number of initiations made by the practitioner, multiplied by 100. The operational definitions of verbal responses and non-verbal responses were modified from Sherer and Schreibman's (2005) "maintaining interactions" definition to differentiate between verbal and non-verbal responses. The definition for verbal initiations was adopted from Sherer and Stahmer (2005). The definition for immediate echolalia was modified from previous research on PRT (Sherer and Schreibman, 2005; Schreibman, Stahmer, Barlett, & Dufek, 2009) that combined rates of immediate echolalia with rates of prompted and spontaneous utterances and collapsed into one reported rate of verbalizations that resulted in assumptions of increased rates of immediate echolalia as a result of PRT. Due to varying theories on the function that echolalia serves as either a developmental progression, or as a self-stimulatory behavior (Wetherby, 1986), a hypothesis was not developed in support of either an increase or a decrease in immediate echolalia as a result of PRT. Instead, this present study separated immediate echolalia into its own reporting category in order to examine if PRT had an effect on either

increasing or decreasing echolalic speech.

Play behaviors included appropriate engagement and varied play. The definition of appropriate engagement was obtained by collapsing all levels of play defined by Sherer and Stahmer (2005) into one code for appropriate engagement, since the purpose of this study was not to increase the complexity of play, as it was in Sherer and Stahmer's (2005). The definition of varied play was also adopted from Sherer and Stahmer (2005).

Table 10

*Operational Definitions for Student Dependent Measures*

Behavior	Operational Definition
Verbal Response	any intelligible verbal response to a practitioner's directive, question, or comment that was deliberately trying to elicit speech within a 5 second delay
Non-verbal Response	any physical or gesture response to a practitioner's directive, question, or comment that was deliberately trying to elicit a response within a 5 second delay. (Examples include, handing a requested item, physically touching to make a choice between two objects, etc.)
Adult Initiations	any directive, question, or comment intended to elicit a response
Verbal Initiations	any verbal initiation that is made after at least 10 seconds from the last attempt by the practitioner to verbally or non-verbally prompt speech, or a verbal initiation following a response when no additional attempt was made by the practitioner to elicit more speech. These comments may or may not be directly related to the task or referencing the practitioner, but must be at least one of the two
Immediate Echolalia	any repeated word, phrase, or partial phrase within a 10 second delay that did not serve as a response
Appropriate Engagement	the use of an object as it was intended either following a practitioner's prompt or spontaneously. Within the context of play this includes dramatic play (using a toy in an invented scenario established with the practitioner) and imaginary play (e.g. playing an air guitar within a context established with the practitioner)
Inappropriate Engagement	the inappropriate use of objects, self-stimulatory behaviors, or aimlessness indicated by not making a choice or engaging with any materials for more than 10 seconds
Downtime	time between activities when the child was not otherwise engaged in inappropriate play behaviors
Varied Play	play that was directed toward a different toy or that has changed in nature with the same object

*Note.* Definitions modified from Sherer & Schreibman, 2005; Sherer & Stahmer, 2005.

## Design

The current study utilized a concurrent multiple-baseline design across practitioner-student dyads. Four phases were employed during the study: baseline (A), training (B), post-training follow-up (C), and consultation as needed (D). During the baseline and training phases sessions occurred 3 to 4 times a week. Then, during the post-training and consultation phases, data collection occurred two times a week, with weekly stimulus generalization probes.

### *Experimental Procedures and Data Decision Rules*

*Baseline (A).* The baseline phase consisted of collecting observation data using continuous coding in 10-minute segments to obtain rates of naturally occurring practitioner and student behaviors. Data was collected for a minimum of 4 sessions in the primary context of play in the special education classroom, and data probes were conducted in the secondary and tertiary stimulus-generalization contexts for each participant. Determination to move from baseline to the training phase was dependent upon the absence of a trend or slope, or relative stability in the student's social communication and play behaviors in the primary intervention setting (Kazdin, 1982). Additionally, since consistent excessive variability in data may reflect a performance deficit rather than a skill deficit (Gresham & Elliot, 1993), student's were also moved from baseline to the training phase if they exhibited consistent, excessive variability in behaviors, with the goal of intervention to stabilize performance at the desired rate.

The stability and presence or absence of slope was taken into consideration across all social communication and play behaviors, however, students' social-communication behaviors were considered of primary importance, and play behaviors of secondary importance. More specifically, the students' percentage of total responses was used as the primary behavior for data decision rules, based on previous research supporting greater gains in response behaviors as compared to initiations (Sherer & Schreibman, 1995, 1997; Stahmer, 1995).

*Training (B).* The training phase of the experiment occurred for a minimum of 12 sessions. To stagger the initiation of phases for each participant dyad within the multiple baseline design, the first participant dyad began the training phase once the previously described baseline conditions were met. The three remaining participant dyads were staggered and moved from baseline to training only after 1) the criteria to move from baseline was met, and 2) the participant dyad most recently moved into the training phase had completed a minimum of 2 training sessions.

*Follow-up (C).* The post-training follow-up phase began for each participant dyad after the practitioner completed a minimum of 12 training sessions and demonstrated the criteria previously outlined for fidelity of implementation. Feedback and consultation were not available to the practitioners during the post-training phase. Data continued to be collected on both the fidelity of implementation of PRT and on the social-communication and play behaviors of the students in the primary context in 10-minute segments for two probes each week. Post-training probes continued for up to two months, unless consultation was deemed necessary based on the data decision rules defined in the

following section.

During the post-training phase, probes for stimulus-generalization were conducted a minimum of one time per week for each student. The probes consisted of collecting observational data in 10-minute segments on both the fidelity of implementation of PRT and on the social-communication and play behaviors of the students' in the secondary and tertiary contexts. The primary focus was to determine if the practitioners' behaviors generalized across educational contexts. However, data was also collected on the students' behaviors for result interpretations.

*Consultation (D).* Consultation in the form of performance feedback and guided practice with modeling was provided during 30-minute booster sessions when any of the following conditions were met: 1) the practitioner's fidelity of implementation dropped below 80% for two consecutive data points, 2) the practitioner's fidelity of implementation dropped below his/her baseline average for one probe, or 3) the practitioner's fidelity of implementation showed a steady descending slope over 4 weeks of probes. The consultation sessions followed the same format as the training sessions.

#### *Data Collection*

Measurement was obtained through direct observation of practitioners' fidelity of implementation and of students' social-communication and play behaviors across all phases. These measures occurred across the three targeted contexts identified for each participant. Behaviors were coded continuously for 10-minutes with the use of the Multi-Option Observation System for Experimental Studies (MOOSES) using hand-held computers (Tapp, Wehby, & Ellis, 1995). MOOSES allows for the simultaneous coding

of multiple behaviors.

#### *Data Collection Training*

Four data collectors, including the researcher, performed all direct observation data collection procedures. The researcher trained the other 3 data collectors prior to the baseline data collection. All data collectors were provided definitions of the dependent variables and instruction on the use of MOOSES to record data. Additionally, practice coding sessions were conducted by observing and coding both live clinic sessions and videotaped interactions between caregiver and child dyads. Practice sessions were conducted simultaneously but separately until an interobserver reliability of at least 85% was achieved during three consecutive training sessions.

#### *Data Analysis*

To answer the research questions, 1) *Do practitioners maintain the fidelity of implementation of PRT once they are trained, or is consultation necessary?*, and 2) *To what extent do practitioners' generalize the implementation of PRT to additional educational contexts once they are trained?*, visual inspection of the data on practitioners' fidelity of implementation is examined across phases and contexts. To answer the research question, *To what extent does the level of fidelity in which PRT is implemented by practitioners positively impact social-communication and play outcomes for students with ASD in educational contexts?*, visual inspection of the data and the calculation of percentage of non-overlapping data points (PND) were employed. The results of the analyses are presented in chapter three, and discussed in chapter four.

### *Interobserver Agreement*

To obtain interobserver agreement a second observer simultaneously but independently collected data with the primary observer. Rates of interobserver agreement for both practitioner and student behaviors were obtained on 33% of sessions across phases and participant dyads. One of the two coders was blind to the phase of the study they were coding.

Percentage agreement for the frequency measures were calculated by dividing the number of agreed upon behaviors by the larger number of behaviors coded and multiplying by 100 (Kazdin, 1982). The practitioners' behaviors that were coded as frequency measures included: adult initiations, gained attention, shared control, multiple cued, contingent reinforcement, and reinforced attempts. The students' behaviors that were coded as frequency measures included: verbal responses, non-verbal responses, echolalia, initiations, and variations in play. Kappa coefficients were calculated to obtain mean agreement for duration measures. The duration measures included the student behaviors of appropriate engagement and inappropriate engagement. Kappa is calculated by dividing the observed agreement minus the probability of chance agreement, by the probability of chance agreement subtracted from one (Ary, Jacobs, & Razavieh, 2002).

Additionally, interobserver agreement on the integrity of the training procedures was obtained for 57% of the training sessions that were coded for training integrity by having the practitioners simultaneously, but independent of the data collector complete the training integrity checklist during the training sessions (Appendix M). Rates of interobserver agreement are presented in the chapter on results.

## Social Validity

The practitioners completed a measure of social validity at the end of the training phase. The measure was designed to give practical feedback on the viability of utilizing PRT within the educational contexts from a practitioner's viewpoint (Appendix N). Specifically, it was created to address the following three goals of social validity outlined by Wolf (1978):

1. The social significance of the goals. Are the specific goals really what society wants?
2. The social appropriateness of the procedures. Do the participants, caregivers, or other consumers consider the treatment procedures acceptable?
3. The social importance of the effects. Are consumers satisfied with the results?

Outcomes are presented in the Results chapter.

## CHAPTER III

### RESULTS

#### Overview

This chapter presents an analysis of the results. First, data is put forth on the integrity of the training provided to the practitioners, including rates of interobserver agreement. Next, rates of interobserver agreement for the dependent measures are reported. Then, results are presented in relation to the research questions: 1) Do practitioners maintain the fidelity of implementation of PRT once they are trained, or is consultation necessary?; 2) To what extent do practitioners' generalize the implementation of PRT to additional educational contexts once they are trained?; and 3) To what extent does the level of fidelity in which PRT is implemented by practitioners positively impact social-communication and play outcomes for students with ASD in educational contexts? Finally, data obtained regarding the social validation of the use of PRT by practitioners within educational contexts is outlined.

#### Treatment Integrity

The integrity of the training provided to the practitioners was monitored across participants for 39% of the training sessions by having a checklist marked for each of the four training component present: 1) performance feedback provided from the previous session, 2) target implementer behavior discussed, including exemplars in other educational contexts, 3) guided practice with modeling occurred for a minimum of 10 minutes, but no more that 15 minutes, and 4) independent practice occurred for at least 10 minutes (Appendix M). A percentage of the components of the training conducted with

integrity, calculated by dividing the number of training components present by the total number of training components (4) multiplied by 100, resulted in an overall training integrity rate of 98% (range, 75% - 100%).

To obtain rates of interobserver agreement on the integrity of the training procedures the practitioners simultaneously, but independent of the data collector, completed the training integrity checklist (Appendix M). Interobserver agreement was collected for 57% of the training sessions that were coded, and resulted in a mean rate of 100% agreement across participants.

#### Interobserver Agreement of Practitioner and Student Behaviors

The reliability of the data was assessed by obtaining interobserver agreement on 35% of baseline, 31% of training, and 29% of follow-up sessions across participant dyads. For frequency measures the observations were considered reliable if a mean rate of at least 80% interobserver agreement was achieved (Kazdin, 1982). The mean agreement for frequency measures across phases for each participant dyad was 86% (range, 80% to 97%) for Vincent and his practitioner, 87% (range, 77% to 96%) for Benton and his practitioner, 94% (range, 87% to 100%) for Isaac and his practitioner, and 95% (range, 80% to 97%) for Omar and his practitioner. Kappa coefficients were calculated to obtain rates of interobserver agreement for duration measures of appropriate engagement and inappropriate engagement. The interpretation of kappa coefficients is as follows: less than 40% indicates fair or poor agreement, 40% to 59% indicates moderate agreement, 60% to 79% indicates substantial agreement, and 80% to 100% indicates almost perfect agreement (Landis & Koch, 1977). The mean kappa coefficients for each

participant across phases were 90% (range, 67% to 100%) for Vincent, 89% (range, 64% to 100%) for Benton, 92% (range, 87% to 100%) for Isaac, and 89% (range, 74% to 97%) for Omar. Table 11 presents the means and ranges of interobserver agreement for both frequency and duration measures across participant dyads and phases.

Table 11

*Mean and Range Percentage of Interobserver Agreement of Dependent Measures*

Participant Dyad	Type of Measure	Baseline	Training	Follow-up
Vincent	Percent	84	83 (80 – 85)	90 (85 – 97)
	Kappa	94	88 (67 – 100)	92 (75 – 100)
Benton	Percent	95	85 (77 – 94)	88 (79 – 96)
	Kappa	96	91 (64 – 100)	81 (73 – 89)
Isaac	Percent	93 (89 – 100)	94 (87 – 100)	94 (91 – 97)
	Kappa	94 (92 – 97)	93 (86 – 100)	88 (74 – 97)
Omar	Percent	88 (80 – 92)	87 (85 – 90)	93 (88 – 97)
	Kappa	91 (84 – 96)	88 (73 – 97)	86 (75 – 96)

*Note:* Participant dyad refers to the listed student and their paired practitioner.

Research Questions

*Do practitioners maintain the fidelity of implementation of PRT once they are trained, or is consultation necessary?*

During training all four practitioners increased their overall rates of fidelity and

achieved fidelity of implementation within the minimum twelve training sessions as prescribed by the study's design. Table 12 depicts the fidelity of individual implementer behaviors during the training phase. The table begins reporting fidelity of individual behaviors with the second training session. The first training session is omitted from the table, because the session provided an overview of PRT, but did not focus on a particular implementer behavior. Additionally, the table omits data from the final three training sessions, because two of the sessions focused on the behavior of reinforced attempts, which was not calculated in the overall measure of fidelity and one of the sessions was a review and did not focus on any one particular implementer behavior.

Table 12

*Practitioner's Fidelity of Individual PRT Behaviors During Training*

Practitioner	Behavior	Training Session							
		2	3	4	5	6	7	8	9
Vincent's	GA	60*	60	80	100	100	100	100	80
	SC			100*	80	80	100	100	100
	MC					100*	100	100	80
	RI							100*	100
Benton's	GA	80*	100	100	100	80	100	100	100
	SC			80*	100	100	100	100	100
	MC					80*	80	100	100
	RI							100*	100
Isaac's	GA	80*	80	80	60	80	80	100	100
	SC			100*	60	100	100	100	100
	MC					80*	80	100	20
	RI							100*	40
Omar's	GA	60*	60	60	100	80	80	100	80
	SC			80*	100	60	100	80	60
	MC					60*	80	80	20
	RI							80*	100

*Note.* GA = gained attention, SC = shared control, MC = multiple cues, RI = contingent, natural reinforcement. The introduction of a new skill is denoted with (\*). The fidelity is

reported as percentages of 2-minute intervals across 10-minute samples in which the targeted behaviors occurred.

To examine the practitioners' maintenance of PRT following the completion of training, data was collected during probes conducted twice weekly for six to ten weeks across a multiple baseline design. The practitioners' fidelity of implementation was determined by mastery criteria of 80% fidelity that was proposed by Koegel and colleagues (1989). It should be noted that due to end of the school-year activities that resulted in scheduling changes during two of the weeks in the follow-up phase, probes were only obtained once during each of those weeks.

Per research design, consultative "booster" sessions were provided if any of the following conditions were met in the primary context post-training: 1) the practitioner's fidelity of implementation dropped below the 80% pre-determined rate for fidelity of implementation on two consecutive data collection probes, 2) the practitioner's fidelity of implementation dropped below his/her baseline average, or 3) the practitioner's fidelity of implementation showed a steady descending slope over 4 weeks of probes. Practitioners' rates of fidelity of implementation are depicted in Figure 1.

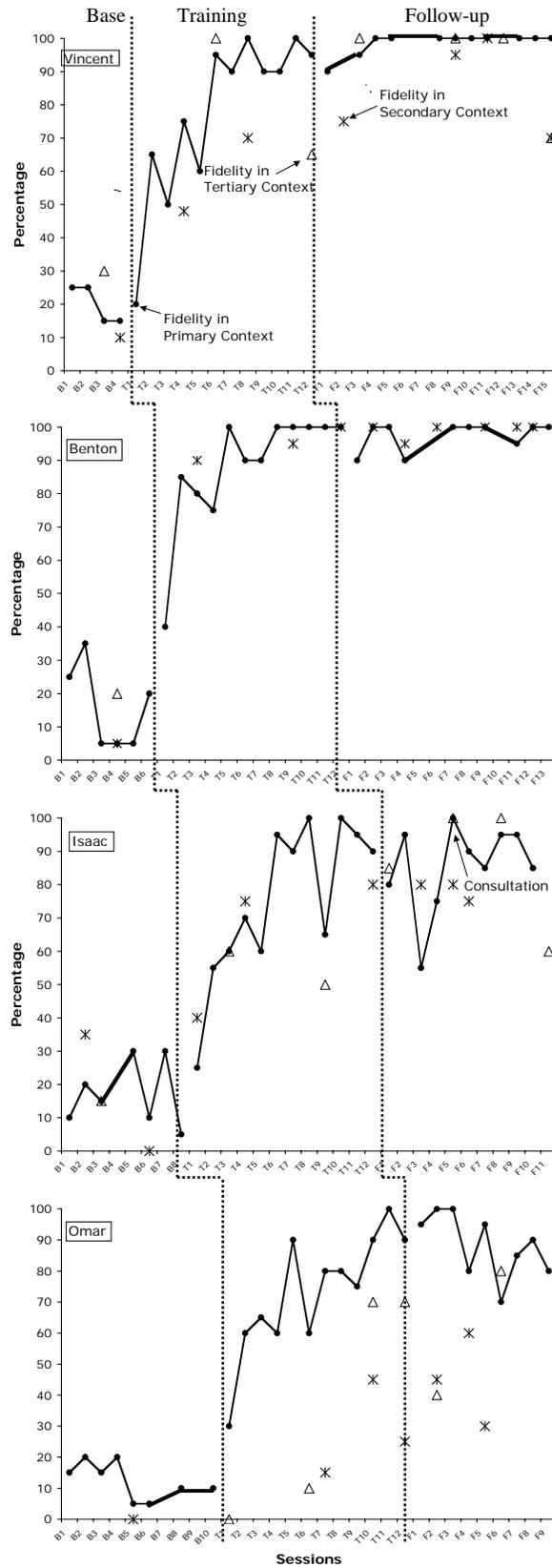


Figure 1. Practitioners' fidelity of PRT across contexts and phases.

Three of the four practitioners who were trained to implement PRT were able to maintain the fidelity of implementation in the primary context in which they were trained during the follow-up phase. Specifically, Vincent's and Benton's practitioners maintained fidelity of implementation at mean rates of 99% and 98% respectively without dropping below the minimum rate of fidelity of implementation of 80% on any data collection probes. Omar's practitioner maintained an overall mean rate of fidelity of implementation of 88% during the follow-up phase, but dropped below the 80% cutoff rate of fidelity of implementation, with a rate of 70% fidelity, on one occasion four weeks into the follow-up phase. She implemented PRT with fidelity on the following data collection probe day and therefore did not meet the criteria to receive a consultation booster session. Further visual inspection of Omar's practitioner's data indicated that she had a descending trend in her rate of fidelity of implementation over the course of a four week period, and would have therefore been eligible for a consultation booster session had the study continued.

Isaac's practitioner met the criteria to receive a consultation booster session on one occasion when her treatment integrity fell below the 80% rate of fidelity on two consecutive data collection probes. During the second week of follow-up, her fidelity of implementation decreased to 55%, and was followed by a consecutive data collection probe during which her fidelity of implementation was at a rate of 75%. The receipt of one consultation booster session resulted in a return to fidelity of implementation above the minimum cut off at a rate of 100%, and on-going maintenance of fidelity for the remainder of the follow-up phase.

*To what extent do practitioners' generalize the implementation of PRT to additional educational contexts once they are trained?*

To answer this research question the data collected on practitioners' fidelity of implementation across contexts was analyzed through visual inspection to examine the rates of fidelity in the untrained contexts as compared to the rates of fidelity in the primary context across phases. This data is also represented in Figure 1.

The results of the study indicate that all four of the practitioners increased their percentages of implementation of the core behaviors of PRT across contexts during follow-up when compared to their natural rates of these behaviors at baseline, but only one of the four practitioners, Benton's practitioner, was able to consistently generalize PRT with fidelity to an untrained context. Specifically, Benton's practitioner exceeded the minimum rate of fidelity of implementation of PRT not only in the primary trained context of play, but also in the secondary untrained context of kindergarten centers during the training phase. Additionally, she maintained high rates of fidelity of implementation across both primary and secondary contexts during the follow-up phase with mean rates of fidelity of implementation of 98% and 99% respectively. Due to a schedule change following the baseline phase Benton was no longer in the classroom during his pre-identified tertiary context of chore time, and therefore follow-up data is not presented for the tertiary context.

Both Vincent's and Isaac's practitioners inconsistently implemented PRT with fidelity across the untrained contexts during the follow-up phase. However, it should be noted, that although their fidelity of implementation across the untrained secondary and

tertiary contexts during individual follow-up probes was inconsistent, their mean rates of fidelity of implementation met, or came close to the minimum standard of 80% fidelity. Table 13 presents the practitioners' mean rates and ranges of fidelity of implementation across contexts during follow-up.

Finally, Omar's practitioner did not implement PRT with fidelity in either of the untrained secondary and tertiary contexts. However, her rates of fidelity at follow-up were higher than the naturally occurring rates of fidelity that were obtained at baseline, indicating that she was increasing her incorporation of the skills in which she was trained.

Table 13

*Practitioners' Mean Rates and Ranges of Fidelity of Implementation Across Contexts During Follow-up*

Context	Vincent	Benton	Isaac	Omar
Primary	99% (90-100)	98% (90-100)	86% (55 -100)	88% (80-100)
Secondary	85% (70-100)	99% (95-100)	78% (75-80)	45% (30-60)
Tertiary	93% (70-100)	---	86% (60-100)	60% (40-80)

*To what extent does the level of fidelity in which PRT is implemented by practitioners positively impact social-communication and play outcomes for students with ASD in educational contexts?*

Visual inspection of the graphed students' data and the calculation of percentages of non-overlapping data points (PND) were employed to determine if: 1) the use of PRT by the students' practitioners positively impacted rates of social-communication and play

behaviors in comparison to baseline rates and 2) if gains were achieved, were they maintained post-training, and 3) did they generalize across the untrained secondary and tertiary contexts?

Visual inspection of the data from the primary educational contexts depicted in Figures 2 and 3 indicate that meaningful behavioral changes occurred across students from baseline to training phases for the behaviors of appropriate engagement, responses, and verbal initiations. These behavioral changes were maintained during follow-up. There were inconsistent variations in the behaviors of immediate echolalia and varied play across phases. Specific behavioral outcomes, including PNDs are presented in the following sections on social-communication behaviors, play behaviors, and behavioral changes across untrained secondary and tertiary contexts. The PNDs reported in the social communication and play behavioral sections were calculated by dividing the number of data points in the primary context during follow-up that were higher than the highest data point in the primary context during baseline by the total number of data points during follow-up, multiplied by 100 (Kazdin, 1982; Scruggs & Mastropieri, 1998). Data that was collected on days when the practitioners did not implement PRT with fidelity during the follow-up phases were excluded from the PND calculations. Common interpretation of intervention effectiveness based on PND is: 90% or greater is considered highly effective; between 70% and 90% is considered moderately effective; between 50% and 70% is considered mildly effective; and less than 50% is considered ineffective (Scruggs & Mastropieri, 1998).

*Social-communication behavioral changes.* Data was collected on the social-communication behaviors of verbal and non-verbal responses and verbal initiations, as well as on the behavior immediate echolalia. Table 14 presents the PND from baseline to follow-up in the primary context for these behaviors for each student. It should be noted, however, that because there are varying theories on the purpose of echolalia, as both a developmental progression and as an observable sign of frustration (Wetherby, 1986), the PND for immediate echolalia was calculated in two ways to examine whether there was either a decrease or an increase in the rates of immediate echolalia of the student participants. First, it was calculated by dividing the number of data points in the primary context during follow-up that were *lower* than the *lowest* data point in the primary context during baseline by the total number of data points during follow-up, multiplied by 100 to see if there was a significant decrease in immediate echolalia, then, it was calculated by dividing the number of data points in the primary context during follow-up that were *higher* than the *highest* data point in the primary context during baseline by the total number of data points during follow-up, multiplied by 100 (Scruggs & Mastropieri, 1998) to see if there was an increase in immediate echolalia.

Table 14

*Percentages of Non-Overlapping Data of Students' Social-Communication Behaviors*

Behavior	Vincent	Benton	Isaac	Omar
Responses	100	100	100	100
Initiations	100	100	75	100
Increased Echolalia	18	0	0	0
Decreased Echolalia	27	0	0	0

*Note:* The PND was calculated from the changes in data that occurred from the baseline to follow-up in the primary context. “Increased Echolalia” indicates a PND calculation to detect an increase in immediate echolalia using the highest baseline data point.

“Decreased Echolalia” indicates a PND calculation to detect a decrease in immediate echolalia using the lowest baseline data point.

Visual inspection of the data on students’ social-communication behaviors in the primary context indicates increases in overall responses and verbal initiations from baseline to follow-up for all 4 students. Figure 2 presents this data.

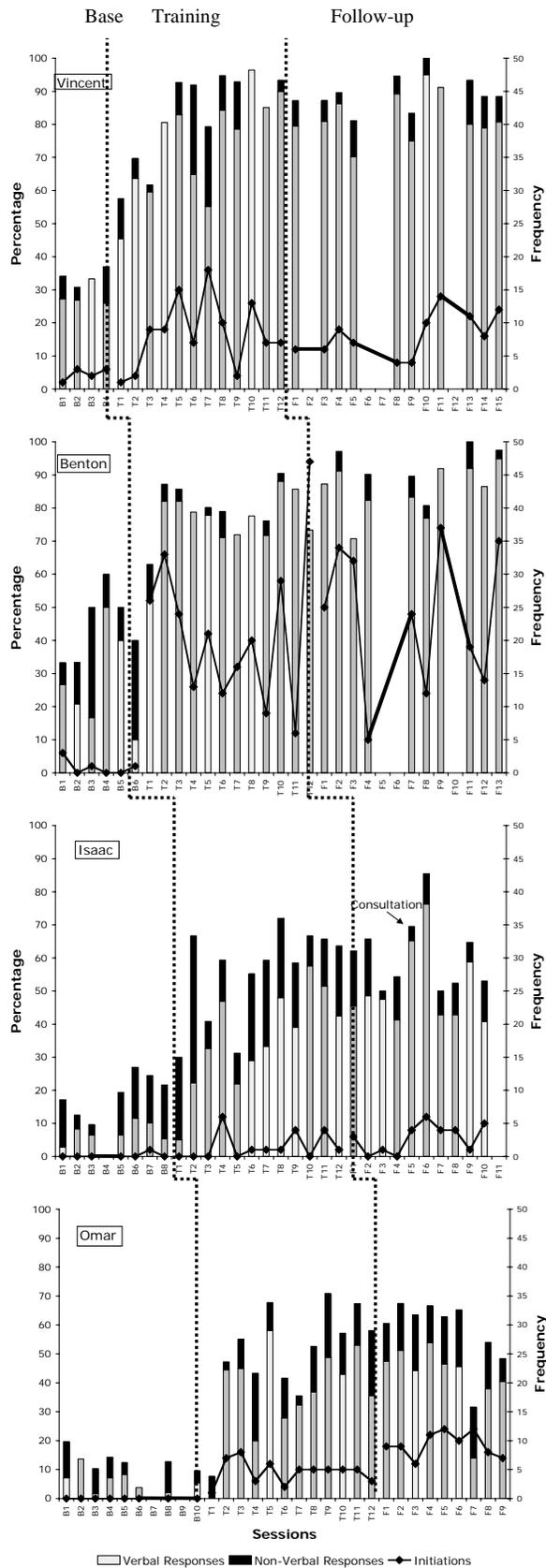


Figure 2. Students' percentages of responses and frequencies of initiations across phases.

In regards to the students' rates of responses, the mean rates overall percentages of responses from baseline to training increased from 31% (range 26% to 34%) to 89% (range, 81% to 100%) for Vincent, from 44% (range, 33% to 60%) to 89% (range 71% to 100%) for Benton, from 18% (range, 10% to 27%) to 57% (range, 50% to 85%) for Isaac, and from 12% (range 4% to 20%) to 50% (range 32% to 62%) for Omar.

Additionally, the students' type of responses changed from baseline to follow-up, noted by increased percentages of the students' total responses being made by means of verbal responses as opposed to non-verbal responses. Percentages of verbal responses were calculated by dividing the number of verbal responses by the total number of responses, multiplied by 100. Specifically, Vincent's rate of verbal responses rose from 82% to 92%, Benton's from 65% to 96%, Isaac's from 38% to 85%, and Omar's from 12% to 50%.

Mean rates of verbal initiations in the primary context also increased from baseline to follow-up for all 4 students. Specifically, Vincent and Benton had low mean rates of verbal initiations at baseline of 2 and 1 mean occurrences per session respectively. These rates increased to mean rates of 8 verbal initiations for Vincent and 24 verbal initiations for Benton per session during follow-up. Isaac and Omar, on the other hand, had mean rates of 0 verbal initiations during baseline, with Isaac only verbally initiating once out of seven baseline sessions, and Omar not verbally initiating at all. During follow-up, Isaac's verbal initiations increased to a mean rate of 3 instances per session, and Omar's increased to a mean rate of 9 instances per session.

As indicated by the PND that was reported in Table 14, meaningful differences in the students' immediate echolalia from baseline to training were not detected. However, slight steady decreases in the students' mean rates of immediate echolalia across phases occurred for Benton, Isaac, and Omar. Table 15 presents the mean frequency of immediate echolalia for the students during the 10-minute coded segments across phases.

Table 15

*Means and Ranges of Students' Echolalia Across Phases*

Student	Baseline	Training	Post-Training
Vincent	8 (4 - 12)	12 (5 - 18)	7 (1 - 15)
Benton	5 (0 - 11)	3 (0 - 8)	2 (0 - 4)
Isaac	2 (0 - 5)	1 (1 - 6)	0 (0 - 3)
Omar	2 (0 - 3)	1 (1 - 6)	1 (0 - 2)

*Play behavioral changes.* Data was collected on the play behaviors of the percentage of time appropriately engaged and the frequency of varied play. Calculations of PND from the data collected in the primary context indicated that PRT was highly effective in increasing the students' percentage of time appropriately engaged, but was ineffective in increasing the students' varied play during each session. Table 16 presents the PND from baseline to training of the play behaviors for each student.

Table 16

*Percentages of Non-Overlapping Data of Students' Play Behaviors*

Behavior	Vincent	Benton	Isaac	Omar
Appropriate	100	100	88	100
Varied Play	0	0	13	25

*Note:* The PND was calculated from the changes in data that occurred in the primary context from the baseline to the training phases of the study.

Visual inspection of the data presented in Figure 3 supports these findings. In regards to the percentage of time the students were appropriately engaged in the primary context, significant increases occurred from baseline to follow-up for all 4 students. Specifically, Vincent's mean rate of percentage of time appropriately engaged increased from 37% (range, 22% to 56%) to 98% (range, 92% to 100%), Benton's from 59% (range, 40% to 70%) to 97% (range, 93% to 100%), Isaac's from 41% (14% to 84%) to 84% (range, 58% to 100%), and Omar's from 33% (range, 12% to 53%) to 94% (range 88% to 98%).

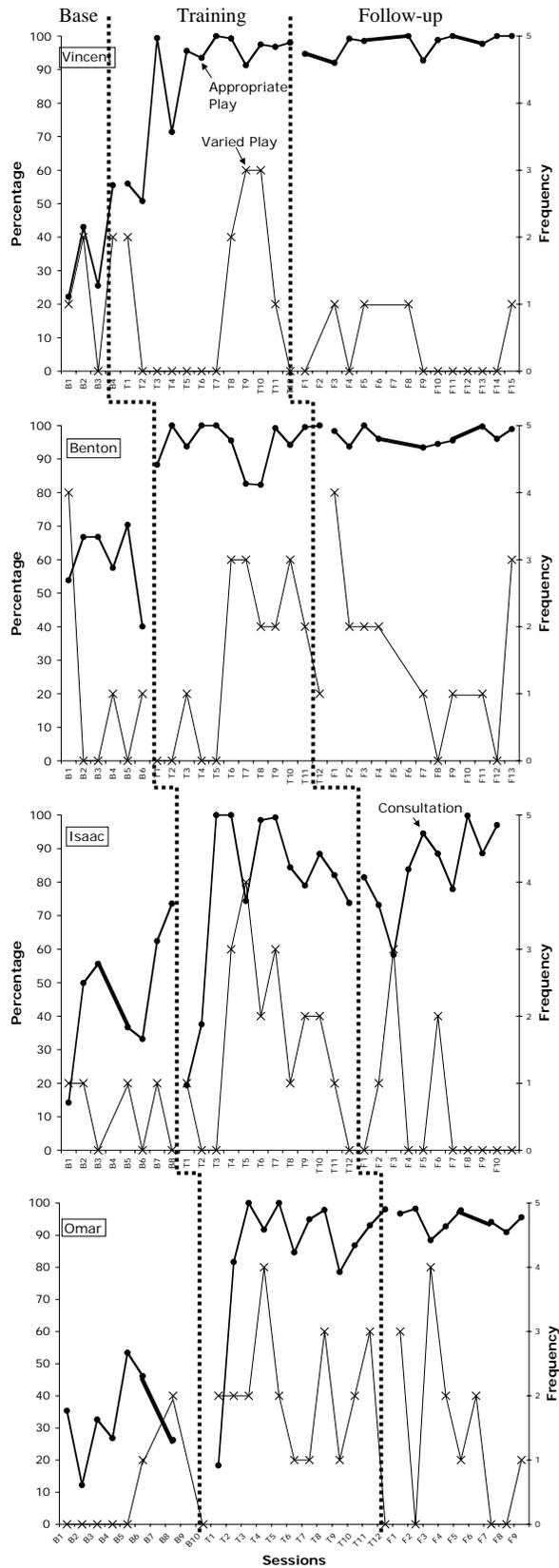


Figure 3. Students' percentages of time appropriately engaged and frequencies of varied play.

Also represented in Figure 3, are the students' variations in play in the primary context across phases. In fitting with the results of the PND calculations that suggest PRT was ineffective in increasing varied play, visual inspection of the data reveals inconsistencies and variability, with no stable, discernable trends. The mean rates of the students' varied play from baseline to follow-up slightly decreased for Vincent, remained stable for Isaac, and slightly increased for Benton and Omar. The mean rates for the students' varied play during baseline and follow-up are presented in Table 17. However, it should be noted, that the data presented is limited in its capacity to capture overall play variation, since variations in play were documented as they occurred during each session, but not as they emerged from session to session. For example, it was anecdotally noted that during the baseline phase Benton only engaged in play in two different ways. Within the baseline sessions he would vary, or alternate, between these two play schemes. Then, during training he began to play with a variety of objects, in a variety of ways. However due to the limitations of the definition presented for data collection, the emergence of new play at the start of each session was not captured, only his variations of play within the sessions.

Table 17

*Means and Ranges of Students' Varied Play*

Phase	Vincent	Benton	Isaac	Omar
Baseline	1 (0 - 2)	1 (0 - 4)	1 (0 - 1)	0 (0 - 2)
Follow-up	0 (0 - 1)	2 (0 - 4)	1 (0 - 3)	2 (0 - 4)

*Behavioral changes across untrained contexts.* To fully examine the extent in which the level of fidelity PRT was implemented with by the practitioners positively impacted the students' social-communication and play behaviors, mean rates of the students' behaviors were compared across contexts. Additionally, consideration was given to the level of fidelity by which the practitioners' implemented PRT in the untrained secondary and tertiary contexts for results interpretation.

Overall, increases in the level of fidelity in which the practitioners implemented PRT appear to have had an impact on the increased mean rates of the students' social-communication and play behaviors. However, it should be noted that students' behavioral increases in the untrained secondary and tertiary contexts were achieved in the absence of consistent practitioner fidelity of implementation above the minimum standard 80% rate of fidelity proposed by Koegel and colleagues (1989). In general, all four students experienced meaningful behavioral changes across the untrained contexts. Table 18 presents the mean rates for the students' behaviors examined of appropriate engagement, total responses, and initiations across contexts.

Table 18

*Mean Rates of Students' Behaviors During Baseline and Follow-up Across Contexts*

Behavior	Context	Vincent		Benton		Isaac		Omar	
		Base	Follow	Base	Follow	Base	Follow	Base	Follow
Appropriate	Primary	37%	98%	59%	97%	41%	84%	33%	94%
	Secondary	68%	97%	99%	100%	63%	92%	12%	65%
	Tertiary	77%	100%	94%	---	65%	94%	49%	77%
Responses	Primary	31%	89%	44%	89%	18%	57%	12%	50%
	Secondary	45%	89%	50%	88%	33%	68%	15%	48%
	Tertiary	53%	82%	56%	---	12%	50%	12%	43%
Initiations	Primary	2	8	1	24	0	3	0	9
	Secondary	1	7	0	7	0	3	0	7
	Tertiary	1	7	0	---	0	2	0	3

Benton's practitioner achieved consistent fidelity of implementation across the secondary context, and Benton's behavioral gains in the secondary context reflect this. His mean rates of appropriate engagement and total responses during follow-up are comparable at 97% and 98% for appropriate engagement, and 88% and 89% for total responses across the primary and secondary contexts respectively. His verbal initiations in the secondary context also significantly increased, from a mean rate of 0 verbal

initiations per session at baseline to a mean rate of 7 verbal initiations per session during follow-up. And although this increase was not as dramatic as his increased rate of verbal initiations in the primary context, from a mean rate of 1 verbal initiation per session at baseline to a mean rate of 24 verbal initiations per session at follow-up, it is still a significant increase. It should be noted however, that Benton's secondary context was kindergarten centers with typically developed peers present, and data was not collected on initiations to peers.

Vincent's and Isaac's practitioners inconsistently implemented PRT with fidelity in the secondary and tertiary contexts during follow-up, yet despite the inconsistency of the rates of fidelity of implementation Vincent and Isaac achieved comparable follow-up mean rates of appropriate engagement, total responses, and verbal initiations across all three contexts, and at times their mean rates of behaviors in the untrained contexts slightly exceeded the mean rates of the behaviors in the primary context.

Omar's practitioner did not achieve fidelity of implementation across the untrained secondary and tertiary contexts, however Omar still achieved behavioral increases across contexts. Specifically, Omar's mean rates of responses and verbal initiations in the secondary context (48% and 7 occurrences per session, respectively) were comparable to his mean rate of responses and verbal initiations in the primary context (50% and 9 occurrences per session, respectively). His rates of these behaviors in the tertiary context were only slightly lower. There was however a notable difference in the mean rates of the percentages of time Omar was appropriately engaged in the primary context (94%), compared to the secondary (65%) and tertiary contexts (77%).

## Social Validity

Of significance is the acceptance of PRT by the practitioners, and their perception of the utility of PRT within educational contexts. The following is a descriptive analysis of the data gathered using a measure of social validity (Appendix N) that was completed by the practitioners at the conclusion of training. The scale used for the measure of social validity was: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, (5) strongly agree. All four of the practitioners strongly agreed that PRT was appropriate for their students' social-communication and play goals. Likewise, all of the practitioners strongly agreed that PRT was a useful intervention, and that they would all use the intervention with other students with ASDs, as well as recommend PRT to other practitioners. Isaac's practitioner disagreed with the statement, "PRT was easy to implement." All other questions were rated as either "agree" or "strongly agree" by all four of the practitioners. The practitioners' ratings for each item are provided in Table 19.

Table 19

*Practitioners' Ratings of Social Validity*

Question	Vincent	Benton	Isaac	Omar
1. PRT was appropriate for the student's social-communication goals.	5	5	5	5
2. PRT was appropriate for the student's play goals	5	5	5	5
3. PRT was easy to implement.	4	5	2	4
4. My student who participated in PRT demonstrated social-communication improvements.	4	5	5	5
5. My student who participated in PRT demonstrated play improvements.	4	5	5	4
6. I would recommend PRT to other practitioners.	5	5	5	5
7. PRT is an appropriate intervention for multiple contexts throughout my student's day.	4	5	5	5
8. I would use PRT with other students with autism spectrum disorders	5	5	5	5
9. PRT is a useful intervention.	5	5	5	5
10. I plan to continue to use PRT	4	5	5	5

## Summary

All four practitioners successfully completed training by meeting the proposed mastery criteria of implementing the core behaviors of PRT across a minimum of four out of five 2-minute segments from a 10-minute sample, on at least two consecutive days

(Koegel et al., 1989). Once trained, three out of four of the practitioners maintained the integrity of treatment over a six to ten week follow-up period.

There was variability among the practitioners in their generalization of PRT across untrained educational contexts. Only Benton's practitioner consistently implemented PRT with fidelity in an untrained context, while Vincent's and Isaac's practitioners inconsistently implemented PRT with fidelity across the untrained contexts, and Omar's practitioner did not implement PRT with fidelity.

All four students exhibited improvement in the social-communication and play behaviors of responses, verbal initiations, and appropriate engagement. Additionally, all four students increased their rates of these behaviors across their secondary and tertiary untrained contexts, with Benton, Vincent, and Isaac achieving behavioral gains comparable to those in the primary context. However, the use of PRT by the practitioners did not have a definitive effect on the students' rates of varied play or immediate echolalia.

Overall the practitioners agreed or strongly agreed with the social validity of PRT as a useful intervention that was beneficial for their students.

## CHAPTER IV

### DISCUSSION

The purpose of this study was to evaluate the feasibility of training practitioners to implement PRT within naturally occurring educational contexts. The objectives of this study were to: 1) determine if practitioners maintained the use of PRT over time, or if consultative services were necessary for maintenance, 2) evaluate the degree to which practitioners generalized PRT to untrained educational contexts, and 3) examine the degree in which students with ASDs social-communication and play behaviors were effected by their practitioners' implementation of PRT within naturally occurring educational contexts. Although PRT had already been established as an empirically supported intervention for treatment of social-communicative and play behaviors of children with ASDs (e.g. Pierce & Schreibman, 1995; 1997; Sherer & Schreibman, 2005), the viability of PRT within educational contexts as delivered by practitioners had yet to be explored in depth prior to this study.

The current study expanded on the existing literature on PRT by: 1) using practitioners as agents of change, 2) collecting data across multiple naturally occurring educational contexts, and 3) using the responder characteristics proposed by Sherer and Schreibman (2005) to identify students who were likely to respond to PRT, and 4) reporting treatment integrity of the practitioners' during follow-up and across untrained contexts. Further, a measure of social validity, completed by the practitioners provided additional insight into the viability of PRT within educational contexts.

In the current study, a concurrent multiple baseline design across participants

consisting of the phases baseline, training, and follow-up was utilized. After natural rates of the practitioners' and students' behaviors were obtained during baseline, the practitioners were trained to implement PRT with fidelity, as determined by meeting the mastery criteria proposed by Koegel and colleagues (1989) of implementing the core behaviors of PRT across a minimum of four out of five 2-minute segments from a 10-minute sample, on at least two consecutive days. The training consisted of the use of modeling, coached practice, and performance feedback in a primary training context, with multiple exemplars provided on how to generalize treatment across additional educational contexts. Then, during follow-up the practitioners' rates of fidelity were monitored to determine if the practitioners were maintaining adequate treatment fidelity, or if they instead met the design criteria to receive additional consultation booster sessions.

The results of the study indicated that once practitioners were trained as intervention agents to implement PRT: 1) there was variability among the practitioners' maintenance of the fidelity of implementation over time, 2) there was variability among the practitioners' generalization of PRT with fidelity across untrained educational contexts and, 3) the use of PRT by the practitioners had a positive effect on the students' social-communication and play behaviors of appropriate engagement, responses, and verbal initiations within naturally occurring educational contexts.

The results of this study demonstrated the feasible practical application of PRT by practitioners to students with ASDs within naturally occurring educational contexts. More specifically, the results indicate the potential for some practitioners to maintain the

use of PRT with fidelity without additional consultative support after training has ended, but the results also indicate a need to consider other potential variables to increase the likelihood of treatment maintenance by all practitioners. Additionally, a measure of social validity capturing the practitioners' perception of ease of use of PRT may help predict which practitioners would require additional consultation in order to maintain the fidelity of PRT over time. Despite the practitioners' variability of fidelity across generalization contexts, the results of the current study indicate that social-communication and play behavioral benefits may still be achieved by students with ASDs across untrained educational contexts in the absence of consistent treatment fidelity at the rate of 80% as proposed by Koegel and colleagues (1989).

The following discussion first presents considerations for interpretation of the current study's specific research questions. Then, the limitations of the current study are described. Finally, the implications of the results of this study on practice and research are summarized.

### Research Questions

*Do practitioners maintain the fidelity of implementation of PRT once they are trained, or is consultation necessary?*

The findings in the current study indicate that three out of four of the practitioners were able to maintain the use of PRT with fidelity in the primary educational context in which they were trained. First off, these results are in concert with the findings of previous studies on practitioner training that indicate a greater likelihood of treatment maintenance when the variables of: 1) providing performance feedback (Alvero, Bucklin,

& Austin, 2001; Noell & Witt, 1999; Noell et al., 2005) and 2) training within the practitioners' classrooms (Rose & Church, 1998) are present during training. Second, because one of the practitioners in the current study was unable to maintain the use of PRT with fidelity in the primary context, the results of this study also indicate the potential need for on-going consultation for some practitioners in order to maintain treatment integrity post-training. This is fitting with the previous recommendation to sustain an on-going cycle of consultation and feedback in order to maintain treatment integrity that was based on a review of the literature (Hans & Weiss, 2005). Third, practitioner specific variables, such as perception of ease of treatment and specialized educational knowledge may have had an effect on the maintenance of the treatment. Each of these findings will be discussed here.

*Training variables.* The current study incorporated strategies identified as promoting the likelihood of the maintenance of skills, which included, providing performance feedback (Alvero, Bucklin, & Austin, 2001; Noell & Witt, 1999; Noell et al., 2005) and training within the naturally occurring context in which the skills would be utilized (Rose & Church, 1998).

In a review of the literature on performance feedback, Alvero, Bucklin and Austin (2001) reported the highest level of consistent effects when performance feedback was provided in graphed format along with either written or verbal feedback. In the current study, a combination of written and verbal performance feedback was provided, but the feedback was not graphed. The addition of providing graphed feedback to practitioners may produce an even greater effect on the sustainability of the trained implementer

behaviors. More research is needed to see if such an addition would make a difference in practitioners' sustainability of PRT.

Other studies indicate that on-going consultative support may be an optimal approach to promoting practitioners' maintenance of treatments' integrities (See Hans & Weiss, 2005 for a review). However, in the current study only one of the four practitioners required consultation in order to maintain PRT with fidelity in the primary context. Additionally, it is important to consider that providing provisions for on-going consultative support is not a practical model for treatment within the resource constraints of typical school districts. Consequently, it may be prudent to turn our attention to identifying practitioners' characteristics that make the maintenance of treatment more likely.

*Practitioner characteristics.* At the onset of the study, descriptive data on the practitioners' level of education, emphasis of degree, prior knowledge of PRT, position held, years of experience working with students with ASDs, and years of experience working with the student with whom they were paired was collected. An examination of this data indicates some noteworthy differences to consider in the current study.

In regards to level of education, the degree held by the practitioners in the present study did not appear to have an impact on the acquisition of treatment skills, or implementation of the treatment after the completion of training. However, this must be interpreted with great caution given the limited number of participants in the current study. With this caution in mind however, the lack of relationship between the practitioners' maintenance of PRT and level of education in the current study is similar to

the findings of a recent study in which level of education was examined further by training three caregivers' with limited education, one with a GED and two with high school diplomas, to implement PRT (Randolph, Stichter, Schmidt, Visovsky, & Schultz, manuscript in process). The results of Randolph and colleagues (manuscript in process) study indicate that level of education was not critical to the acquisition and maintenance of PRT.

An additional study on practitioner training indicates that level of degree does not appear to be as critical as specific content of degree (Wayne and Youngs, 2003). They further conclude that this may be especially critical in specialized areas of study, such as mathematics and science when the higher degrees are held in those specialized areas. This leads to the interpretation that higher degrees may not be as relevant an indicator of practitioner influence on student achievement as acquiring knowledge specific to instructional content.

Although Wayne and Young's (2003) study was related to instruction provided by general education teachers with varying degrees, the same significance on "specialized knowledge" may hold true for the practitioners in the present study in relation to their specific knowledge of special education, early development, and ASDs. To take the case in point, it should be noted that although Isaac's practitioner held a masters of the arts degree, her degree was in business and not in special education. Additionally, she had less experience working with students with ASDs and less experience working with the child she was assigned in comparison to some of the other practitioners in the study. These variables may indicate her limitation of specialized knowledge, and therefore may

have affected her ongoing implementation of PRT with fidelity.

In regards to prior knowledge of PRT, although Vincent's and Benton's practitioners had prior knowledge of PRT, their knowledge was limited to an overview of the techniques provided in a lecture-based training over a year prior to the start of the current study. Baseline data of these practitioners, compared to the two practitioners without any previous knowledge of PRT indicate that, similar to other research findings, lecture-based training alone does not support practitioners' use of the skills presented (Han & Weiss, 2005; Noell et al., 1997). There was no meaningful difference in the baseline rates of naturally occurring implementation of PRT between the practitioners who had previous knowledge of PRT, and the ones who did not. Prior exposure to PRT may have, however, affected the practitioners' initial acceptance of its use as a treatment. Previous research supports that a practitioner's attitude towards a treatment may play a critical role in the maintenance and generalization of trained skills (Gersten, Chard, & Baker, 2000; Han & Weiss, 2005). This may therefore indicate that the previous knowledge of PRT may have had a positive effect on Vincent's and Benton's practitioners' maintenance of the fidelity of PRT during follow-up.

*Practitioners' attitudes towards PRT.* It is well understood that socially valid interventions are more likely to be maintained and generalized (Gersten et al., 2000; Han & Weiss, 2005). As a result social validity measures are one common way to capture practitioners' attitudes towards the treatment. In the current study practitioners' feedback on the social validity of the use of PRT in naturally occurring educational contexts was obtained. Specifically, the practitioners' perception of: 1) the appropriateness of PRT to

target the students' social-communication and play goals, 2) the behavioral benefits achieved by the students, 3) the ease of use of PRT, 4) the appropriateness of PRT for use across multiple contexts, and 5) the overall satisfaction with PRT were explored. The results indicate that PRT was viewed favorably as an effective treatment within educational contexts.

More specifically, the results of the current study indicate that the practitioners either agreed or strongly agreed with the social validity of PRT for use with students with ASDs within naturally occurring educational contexts. However, it is noteworthy to point out that Isaac's practitioner, the one who required an additional consultative booster session during follow-up, disagreed with the statement "PRT was easy to implement", while the other practitioners, who maintained the fidelity of implementation, agreed or strongly agreed with the same statement. For practical purposes, this may indicate the potential to predict the practitioners who will need additional consultation services in order to maintain treatment post-training based upon their answer to this question. More research is needed on the use of social validity measures to identify predictor variables of treatment maintenance and generalization in order to better develop supportive programming.

*To what extent do practitioners' generalize the implementation of PRT to additional educational contexts once they are trained?*

There was an apparent disconnect between the practitioners' perception of the treatment's usefulness across multiple contexts as rated on the measure of social validity, and the practitioners' actual fidelity of implementation of PRT across untrained contexts.

Specifically, in regards to the statement “PRT is an appropriate intervention for multiple contexts throughout my student’s day”, Vincent’s practitioner “agreed”, and Benton’s, Isaac’s, and Omar’s practitioners “strongly agreed”. Yet, the results of the study indicate that even though all four of the practitioners increased their percentages of implementation of the core behaviors of PRT across contexts during follow-up when compared to their natural rates of these behaviors at baseline, only Benton’s practitioner was able to consistently generalize PRT with fidelity to an untrained context. The other practitioners inconsistently implemented PRT with fidelity (Vincent’s and Isaac’s practitioners), or did not implement PRT with fidelity (Omar’s practitioner) across the untrained contexts during the follow-up phase.

The lack of consistent treatment generalization by the practitioners may indicate one of three things, or a combination of the following three considerations. First, it may indicate a need to train practitioners more explicitly across contexts. Second, it may indicate the incompatibility of PRT to some contexts. Third, it may indicate that individual practitioner variables have an effect on treatment generalization. This section first presents a discussion of training variables that make the generalization of treatment more likely, and a reflection of how those training variables relate to the current study. Then, an examination of contextual variables and their potential roll in treatment generalization is discussed. Finally, the individual practitioner variables discussed previously is briefly summarized into recommendations for future research.

*Training variables.* Scheeler’s (2008) review of the literature on practitioner’s generalization of skills, highlighted four key components necessary for treatment

generalization: 1) immediate feedback, 2) training to mastery, 3) specifically programming for generalization, and 4) providing feedback within the classroom setting in which it will occur. The current study utilized these training components by: 1) providing immediate feedback during the practice portion of the training sessions, 2) training the practitioners to implement PRT until the mastery criteria for fidelity proposed by Koegel and colleagues (1989) was achieved, 3) discussing multiple exemplars of treatment use in additional educational contexts, and 4) providing the training within the students' naturally occurring routines in their special education classrooms.

Moreover, this study employed the use of programming for common stimuli, which was recommended in addition to training sufficient exemplars, in Stokes and Baer's (1977) seminal piece on treatment generalization. Programming for common stimuli, defined as ensuring that sufficient common stimulus components are present in both the trained and untrained settings, was achieved across contexts by: 1) having the practitioners paired with the same students across contexts, 2) having the contexts structured similarly in their allowance of open-communication by the students, and 3) having the treatment embedded in the structures of play in both the primary and secondary contexts. Yet, in spite of the application of the recommended structures for treatment generalization, the results of the current study indicate that these structures were not sufficient enough to promote the practitioners' generalization of PRT with fidelity across untrained educational contexts.

It should be noted, that although re-training across settings was also highlighted by Stokes and Baer (1977) as an effective generalization procedure, this study did not

employ procedures to specifically re-train across each educational context in which data was collected in an attempt to streamline the training process in order to present a potentially more viable training model for implementation within the structures of typical school districts.

*Contextual variables.* Although consideration should be given to the potential contextual variables that make practitioners' generalization of PRT more likely, the results of the current study suggest that the variables present across contexts in the current study may not play a critical role in treatment generalization.

Three educational contexts were utilized for each participant dyad during the study. The primary educational context utilized for all for participant dyads was during unstructured playtimes within the students' special education classrooms. Secondary and tertiary contexts were used to analyze the stimulus generalization. The secondary context was similar to the primary context in having its structure based in play and in the type of materials available. Specifically, kindergarten centers within the general education setting was selected for Isaac and Benton, and recess was selected for Omar and Vincent.

The tertiary context was used to examine the notion that treatment can be incorporated into everyday routines (Koegel & Koegel, 2006). Therefore, the tertiary educational contexts had materials different from those in the primary context (not toys) and more structure than the primary context, but still permitted open-communication of the students. For Isaac and Vincent a special education art class was selected, and for Omar and Benton a daily chore time was selected as the tertiary contexts.

The results indicate no clear contextual variables that may have affected the practitioners' generalization of PRT across contexts. Specifically, comparisons of the practitioners' mean rates of fidelity of implementation of PRT across untrained contexts indicate that Vincent's and Benton's practitioners implemented PRT with fidelity in the secondary contexts of recess and kindergarten centers respectively, whereas, Isaac's and Omar's practitioners did not implement PRT with fidelity in the same contexts of kindergarten centers for Isaac and recess for Omar. Additionally, Vincent's and Isaac's practitioners mean rates of implementation indicate that they implemented PRT with fidelity in the tertiary context of art, while Omar's practitioner failed to implement PRT with fidelity in the tertiary context of chores. It should be noted here, however, that because data could not be collected on Benton's practitioner's implementation of PRT in the tertiary context of chores due to a schedule change after the initial baseline phase, there is no data available by which to compare Omar's practitioner's rates of implementation in the same context in order to determine if there may have been variables specific to the context of chores that made it difficult to implement the treatment with fidelity. In summary, the lack of relationship between the contextual variables and practitioners' level of fidelity of PRT across contexts indicates that contextual variables did not likely play a critical role in the practitioners' generalization of PRT in the current study.

*Practitioner characteristics.* Practitioner characteristics are a potential variable, discussed previously, that may have an effect on the generalization of treatment. More research is needed to better understand the potential affect of practitioners'

characteristics, such as knowledge specific to educating children with ASDs, years of experience working with children with ASDs, acceptance of PRT, and other characteristics of instructional style on practitioners' generalization of PRT across untrained educational contexts.

It is essential to note, that in spite of the lack of the practitioners' generalization of PRT at the 80% rate of fidelity proposed by Koegel and colleagues (1989), the students' in the current study exhibited behavioral benefits across contexts. The significance and implications of these findings are further discussed in the next section examining the third research question.

*To what extent does the level of fidelity in which PRT is implemented by practitioners positively impact social-communication and play outcomes for students with ASD in educational contexts?*

This section first presents a discussion on the similarities and differences of the students' behavioral outcomes in the primary context of the current study as compared to the behavior outcomes of the children with ASDs in previous research on PRT. Then, an explanation is provided on the potential rationales for the students' increased social-communication and play behaviors across contexts in spite of the lack of the practitioners' implementation of PRT with fidelity. Finally, a discussion of additional student characteristics that may have affected the behavioral outcomes is presented.

*Behavioral outcomes compared to previous research.* Data was collected on the students' social-communication and play behaviors of responses, initiations, immediate echolalia, appropriate engagement and varied play across contexts. Similar to the results

of previous studies using PRT (e.g. Stahmer, 1995; Pierce & Schreibman 1995; 1997; Baker-Ericzen, Stahmer, & Burns, 2007), all four of the students in the current study exhibited increased responses, initiations, and amount of time engaged appropriately. Additionally, the results of the current study indicate that the overall percentage of verbal responses of the total responses increased across participants from baseline to follow-up. Two considerations must be taken into account however when interpreting the data that indicates increased percentage of time appropriately engaged. First, Isaac's percentage of time appropriately engaged in the primary context during baseline had an increasing trend. Second, due to a coder's error, data on Omar's percentage of time appropriately engaged from his final baseline session in the primary context is not available for interpretation. However, these two considerations may be outweighed in relevance by both the increases in the mean rates of the students' percentages of time appropriately engaged from baseline to follow-up, and by the highly significant outcomes of the PND calculations.

The results of the current study differed from previous research on PRT (Sherer & Schreibman, 2005; Schreibman et al., 2009) in that the students did not demonstrate significant stable differences in the behaviors of immediate echolalia and varied play. The reported increase in immediate echolalia in previous studies may be explained by a difference in data collection from the present study. In previous research on PRT (Sherer and Schreibman, 2005; Schreibman et al., 2009) the data on immediate echolalia was combined with rates of prompted speech and spontaneous utterances and collapsed into one reported rate of verbal speech that resulted in assumptions of increased rates of

immediate echolalia as a result of PRT. Additionally, because the literature has suggested that echolalia may serve various functions (Wetherby, 1986), this present study separated echolalia into its own reporting category for a more fine grain analysis in order to examine if PRT had an effect on echolalic speech. The results of the present study indicate a slight decrease in the mean rates of immediate echolalia from baseline to follow-up for three of the four participants, but the calculation of PND indicated that PRT was ineffective in changing the students' rates of immediate echolalia. Further replication utilizing immediate echolalia as a separate, distinct behavior is warranted to better clarify the impact of PRT on immediate echolalia.

The lack of increases in varied play in the current study differed from previous research. There are at least two reasons for this. First, the data collected on the frequency of variations in play in the primary context was limited to capturing variations in play that occurred during each session, but not as they emerged from session to session. Second, there was a difference of the mean ages of the participants between these two studies. Specifically, in Sherer and Schreibman's (2005) study, the mean age of the children was 3 years and 3 months, while the mean age of the participants in the current study was 7 years and 11 months. This may account for some of the difference in the variation of play observed during the 10-minuted coded intervals in each study. In fact, maintaining play during a 10-minute session, but demonstrating overall variation from session to session (although not captured in the data collection) may be more appropriate for elementary age children, as in the current study. Any further interpretation of this data is limited by not having mean rates of variations in play of typical peers, both

chronologically and developmentally, by which to compare the results of the current study.

*Behavioral changes across untrained contexts.* The current study is the first to report on the generalization of the fidelity of implementation across untrained contexts. Similar to the current study, Stahmer (1995) reported on the successful generalization of the social-communication and play behavior outcomes of children with ASDs across untrained contexts and stimuli. However, with the addition of reported practitioner fidelity of implementation across untrained contexts, the results of the current study provide further insight into the interpretation of the students' behavioral changes across untrained contexts. Overall, increases in the level of fidelity in which the practitioners implemented PRT appear to have had an impact on the increased mean rates of the students' social-communication and play behaviors. However, also of importance is the increase in the students' behaviors across untrained contexts in the absence fidelity of implementation by the practitioners. Refer to Table 17 in the third chapter on the results for specific mean rates for the students' behaviors.

In light of this, it may be that the proposed 80% rate of fidelity, as prescribed by Koegel and colleagues (1989) is not necessary in order to achieve treatment benefit. Further research is need to examine: 1) if there is an ideal rate of fidelity of implementation in which maximum benefit may be achieved, 2) if there is a corresponding minimal rate of fidelity in which some benefit may still be achieved, and 3) if there are specific implementer behaviors that are more critical than others.

*Student characteristics.* Participant characteristics are a significant consideration in results interpretation. This study attempted to increase the likelihood of the students' responsiveness to PRT by utilizing the procedures of identifying "responders" to PRT outlined by Sherer and Schreibman (2005). To be included in the present study, the students had to meet the cutoff percentage of intervals of occurrence for at least four out of five of the responder behaviors. One participant, Vincent, met the criteria of "responder" for all five behaviors screened. The other three student participants met the criteria for 4 out of 5 of the behaviors screened. All three of these participants, Benton, Isaac, and Omar did not meet the criteria for the behavior of toy engagement. As discussed previously, all four of the participants achieved positive social-communication and play behavioral changes of increases in responsiveness, initiations, and appropriate engagement when comparing data in the primary context from baseline to follow-up.

Following the initiation of this study, Schreibman and colleagues (2009) published a brief report outlining a refined predictive behavioral profile of child responsiveness to PRT. Their study isolated the previously determined predictive behaviors for responsiveness of high rates of toy engagement and low rates of avoidance to examine the strength of each of these behaviors in predicting responsiveness to PRT. The six children with ASDs who participated in the study comprised three who met the criteria for "nonresponders" except for the behavior of appropriate toy engagement, and three who met the criteria of "non-responders" except for the behavior of avoidance. The benefit the children achieved from 18 hours of PRT was compared between the two groups of participants. The results of Schreibman and colleague's (2009) investigation

suggested that high rates of appropriate toy engagement may be a stronger predictor of responsiveness to PRT than low rates of social avoidance.

In light of these results, it is possible that the benefit achieved by Benton, Isaac, and Omar was constrained by their limited appropriate toy engagement that was identified through the screening process. They did, however, still achieve significant benefit. This reflection is significant because it suggests that although high rates of appropriate toy engagement was a stronger predictor of responsiveness than low rates of avoidance in Schreibman and colleague's (2009) study, benefit can still be achieved from PRT by students meeting a combination of the other predictive characteristics in lieu of meeting the criteria for appropriate toy engagement.

Also of importance is the consideration of the students' developmental levels across domains as reported from results of the PEP-3 (Schopler et al., 2005). Specifically, Vincent, Benton, and Omar had somewhat higher developmental functioning in the areas of cognitive verbal performance and expressive language than Isaac. Either of these variables, or the combination of the two may account for Isaac's lesser rate of initiations, compared to the other three students'.

All four students had comparable developmental ages within five months of one another in the area of receptive language, thus making it an unlikely cause of differential outcomes. Likewise, developmental functioning in the area of visual-motor imitation did not appear to have an effect on the students' behavioral outcomes, as indicated by Vincent's comparable behavioral gains despite his significantly lower developmental functioning in this domain. Refer to Table 3 in the second chapter on the research

method for the students' specific developmental ages of functioning across domains.

Future research is warranted to continue to isolate and study individual behaviors and combinations of predictive behaviors to continue to better refine the description of potential responders. However, within this line of research, it is critical to acknowledge the potential benefit, although perhaps not a maximum benefit, that may be achieved when some, but not all of the responder variables are present.

#### Limitations

As always, caution must be exhibited in the interpretation of the results, because of the multitude of variables that cannot be controlled for in naturalistic environments. First, the researcher could not control for the time of day in which the students' multiple contexts were scheduled. Ideally, all data would have been collected during the same time of day. As it was, Vincent's and Benton's primary data was collected mid day, while Isaac's and Omar's primary data was collected early afternoon. All data collected in the secondary and tertiary contexts occurred during the afternoon.

A second consideration is that the presence of the observers and video recording equipment may have had reactive effects. Consequently, it is also unknown if this had an effect on the practitioners' use of PRT and on the students' behaviors. Furthermore, it is unknown how often the practitioners implemented PRT when the researcher was not present, and how this may have affected the outcomes of the research.

Also of significance, only a limited number of probes were obtained across contexts during the baseline phase. This was due to a variety of reasons. First, during this initial phase of the study, inclement weather prevented outdoor recess from

occurring. Probes were not collected during indoor recess in place of outdoor recess because the contexts were considerably different, as some practitioners scheduled structured class group activities to occur during indoor recess. Secondly, the secondary and tertiary contexts all occurred at the end of the school day, and were frequently canceled due to early dismissals, assemblies, and meetings.

An additional limitation was the small number of participant-dyads in the study. The limited number of participants, and the single-subject design of the study limit the ability of the results to be generalized to other practitioner-student dyads. Additional replications are needed across various educational contexts to provide support for the use of PRT within naturally occurring educational contexts.

#### Summary of Implications for Practice and Research

The current study was an extension of the existing research on PRT in that it used practitioners as agents of change, assessed outcomes across multiple naturally occurring educational contexts, used the responder characteristics proposed by Sherer and Schreibman (2005) to control for effects of student characteristics on the interpretation of the results, and reported treatment integrity during follow-up and across untrained contexts.

Additionally, the current study employed a high standard of rigor by addressing all seven of the quality indicators of single subject design outlined by Smith and colleagues (2007). Specifically, Smith, et al. (2007) proposed a 4 phase model, based on variable research design, to address the methodological challenges research design. The first phase of the model supports the use of single-case experimental designs to identify

and refine intervention techniques that show improvement in target behaviors from baseline to intervention. To identify promising practices, a summary of seven recommended quality indicators for single-subject research, as described in recent professional publications was presented. This current study was designed to address the seven recommended quality indicators by: 1) using a multiple baseline design, 2) including specific inclusion criteria for participants based on previous research, 3) defining the participants by diagnostic information and adaptive level of developmental functioning, 4) replicating the intervention across three or more participants, 5) assessing both generalization and maintenance, 6) having interobserver agreement of the targeted behavioral outcome measures coded from videos by research assistants blind to the phase of the study in which they were coding for, and 7) measuring the fidelity of the intervention consistently throughout all phases.

The goal of the current study was to address the viability of PRT within educational contexts. In particular, the current study took into consideration recommended multiple dimensions of treatment compatibility (Greene, 1995) by examining student-treatment compatibility, practitioner-treatment compatibility, and treatment-context compatibility. The results of the study provide evidence that students with ASDs can achieve benefit from PRT in naturally occurring educational contexts. Additionally, the results indicate that not all of the responsive predictor characteristics outlined by Sherer and Schreibman (2005) and refined by Schreibman and colleagues (2009) must be met in order for students to achieve benefit from practitioner implemented PRT. More research is needed to identify the most salient characteristics of

the responders to treatment, and to better identify the scope of characteristics that encompass some potential benefit if not maximum benefit. The current study also supports previous research findings that level of education may not have an effect on treatment implementation (Randolph et al., manuscript in process; Wayne and Youngs, 2003), but the potential effect of other practitioner characteristics, such as specific knowledge of ASDs, and years of experience need to be explored further.

The results of the study indicate that PRT may be appropriate for use across multiple educational contexts, however it should be noted that the current study prescribed specific contextual characteristics in its examination. Future research should expand on the contextual characteristics to better understand any contextual variables that may limit the effectiveness of PRT. Of particular interest is the need for an examination of practitioner implementation of PRT in a group format, as this reflects a more common student-teacher ratio within educational institutions. It should be noted, however, that training the practitioner participants to implement PRT within the described training model took considerable resources of time and personnel to collect and analyze data on practitioner performance. This limitation should be taken into consideration if planning for the eventual implementation of a train-the-trainer model to build capacity within an educational institution.

Perhaps the most significant finding in the current study is that the results indicate that practitioner generalization of implementation of PRT with fidelity, as described by Koegel and colleagues (1989) is not necessary in order for students to achieve treatment benefit from a trained practitioner across untrained educational contexts. This supports

the efficacy of PRT as a viable model of treatment within educational institutions. More research is needed to determine if there is an ideal rate of fidelity of implementation in which maximum benefit may be achieved, and a corresponding rate in which no benefit may be achieved. Additionally, future research to examine if there are specific implementer behaviors that are more critical than others may help streamline the implementation criteria.

### Conclusion

Practitioners are challenged to provide effective services to target students with ASDs' deficits in social competence. PRT is one intervention that has empirical support for its effectiveness in promoting positive social-communication and play behavioral changes in clinical and educationally isolated settings. The current study explored the use of PRT in naturally occurring educational contexts, with practitioners as the agents of change implementing PRT.

Given the limited resources available to typical school districts, it is essential that procedures for training practitioners, and promoting the maintenance of treatment be identified to limit the pull on available resources while maximizing the potential students' achievement outcomes. The results of the present study suggest that the use of PRT by practitioners within naturally occurring educational contexts has promise.

In general, the potential benefit of PRT within educational contexts is apparent in the student participants' behavioral improvements of increased appropriate engagement, social-communicative responses and initiations. The results of this study have the potential to impact decisions about how to potentially build capacity for the use of PRT

in educational institutions through a train-the-trainer model. Such a model would address the need to have various personnel and peers trained over time.

APPENDIX A

**Research Coding Form**

**Tier I**

**Inclusion Criteria**

1. Yes No      Year published between 1985-2007: Year published \_\_\_\_
2. Yes No      Article written in English
3. Yes No      Peer reviewed
4. Yes No      Original research report
5. Yes No N/A      Single-subject design with more than 1 demonstration
7. Yes No      Is there at least one participant that meets participant criteria?  
    \_\_# of total participants in study: \_\_\_\_ year old, \_\_\_\_ grade

**Determination of Study Inclusion**

8. Yes No      Study meets all inclusion criteria. (If yes, proceed to Tier II)

**Tier II**

**Design Type**

Mark type of single subject design noted by author. If none is noted, use descriptors below to categorize type of study.

\_\_\_\_[01] Multiple baseline or variation (i.e., multiple probe)

\_\_\_\_[02] Reversal or variation (i.e., withdrawal)

\_\_\_\_[03] Multiple treatment or variation (i.e., multiple schedule, simultaneous treatment, alternating-treatment, concurrent schedule)

\_\_\_\_[04] Changing criterion \_\_\_\_\_

\_\_\_\_[05] Other: \_\_\_\_\_

Record design as labeled by author: \_\_\_\_\_

### **Utilizing Pivotal Response Training**

2. Yes or No Description of dependent variable is completed with operational precision.

3. Yes or No Assessment of dependent variable is consistent

4. Yes or No Assessment of dependent variable occurs repeatedly

5. Yes or No Measurement of dependent variable

Mark type of recording used as noted by author. If none is noted, use descriptors below to determine type.

\_\_\_\_ Interval Recording      \_\_\_\_ Frequency

\_\_\_\_ Time Sampling      \_\_\_\_ Discrete Categorization

\_\_\_\_ Latency      \_\_\_\_ Permanent Product

\_\_\_\_ Duration      \_\_\_\_ Other: \_\_\_\_ (specify)

6. Yes or No Description of independent variable is completed with replicable precision.

7. Yes or No Independent variable is systematically manipulated and under the control of the experimenter

8. Yes or No Description of baseline condition is completed with replicable precision.

9. Yes or No Functional relationship is present: The data pattern indicates that a change in the DV (academic outcome) is a function of manipulating the IV (academic treatment). PLUS, intervention effects are demonstrated 3 or more times in order to demonstrate control for threats to internal validity

10. Number of demonstrations: *If multiple baseline, combine; If more than one participant or one variable, record each separately below*

1 2 3 4 5 6 7 Participant \_\_\_\_\_; Variable \_\_\_\_\_

1 2 3 4 5 6 7 Participant \_\_\_\_\_; Variable \_\_\_\_\_

1 2 3 4 5 6 7 Participant \_\_\_\_\_; Variable \_\_\_\_\_

1 2 3 4 5 6 7 Participant \_\_\_\_\_; Variable \_\_\_\_\_

1 2 3 4 5 6 7 Participant \_\_\_\_\_; Variable \_\_\_\_\_

\_\_\_\_IOA    \_\_\_\_% sessions

### **Tier III**

#### **Desirable Quality Indicators**

11. Yes or No    Description of setting described with replicable precision.

12. Yes or No    Description of participants allows others to select individuals with similar characteristics through similar process. *Mark "no" if any 1-4 are absent: 1) age/grade, 2) gender, 3) autism, AS, ASD, PDD-NOS, 4) either criteria used to select/exclude participants including teacher nomination/referral/scores on standardized exam OR specific instrument/process used to determine disability.*

13. Yes or No    Assessment of independent variable: *treatment integrity/fidelity, or procedural reliability. Evidence for this may include checklists, observational measure, audio/video % fidelity is implementation occurring correctly:*

[01] 75% +    High

[02] 74%-50    Medium

[03] 49%-1%    Low

[04] None

[05] Unknown *only if (a) overt measurement occurred and (b) authors did not quantify*

14. Yes or No Social validity of independent variable assessed.

15. Yes or No Evidence for social validity of independent variable

16. Yes or No Social validity of dependent variable assessed

17. Yes or No Evidence of social validity of dependent variable.

### **Determination of Study Inclusion**

This study meets \_\_\_\_\_ out of **8** essential quality indicators (line codes 2 - 9).

This study meets \_\_\_\_\_ out of **7** desirable quality indicators (line codes 11 -17).

\_\_\_7      \_\_\_9

18. Yes or No Study meets minimal quality indicators. Mark “yes” if study meets all

but 1 essential\* quality indicator and meets any 2 or more desirable quality indicators

(\*line codes 7 and 9 must be included; if line codes 7 &/or 9 are not present, mark “no.”)

***If study receives “Yes” (line 18), complete Section IV***

*Maintenance/generalization:* \_\_\_\_\_

### **Section IV: Information for Three-Tiered Classification Framework**

Geographical region from where sample selected

[1] New England (CT, ME, MA, NH, RI, VT)

[6] ES Central (AL, KY, MS, TN)

[2] Middle Atlantic (NJ, NY, PA)

[7] WS Central (AR, LA, OK, TX)

[3] EN Central (IN, IL, MI, OH, WI)

[8] Mountain (AZ, CO, ID, NM, MT,

[4] WN Central (IA, KS, MN, MO, NE, ND, SD)

UT, NV, WY)

[5] S Atlantic (DE, FL, GA, MD, NC, SC, VA)

[9] Pacific (AK, CA, HI, OR, WA)

[10] Other \_\_\_\_\_(e.g., Canada, UK)

Hudson, S.S., Lewis, T.J., & Stichter, J.P. (in review). Putting Quality Indicators to the Test: An

Examination of Thirty Years of Research. *Exceptional Children*.

## APPENDIX B

### Practitioner Permission

Date:

Dear Practitioner,

You have been asked to participate in a research study entitled: *Supporting Practitioner's Use of Pivotal Response Training in Natural School Settings*. The purpose of the project is to use Pivotal Response Training to enhance the social-communication and play behaviors for children with Autism Spectrum Disorders (ASD). The participating practitioners will be trained to implement the components of PRT with a child participant. Sessions in which data will be collected will occur within your pre-existing classroom routines over the course of the second semester of the school year, from January 2009 to May 2009. Our goal is for the student participants to strengthen the following attributes: increased social-communication responses, social initiations, reduction of ritualistic behaviors, increased appropriate play, and broadening of child's interests. We hope to measure the participant's social improvements in order to document the effectiveness of PRT.

This Project has three parts:

**Assessments:**

Once the permission has been given for participation, potential participants will be screened by observing naturally occurring social interactions between the student and

practitioner. Behaviors that will be specifically observed for the student are: interest in toys, tolerance of another person in close proximity, non-verbal self-stimulatory behaviors, and verbal-stimulatory behavior. Additionally, naturally occurring rates of PRT implementation will be observed for. Once student participants for the study are selected, they will be given the Psychoeducational Profile, Third Edition (PEP-3) to obtain descriptive measures of developmental cognitive and language functioning. During the project, we will be video taping the sessions and using those videos to assess each participant's behaviors and progress throughout the semester, and to provide feedback to the practitioners. The videos will be placed in a locked cabinet when not being coded, and will only be accessible to limited, approved researchers.

**Practitioner Training:** A practitioner training component will teach each practitioner how to implement PRT within naturally occurring contexts of the participants' education program. The purpose of treatment is to target key behaviors, specifically motivation and responsiveness to cues, which have been identified as "pivotal behaviors". Koegel (2006) refers to the importance of pivotal behaviors; "Since most children with severe handicaps need to receive treatment for many behaviors it is essential to identify target behaviors for treatment that will produce simultaneous changes in many other behaviors instead of having to treat each individual behavior one at a time. Positive changes in pivotal behaviors should have widespread positive effects on many other behaviors and therefore constitute an efficient way to produce generalized improvements in the behavior of children with autism." Implementation is based on the core components

outlined in Koegel's PRT Training Manual (2006): 1) clear appropriate instruction while the child is attending; 2) maintenance tasks interspersed frequently; 3) multiple cues presented; 4) child choice; 5) contingent, effective, & immediate rewards; 6) direct reinforcers; and 7) rewards of response attempts. Practitioner training will consist of modeling, guided practice, independent practice and performance feedback regarding the implementation of PRT components.

**Follow-up sessions:** Following the completion of training, practitioners will be provided on-going support to implement PRT for two months. Support will be provided through consultation and feedback as needed. Observations will continue to be conducted in order to monitor student response to PRT.

Participation is voluntary, and you may withdraw at any time. The time to complete this project is five months. Each of the 12 training sessions will be forty-minutes and all follow-up sessions will be 10-minutes three times per week. All information collected, including videotapes, will remain absolutely confidential and only Jena Randolph will have an ongoing access to it.

Confidentiality is assured during the project. Your name will not appear on any data collected throughout the project. All data will be stored in locked files or areas under lock and key and will be kept by Jena Randolph for a minimum of three years. There are no anticipated risks associated with participating in the described project, however, if you experience any problems through participation, you are free to withdraw

from the study at any time. Consent or refusal to participate will not affect your employment or your relationship with the University. The benefits of participating include improved social-communication and play behaviors for the target student in your care.

If you have any questions or would like further information please contact: Jena Randolph (573) 356-7047, or [jkb505@mizzou.edu](mailto:jkb505@mizzou.edu), Doctoral Student in Special Education, University of Missouri. My advisor, Dr. Janine Stichter can be contacted at [stichterj@missouri.edu](mailto:stichterj@missouri.edu).

If you have questions concerning your rights as a research subject contact: Research Compliance Office, University of Missouri (573-882-8595).

**I give my permission to be observed and videotaped during implementation of the project as described above. I further understand that allowing observation by University staff is voluntary and that I may request data collection to cease at any time.**

(Signature)

(Date)

*Keep a copy of this letter for your records, return the original to Jena Randolph*

## APPENDIX C

### DSM-IV Criteria for Autistic Disorder

(A) A total of at least six items from (1), (2), and (3) with at least two from (1) and one each from (2) and (3):

(1) qualitative impairment in social interaction, as manifested by at least two of the following:

- (a) marked impairment in the use of multiple nonverbal behaviors such as eye-to-eye gaze, facial expression, body postures, and gestures to regulate social interaction
- (b) failure to develop peer relationships appropriate to developmental level
- (c) a lack of spontaneous seeking to share enjoyment, interests, or achievements with other people (e.g., by a lack of showing, bringing, or pointing out objects of interest)
- (d) lack of social or emotional reciprocity

(2) qualitative impairments in communication as manifested by at least one of the following:

- (a) delay in, or total lack of, the development of spoken language (not accompanied by an attempt to compensate through alternative modes of communication such as gesture or mime)
- (b) in individuals with adequate speech, marked impairment in the ability to initiate or sustain a conversation with others
- (c) stereotyped and repetitive use of language or idiosyncratic language

(d) lack of varied, spontaneous make-believe play or social imitative play appropriate to developmental level

(3) restricted, repetitive and stereotyped patterns of behavior, interests, and activities, as manifested by at least one of the following:

(a) encompassing preoccupation with one or more stereotyped and restricted patterns of interest that is abnormal either in intensity or focus

(b) apparently inflexible adherence to specific, nonfunctional routines or rituals

(c) stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)

(d) persistent preoccupation with parts of objects

(B) Delays or abnormal functioning in at least one of the following areas, with onset prior to age 3 years: (1) social interaction, (2) language as used in social communication, or

(3)

symbolic or imaginative play.

C. Not better accounted for by Rett's Disorder or Childhood Disintegrative Disorder.

(APA, 2000)

## APPENDIX D

### Parent Permission for Participation and Child Assent

Dear Parent or Guardian:

My name is Jena Randolph. I am a doctoral student in the Department of Special Education at the University of Missouri-Columbia. I am inviting your child to take part in a research project titled “Supporting Practitioner’s Use of Pivotal Response Treatment (PRT) within Educational Contexts”. The project will be at Rock Bridge Elementary. Your child may benefit from the project. Below are details of the project.

The project will use PRT to improve social-communication and play skills for children with Autism Spectrum Disorders (ASD). Each child’s teacher or teacher’s aide will be trained to use PRT. Data will be collected on social-communication and play skills. Our goal is to better each child’s social-communication and play skills. We hope to use the data to find out the value of using PRT in schools. This Project has three parts:

#### **Assessments:**

Your child will be observed for:

1. Interest in toys,
2. Tolerance of others close by
3. Repetitive behaviors

Children for the study will then be selected. The children will be given the Psychoeducational Profile (PEP-3). The PEP-3 will be used to find your child’s

cognitive and language skills. During the project, we will video record each session. The video will be used to gauge your child's social-communication and play skills. The videos will be kept locked up when not being viewed by approved staff.

**Practitioner Training:** Your child's teacher or teacher's aides will be trained to use PRT. The purpose of PRT is to target key behaviors, including motivation and reaction to multiple cues. Positive changes in pivotal behaviors should have positive effects on many other behaviors. PRT is based on the following, as outlined in Koegel's PRT Training Manual (2006): 1) clear instruction while the child is attending; 2) maintenance tasks; 3) multiple cues; 4) child choice; 5) contingent, effective, & immediate rewards; and 6) rewards for attempts at responses. The training will include modeling, practice, and feedback on the use of PRT.

**Follow-up sessions:** Your child will continue to be observed to check their response to PRT. Assistance will be available to the child's teachers or teacher's aides.

Taking part is voluntary and your child may pull out at any time. This project will take place from January 2009 to May 2009. Each of the 12 training sessions will be forty minutes and all follow-up sessions will be 10 minutes, two times per week. All data collected will remain confidential and only Jena Randolph will have an ongoing access.

There are no anticipated risks linked with this project for the children other than possible discomfort from being observed. Growth in social-communication and play skills is a possible benefit of taking part. Your child's identity will not be disclosed and

all data will be stored securely.

Any questions about the project should be sent to Jena Randolph. My advisor, Dr. Janine Stichter, can be reached at [stichterj@missouri.edu](mailto:stichterj@missouri.edu). If you have questions about your rights please contact the Campus Institutional Review Board, University of Missouri (573-882-9585).

Your consent to take part is voluntary and you can pull out at any time. Your choice to take part will not affect your relationship with Rock Bridge, the UMC, or any other agency you or your child may be linked with. Thank you very much and I look forward to working with you and your child.

Sincerely,

Jena K. Randolph, M.A.  
303 Townsend Hall  
Department of Special Education  
University of Missouri  
Columbia, MO 65211  
(573) 356-7047  
[jkb505@mizzou.edu](mailto:jkb505@mizzou.edu)



Legal Guardian/Advocate/Witness (if required)\*\*

Date

\*A minor's signature on this line indicates his/her assent to participate in this study. A minor's signature is not required if he/she is under 7 years old.

\*\*The presence and signature of an impartial witness is required during the entire informed consent discussion if the subject or subject's legally authorized representative is unable to read.

**“Supporting Practitioners’ Use of Pivotal Response Treatment  
Within School Contexts”  
Child/Youth Assent Form**

I \_\_\_\_\_ want to be a part of the new project at my school about how to talk to and play with others. My parent told me that for this project I will be watched at school. Sometimes I will be videotaped. No one will see the videotapes, just the people running the study. I know that if I do not like this project I can stop anytime, I just have to tell my parent or teacher. My parent has already told the people running the study that I can be a part of the project.

\_\_\_\_\_  
Child signature

\_\_\_\_\_  
date

This form was either read by the student, read to the student or explained to by

\_\_\_\_\_ Adult signature

APPENDIX E

Screening Student Behavior Coding Form

	3 0	6 0	9 0	1 2 0	1 5 0	1 8 0	2 1 0	2 4 0	2 7 0	3 0 0	3 0 0	6 0 0	9 0 0	1 2 0	1 5 0	1 8 0	2 1 0	2 4 0	2 7 0	3 0 0	
Approach																					
Avoidance																					
Object Manipulation																					
Non-Verbal Stim																					
Verbal-Stim																					

	3 0	6 0	9 0	1 2 0	1 5 0	1 8 0	2 1 0	2 4 0	2 7 0	3 0 0	3 0 0	6 0 0	9 0 0	1 2 0	1 5 0	1 8 0	2 1 0	2 4 0	2 7 0	3 0 0	
Approach																					
Avoidance																					
Object Manipulation																					
Non-Verbal Stim																					
Verbal-Stim																					

Place a mark in the box if the behavior occurred at all during the 30-s interval (partial interval recording)

**Behavior Definitions:**

***Approach Behaviors*** – The child moved to within arms reach of the adult or closer (only those intervals in which the child physically moved closer). These behaviors also include

spontaneous looking at the adult's face or reaching to the adult (with or without looking at the adult) and approaching to take a toy.

***Avoidant Behaviors*** – The child moved away from the adult, out of arms reach (only those intervals in which the child physically moved away to avoid contact). These behaviors include instances in which the child pulls part of his/her body from adult's touch, resisted looking at the adult's face when the adult initiated looking, or covering eyes or ears in response to the adult speaking.

***Toy contact/ Object Manipulation*** – The child interacted with a toy appropriately for 5 consecutive seconds or more.

***Non-Verbal self-stimulatory Behaviors*** – These will vary from child to child, examples include, but are not limited to: hand flapping, rocking, head shaking, body posturing.

***Verbal Self-Stimulatory Behaviors*** – These behaviors are defined as non-sensical sounding utterances that are not associated with a tantrum. This includes repetitive sounds.

## APPENDIX F

### Pivotal Response Training

Pivotal response training is a behavioral treatment intervention based on the principles of applied behavior analysis (ABA) and derived from the work of Koegel, Schreibman, Dunlap, Horner, and other researchers. It is a composite of the research on task interspersal, direct reinforcement, and role of choice. Key pivotal behaviors have been identified for children with autism: motivation and responsivity to multiple cues (Koegel & Koegel, 2006). PRT has demonstrated positive changes in these "pivotal behaviors" exhibiting widespread effects on many other behaviors associated with language and social interaction. Pivotal Response Training (PRT) provides a guideline for teaching skills and has been most successful for language, play and social interaction skills in children with autism.

The following are components that we will be discussing in greater detail throughout the training:

*Gain Attention* – the question, instruction, and opportunity to respond should be clear, uninterrupted, appropriate to the task, and given when the child's attention is focused on you or the task you are engaged in.

*Shared control* – Motivation comes from child choice. Whenever appropriate the child should have choice. However, control over the materials, topic, etc. should be shared between you and your child. This is a key behavior in building reciprocal social

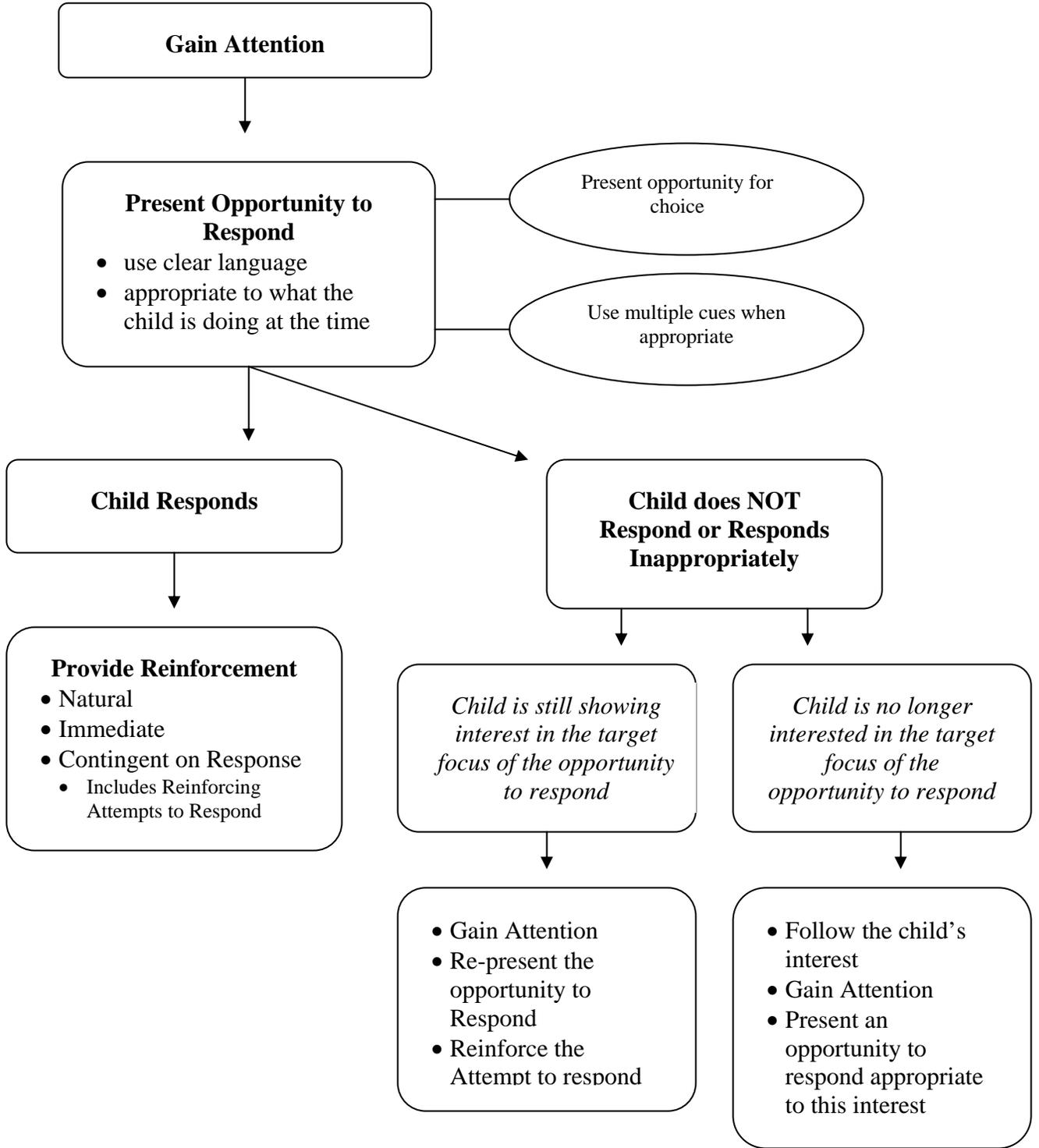
interactions.

*Responsiveness to Multiple Cues* – Present multiple components to attend to.

*Contingent Reinforcement with a Direct Response/ Reinforcer Relationship* - Rewards need to be immediate, contingent, uninterrupted, and effective. Direct reinforcers (natural) need to be used the majority of time. This will allow for generalization and maintenance of skills learned.

*Reinforce Attempts (Maintenance of Social and Communication Skills)* – Any reasonable, goal-directed attempt to respond to questions, instructions, or opportunities to respond should be reinforced. The responses must be a reasonable attempt at the correct answer, and must be at or above the previous level used within the response set to be accepted.

## Pivotal Response Training Flowchart



## APPENDIX G

### PRT - Gaining Attention

When presenting the child with a question, instruction, or opportunity to respond, it is important to first make certain to have the child's attention. Obviously the child will learn little or nothing if he/she is not paying attention. The child should not be looking away, should not be engaging in self-stimulatory behavior, or tantruming. The child should be oriented to the speaker and/or attending to the task at hand. Once the child is attending, give an instruction that is clear and appropriate to what the child is doing at the time.

The instruction must be:

- clear
- appropriate to the task
- uninterrupted
- and the child must be attending

#### *Example:*

It is the end of the school day, and Terrence has free time before until his bus is called. Terrence is twirling a puzzle piece from his favorite puzzle. The teacher would like Terrence to be ready to walk out the door when his bus is called. First, she needs to get his attention. She walks over, puts her hand on his hand, and says, "Terrence". She ensures eye contact and then says, "Put on your backpack, please." Terrence puts down the puzzle piece and gets his backpack.

*Non-Example:*

It is the end of the school day, and Terrence has free time before until his bus is called.

Terrence is twirling a puzzle piece from his favorite puzzle. The teacher would like

Terrence to be ready to walk out the door when his bus is called. She calls to him, “Are you ready to go home?”

*Activity:*

Identify 3 different ways you may use to obtain your student’s attention before delivering a clear, concise directive, comment, or question:

1.

2.

3.

(Koegel et al., 1989)

## APPENDIX H

### PRT – Shared Control

Shared control enhances child motivation in participation. Allow the child to have a choice of what toy to play with and when to terminate an activity. Whenever possible the parent/therapist should comply with the child's wishes so that the child will learn that language results in desirable changes in the environment. This will make language important to the child.

Under no circumstances should the child be allowed to engage in an activity that is hazardous (aggression, self-injury) or unacceptable because it is inappropriate (self-stimulation, compulsive rituals). In these circumstances assume control until the child is able to assume appropriate control.

Also included in shared control is turn-taking. Turn taking involves a give and take interaction between the child and therapist that takes place while they are involved with the activity the child has chosen.

#### *Example:*

It is recess time. Sam's para Jeni asks, "What should we play?" Sam takes Jeni's hand and leads her to the swing. "Okay, lets swing!" says Jeni. She pushes Sam on the swing. After a few minutes Jeni says, "My turn," and prompts Sam to give her a push. After a couple of pushes Sam takes Jeni's hand and leads her to the slide. "Okay, let's slide!"

They take turns going down the slide.

*Non-Example:*

It is recess time. Sam's para Jeni asks, "What should play?" Sam takes Jeni's hand and leads her to the swing. Jeni says, "No, we played on the swings yesterday, lets throw the ball. Jeni picks up the ball and throws it to Sam. Sam lets the ball fall to the ground and tries to pull Jeni towards the swing. "No Sam", says Jeni, "lets go down the slide." Sam drops to the ground and starts banging his head.

*Activity:*

Identify three activities that you can do with your target child to utilize shared control through turn-taking:

1.

2.

3.

Describe how you plan to regain control (using the least intrusive means necessary) if your target child engages in self-stimulatory behavior, or perseverates.

(Koegel et al., 1989)

## APPENDIX I

### PRT - Responsiveness to Multiple Cues

The most efficient way to teach children to utilize a wider range of cues or components in their learning environment is to choose instructions and tasks that require the child to use multiple cues. By multiple cues, or multiple components, we mean that the child is aware of, and responds to, two or more units within the environment (e.g. "red pen" indicates the red pen, but not the red pencil or the blue pen - all of which are in the immediate environment). Research indicates that if the child is repeatedly exposed to this type of instruction, as opposed to a single-cue instruction such as "pen", where any pen in the environment will do, the child eventually learns to be more responsive.

#### *Example:*

Joel is learning to wash his hands after toileting. His teacher has hung up a blue towel, a red towel, and a blue washcloth in the bathroom. After he has finished turning off the water, his teacher says, "Get the blue towel."

#### *Non-Example:*

Joel is learning to wash his hands after toileting. After he has finished turning off the water, his teacher says, "Dry your hands," and directs him to the paper towels.

#### *Using Multiple Cues:*

It is not always appropriate to use multiple cues. The child must first have basic

receptive object labels.

Level 1: Use multiple cues to label and describe things as you interact with your child.

“I have a big car.” “You have a little car.”

Level 2: Use multiple cues in directives.

“Sit in the red chair.”

Level 3: Use multiple cues in directives when there are multiple variables present.

If a box of markers and crayons are on the table, “Give me the green crayon.”

Level 4: Encourage the use of multiple cues in your child’s expressive language.

Adult: “What do you have?”

Child: “I have a car.”

Adult: “That’s right, you have a car. You have a BLUE car.” “What do you

have?”

Child: “I have a blue car.”

*Activity:*

Try to identify 10 different materials/ ways that will allow you to utilize responsiveness to multiple cues.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

(Koegel et al., 1989)

## APPENDIX J

### PRT – Contingent, Direct Reinforcement

#### Contingent Reinforcement

Any response to the child's behavior must be contingent upon the correct behavior or attempt. This means that the parent's response must be as immediate as possible after the child's response, must be appropriate to the response, and must be dependent upon the response. Never wait before providing the consequence, never reinforce an incorrect response, and never fail to reinforce a correct response or attempt. It should be clear to the child that your response depends on his/her behavior. The exception would be if the behavior is well established and thus you would not have to reinforce every occurrence.

The response must be:

1. As immediate as possible after the child's response
2. Appropriate to the response
3. Dependent upon the response

#### *Example:*

Bill's teacher is focusing on possessive pronouns during lunch time. Bill has asked for juice. His teacher holds the juice and says, "Who has the juice?" Bill answers correctly, "You do." Another student runs into the room. His mom says, "Good Bill!" and gives Bill the juice.

*Non-Example:*

Bill's teacher is focusing on possessive pronouns during lunch time. Bill has asked for juice. His teacher holds the juice and says, "Who has the juice?" Bill answers correctly, "You do." Another student runs into the room. His teacher turns to the student and scolds him for running, then she turns to Bill and says, "Good Bill!" and gives Bill the juice as he is pulling his hair.

### Direct Reinforcement

All reinforcers should have a direct relationship to the desired behavior. Thus if a child says "car" this verbal response might be reinforced with the opportunity to play with the car as opposed to being reinforced with a bite of candy. Rolling a car after saying "car" is a very normal, natural consequence and is certainly directly related to the verbalization. In contrast, being fed a piece of candy is not directly related to the word "car". The main advantage of a direct reinforcer is that it is the type of consequence the child will normally receive in the natural environment and thus we may expect the speech to generalize to this environment.

*Example:*

Simon wants to work on teaching object labels to Lawson. Lawson loves playing with toys in water. Simon fills the sink and puts out several toys. He holds up a toy while Lawson is playing in the water and asks Lawson, "What is this?" "Boat," says Lawson. "Very good," says Simon, and he gives Lawson the boat. Then he holds up a toy shark

and asks, “What is this?” “Shark,” says Lawson. “Very good”, Simon says. And he gives Lawson the shark to play with.

*Non-Example:*

Simon wants to work on teaching object labels to Lawson. He holds up a toy and asks Lawson, “What is this?” “Boat,” says Lawson. “Very good,” says Simon, and he puts a sticker on a chart for Lawson.

(Koegel et al., 1989)

## APPENDIX K

### PRT - Reinforce Attempts

When organizing the child's learning environment it is important to intersperse maintenance tasks (i.e. tasks the child has already mastered) with new and more challenging tasks. By doing this the child's motivation and self-confidence should be increased and maintained, enabling him/her to tackle novel tasks while still being highly successful overall.

For new tasks/skills, any goal-directed attempt to respond to questions, instructions, or opportunities should be reinforced. This means that we want to be certain to encourage the child to try by reinforcing attempts rather than risk discouraging the child by requiring only correct responses (which at the initial stages of training may be few and far between). A child's motivation to respond can be significantly enhanced if the child is rewarded for any reasonable attempt to respond even if the response is not completely correct.

While the response does not necessarily have to be correct it does, however, have to be a reasonable attempt. Thus the child must be directing his/her attention to the task, the attempt has to be related to the task, and it has to be emitted with a reasonable amount of effort. For example, if a child has consistently referred to a ball with "ball", or "ba", we would not reinforce a whispered or mumbled "b" sound or other obviously inadequate attempts. We know that the child has consistently done better in the past. The main thing to remember is that we want the child to be encouraged, motivated, and to continue to try.

*Example:*

Sara wants to teach Wendy to talk more when she plays with her toys. Since Wendy enjoys looking at books, and knows her animals and sounds, Sara chooses a book with animals on each page. She wants Lisa to label the animal and sound before she turns the page. Sara opens the book and places it in front of Wendy, but keep her hand on the page. As Wendy goes to turn the page, Sara holds the page and models for Wendy, “Cow says moo.” Wendy says nothing and tries to turn the page. Sara says, “Wendy, listen to me.” When Wendy is looking, Sara models again, “Cow says moo.” Wendy says, “Cow,” and Sara says, “Good!” and lets her turn the page.

*Non-Example:*

Sara wants to teach Wendy to talk more when she plays with her toys. Since Wendy enjoys looking at books, and knows her animals and sounds, Sara chooses a book with animals on each page. Sara opens the book and places it in front of Wendy, but keep her hand on the page. As Wendy goes to turn the page, Sara holds the page and models for Wendy, “Cow says moo.” Wendy says nothing and tries to turn the page. Sara says, “Wendy, listen to me.” When Wendy is looking, Sara models again, “Cow says moo.” Wendy says, “Cow,” and Sara says, “Listen Wendy. Cow says moo.” Wendy tries to grab the book away and screams.

(Koegel et al., 1989)

APPENDIX L

Fidelity Feedback Form

Data Taken:

Practitioner:

Coder – JKR	<b>FIDELITY</b>					
	<i>TWO-MINUTE INTERVALS</i>					
<b>VARIABLE</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>TOTAL</b>
Gain Attention (GA)						
Shared Control (SC)						
Multiple Cues (MQ)						
Reinforcement Given (RI)						
Reinforced Attempt (RA)						

APPENDIX M

Training Integrity Checklist

Coded By: \_\_\_\_\_

Date: \_\_\_\_\_

Target Skill: \_\_\_\_\_

Participant: \_\_\_\_\_

Performance feedback from previous session provided.

Target skill discussed, including exemplars in other contexts.

Start time   Stop time   Total Time

Guided practice, including modeling \_\_\_\_\_

(for at least 10 min., no more than 15 min.)

Independent practice \_\_\_\_\_

(for at least 10 min.)

## APPENDIX N

### Pivotal Response Training Social Validity Measurement Tool

This questionnaire was designed to assess your acceptance of Pivotal Response Treatment (PRT). Please mark the box that best describes your agreement or disagreement with each statement utilizing the scale below.

1. PRT was appropriate for the student's social-communication goals.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

2. PRT was appropriate for the student's play goals

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

3. PRT was easy to implement.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

4. My student who participated in PRT demonstrated social-communication improvements.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

5. My student who participated in PRT demonstrated play improvements.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

6. I would recommend PRT to other practitioners.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

7. PRT is an appropriate intervention for multiple contexts throughout my student's day.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

8. I would use PRT with other students with autism spectrum disorders

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

9. PRT is a useful intervention.

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

10. I plan to continue to use PRT

Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
----------------	-------	---------	----------	-------------------

The following scale will be utilized for data interpretation:

1= strongly disagree 2= disagree 3= neutral 4= agree 5= strongly agree

## References

- Alvero, A. M., Bucklin, B. R., & Austin, J. (2001). An objective review of the effectiveness and essential characteristics of performance feedback in organizational settings. *Journal of Organizational Behavior Management*, 21, 3-29.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders - revised* (4<sup>th</sup> ed.). Washington, DC: Author.
- Anand, P. & Ross, S. (1987). A computer-based strategy for personalizing verbal problems in teaching mathematics. *Education Communication and Technology Journal*, 35, 151-162.
- Ary, D., Jacobs, L. C., & Razavieh, A. (2002). *Introduction to research in education* (6<sup>th</sup> ed.). Belmont, CA: Wadsworth.
- Baker-Ericzen, M. J., Stahmer, A. C., & Burns, A. (2007). Child demographics associated with outcomes in a community-based pivotal response training program. *Journal of Positive Behavioral Interventions*, 9(1), 52-59.
- Bowles, P. E. & Nelson, R. O. (1976). Training teachers as mediators: Efficacy of a workshop versus the bug-in he-ear technique. *Journal of School Psychology*, 14, 15-26.
- Bryson, S. E., Koegel, L. K., Koegel, R. L., Openden, D., Smith, I. M., & Nedft, N. (2008). Large-scale dissemination and community implementation of pivotal response treatment: Program description and preliminary data. *Research and Practice for Persons with Severe Disabilities*, 32(2), 142-153.
- Bryson, S. E., Rogers, S. J., & Fombonne, E. (2003). Autism spectrum disorders: Early detection, intervention, Education, and Psychopharmacological Management. *Canadian Journal of Psychiatry*, 48, 506-516.
- Burke, J. C. & Cerniglia, L. (1990). Stimulus complexity and autistic children's responsivity: Assessing and training a pivotal behavior. *Journal of Autism and Developmental Disorders*, 20, 233-253.
- Center of Disease Control and Prevention (2007). *Prevalence Statistics*. Retrieved January 22, 2009, [www.cdc.gov/ncbddd/Autism/faq\\_prevalence.htm](http://www.cdc.gov/ncbddd/Autism/faq_prevalence.htm).
- Cooper, J. O., Heron, T. E., & Heward, W. L. (2007). *Applied behavior analysis*. Pearson Education, Inc.: Upper Saddle River, NJ.
- Corcoran, T. B. (1995). *Helping Teachers Teach Well: Transforming Professional Development*. Office of Educational Research and Improvement (ED),

Washington, DC.

- Cordova, D. I. & Lepper, M. R. (1996). Intrinsic motivation and the process of learning: Beneficial effects of contextualization, personalization, and choice. *Journal of Educational Psychology, 18*, 105-115.
- Dunlap, G., Koegel, R. L., & Burke, J. C. (1981). Educational implications of stimulus overselctivity in autistic children. *Exceptional Education Quarterly, 20*, 17-22.
- Dunn, L. M., & Dunn, L. (1981). *Peabody Picture Vocabulary Test-Revised Manual*, MN: American Guidance Service.
- Eaves, L. C. & Ho, H. H. (2008). Young adult outcome of autism spectrum disorders. *Journal of Autism and Developmental Disorders, 38*(4), 739-747.
- Elliot, S. N. & Gresham, F. M. (1993). Social skills interventions for children. *Behavior Modification, 17*(3), 287-313.
- Etscheidt, S. (2003). An analysis of legal hearings and cases related to individualized education programs for children with autism. *Research and Practice for Persons with Severe Disabilities, 28*(2), 51-69.
- Ferguson, R. F. (1991). Paying for public education: New evidence on how and why money matters. *Harvard Journal on Legislation, 28*, 465-498.
- Gardner, M. F. (1990). *Expressive One-Word Picture Vocabulary Test-Revised Manual*. CA: Western Psychological Services.
- Gersten, R., Chard, D., & Baker, S. (2000). Factors enhancing sustained use of research-based instructional practices. *Journal of Learning Disabilities, 33*, 445-457.
- Goldhaber, D. D. & Brewer, D. J. (2000). Does teacher certification matter? High school certification status and student achievement. *Educational Evaluation and Policy Analysis, 22*, 129-146.
- Gottfredson, D. C. & Gottfredson, G. D. (2002). Quality of school-based prevention programs: Results from a national survey. *Journal of Research on Crime and Delinquency, 39*(1), 3-35.
- Greene, R. W. (1995). Students with ADHD in school classrooms. Teacher factors related to compatibility, assessment, and intervention. *School Psychology Review, 24*, 81-93.
- Gresham, F. M. (2004). Current status and future directions of school-based behavioral intervention. *School Psychology Review, 33*(3), 326-343.

- Gresham, F. M. & Elliot, S. N. (1993). Social skills intervention guide to systematic approaches to social skills training. *Special Services in the Schools*, 8(1), 137-158.
- Gresham, F. M., Sugai, G., & Horner, R. (2001). Interpreting outcomes of social skills training for students with high-incidence disabilities. *The Council for Exceptional Children*, 67(3), 331-344.
- Han, S. S., & Weiss, B. (2005). Sustainability of teacher implementation of school-based mental health programs. *Journal of Abnormal Child Psychology*, 33, 665-657.
- Heflin, L. J. & Simpson, R. (1998). Interventions for children and youth with autism: Prudent choices in a world of exaggerated claims and empty promises. Part I: Intervention and treatment option review. *Focus on Autism and Other Developmental Disabilities*, 13(4), 194-211.
- Horner, R. H., Carr, E. G., Halle, J., McGee, G., Odom, S., & Worley, M. (2005). The use of single-subject research to identify evidence-based practice in special education. *Exceptional Children*, 71(2), 165-179.
- Hudson, S. (2006). *Identification and Teacher Perceptions of Academic Practices: Initial Results of Quality Indicators and a Three-tiered Classification Framework*. Unpublished doctoral dissertation, University of Missouri, Columbia.
- Individuals with Disabilities Education Act (IDEA) (2004). Regulations, 34 C.F.R. § 300.
- Jarrold, C., Boucher, J., & Smith, P. K. (1996). Generativity deficits in pretend play in autism. *British Journal of Developmental Psychology*, 14, 275-300.
- Kasari, C. (2008, September). *Peer isolation or involvement at school for children with higher functioning autism and Asperger disorder*. Symposium conducted at The 3<sup>rd</sup> Annual PRT Conference, Santa Barbara, CA.
- Kazdin, A. E. (1982). *Single-case research designs: Methods for clinical and applied settings*. New York: Oxford University Press.
- Knight, J. (2009). Coaching: The key to translating research into practice lies in continuous, job-embedded learning, with on-going support. *Journal of Staff Development*, 30(1), 18-20.
- Koegel, R. L., Bimbela, A., & Schreibman, L. (1996). Collateral effects of parent training on family interactions. *Journal of Autism and Developmental Disorders*, 26(3), 347-359.

- Koegel, L. K., Carter, C. M., & Koegel, R. L. (2003). Teaching children with autism self-initiations as a pivotal response. *Topics in Language Disorders, 23*(2), 134-145.
- Koegel, R. L. & Frea, W. D. (1993). Treatment of social behavior in autism through the modification of pivotal social skills. *Journal of Applied Behavior Analysis, 26*(3), 369-377.
- Koegel, R. L., & Koegel, L. K. (1988). Generalized responsivity and pivotal behaviors. In R. H. Horner, G. Dunlap, & R. L. Koegel (Eds.), *Generalization and maintenance: Lifestyle changes in applied settings* (pp. 41-66). Baltimore: Paul H. Brookes.
- Koegel, R. L. & Koegel, L. K. (2006). *Pivotal Response Treatments for Autism*. Baltimore, MD: Paul H. Brooks.
- Koegel, L. K., Koegel, R. L., Harrower, J. K., & Carter, C. M. (1999). Pivotal response intervention I: Overview of approach. *The Journal of the Association for Persons with Severe Handicaps, 24*(3), 174-185.
- Koegel, R. L., Koegel, L. K., Frea, W. D., & Smith, A.E. (1995). Emerging interventions for children with autism: Longitudinal and lifestyle implications. In R. L. Koegel & L. K. Koegel (Eds.), *Teaching children with autism: Strategies for initiating positive interactions and improving learning opportunities*. (p.p. 1-16) Baltimore: Brookes.
- Koegel, R. L., Schreibman, L., Good, A., Cerniglia, L, Murphy, C., & Koegel, L. K. (1989). *How to Teach Pivotal Behaviors to Children with Autism: A Training Manual*. Santa Barbara, CA: University of California.
- Koegel, L. K., Koegel, R. L., Shoshan, Y., McNerney, E. (1999). Pivotal response intervention II: preliminary long-term outcome data. *The Journal of the Association for Persons with Severe Handicaps, 24*(3), 186-198.
- Kuhn, L. R., Bodkin, A. E., Devlin, S. D., & Doggett, A. (2008). Using pivotal response training with peers in special education to facilitate play in two children with autism. *Education and Training in Developmental Disabilities, 43*(1), 37-45.
- Landis, J.R. and Koch, G. G. (1977) The measurement of observer agreement for categorical data. *Biometrics, 33*, 159—174.
- Lantz, J. F., Nelson, J.M. & Loftin, R.L. (2004). Guiding children with autism in play: Applying the integrated play group model in school settings. *Teaching Exceptional Children, 37*(2), 8-14.

- Lewis, V., Boucher, J., Lupton, L., & Watson, S. (2000). Relationship between symbolic play, functional play, verbal and nonverbal ability in young children. *Autism*, 7(4), 391-399.
- Lovaas, I. O. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology*, 55, 3-9.
- Lovaas, O. I., Schreibman, L., Koegel, R., & Rehm, R. (1971). Selective responding y autistic children to multiple sensory input. *Journal of Abnormal Psychology*, 77(3), 211-222.
- Matson, J. L., Benavidez, D. A., Compton, L. S., Paclawskyj, T., & Baglio, C. S. (1996). Behavioral treatment of autistic persons: A review of research from 1980 to the present. *Research in Developmental Disabilities*, 17, 433-465.
- McConnell, S. R. (2002). Interventions to facilitate social interaction for young children with autism: Review of available research and recommendations for educational intervention and future research. *Journal of Autism and Developmental Disorders*, 32(5), 351-372.
- Monk, D. H. (1994). Subject area preparation of secondary math and science teachers and student achievement. *Economics of Education Review*, 13, 125-145.
- Murane, R. J. & Phillips, B. R. (1981). What do effective teachers of inner city children have in common? *Social Science Research*, 10, 83-100.
- National Research Council. (2001). *Educating Students with Autism*. Washington, DC: National Academy Press.
- Neuman, S. B. & Roskos, K. (1990). Play, print, and purpose: Enriching play environments for literacy development. *The Reading Teacher*, 44, 214-221.
- No Child Left Behind Act of 2001, Public Law No. 107-110, 115 Stat. 1425 (2002).
- Noell, G. H. & Witt, J. C. (1999). When does consultation lead to intervention implementation? Critical issues for research and practice. *The Journal of Special Education*, 33(1), 29-35.
- Noell, G. H., Witt, J. C., Gilbertson, D. N., Ranier, D. D., & Freeland, J. T. (1997). Increasing teacher intervention implementation in general education settings through consultation and performance feedback. *School Psychology Quarterly*, 12, 77-88.
- Noell, G. H., Witt, J. C., Slider, N. J., Connell, J. E., Gatti, S. L., Williams, K. L., Koenig, J. L., Resetar, J. L., & Duhon, G. J. (2005). Treatment implementation

- following behavioral consultation in schools: A comparison of three follow-up strategies. *School Psychology Review*, 34, 87-106.
- Ochs, E., Kremer-Sadlik, T., Solomon, O., Sirota, K. (2001). Inclusion as social practice: Views of children with autism. *Social Development*, 10(3), 399-419.
- Odom, S. L., Brantlinger, E., Gersten, R., Horner, R. H., Thompson, B., & Harris, K. R. (2005). Research in special education: Scientific methods and evidence based practices. *Exceptional Children*, 71, 137-148.
- Odom, S. L., Brown, W. H., Frey, T., Karasu, N., Smith-Canter, L.L., & Strain, P. S. (2003). Evidence-based practices for young children with autism: Contributions for single-subject design research. *Focus on Autism and Other Developmental disabilities*, 18, 166-175.
- Patall, E. A., Cooper, H., & J. C. Robinson. (2008). The effects of choice on intrinsic motivation and related outcomes: A meta-analysis of research findings. *Psychological Bulletin*, 134(2), 170-200.
- Pierce, K. & Schreibman, L. (1995). Increasing complex social behaviors in children with autism: Effects of peer-implemented pivotal response training. *Journal of Applied Behavior Analysis*, 28, 285-295.
- Pierce, K. & Schreibman, L. (1997a). Multiple use of pivotal response training to increase social behaviors of classmates with autism: Results from trained and untrained peers. *Journal of Applied Behavior Analysis*, 30, 157-160.
- Pierce, K. & Schreibman, L. (1997b). Using peer trainers to promote social behavior in autism: Are they effective at enhancing multiple social modalities? *Focus on Autism and Other Developmental Disabilities*, 12(4), 207-218.
- Prizant, B. M. & Rubin, E. (1999). Contemporary issues in interventions for autism spectrum disorders: A commentary. *The Journal of the Association for Persons with Severe Handicaps*, 24(3), 199-208.
- Randolph, J. K., Stichter, J. , Schmidt, C., Visovsky, K., & Schultz, T. Controlling for the influence of education level on fidelity of implementation of pivotal response treatment for children with autism. Manuscript in process.
- Reichow, B., Volkmar, F., & Cicchetti, D. V. (2008). Development of the evaluative method for evaluating and determining evidence based practices for autism. *Journal of Autism and Developmental Disorders*, 38(7), 1311-1319.
- Reimers, T. M., Wacker, D. P., & Koepl, G. (1987). Acceptability of behavioral interventions: A review of the literature. *School Psychology Review*, 16(2), 212-227.

- Riggs, C. G., & Mueller, P.H. (2001). Employment and utilization of paraeducators in inclusive settings. *The Journal of Special Education, 35*(1), 54-62.
- Rose, D. J., & Church, R. J. (1998). Learning to teach: The acquisition and maintenance of teaching skills. *Journal of Behavioral Education, 8*, 5-35.
- Rosenblatt, J., Bloom, P., & Koegel, R. L. (1995). Overselective responding: Description, implications, and intervention. In R. L. Koegel & L. K. Koegel (Eds.), *Teaching children with autism: Strategies for initiating positive interactions and improving learning opportunities* (pp. 33-42). Baltimore: Paul H. Brookes.
- Rutherford, R. B., & Nelson, C. M. (1988). Generalization and maintenance of treatment effects. In J. Witt, S. N. Elliot, & F. M. Gresham (Eds.). *Handbook of behavior therapy in education*. New York: Plenum.
- Scheeler, M. C. (2008). Generalizing effective teaching skills: The missing link in teacher preparation. *Journal of Behavioral Education, 17*, 145-159.
- Schopler, E., Lansing, M. D., Reichler, R. J., & Marcus, L., M. (2005). *Psychoeducational Profile: Third Edition (PEP-3)*. Western Psychological Services: Los Angeles, CA.
- Schreibman, L. (1988). *Autism*. Newbury Pak, CA: Sage.
- Schreibman, L., Charlop, M. H., & Koegel, R. L. (1982). Teaching autistic children to use extra-stimulus prompts. *Journal of Experimental Child Psychology, 33*(3), 475-491.
- Schreibman, L., Stahmer, A. C., Barlett, V. C., & Dufek, S. (2009). Brief report: Toward refinement of a predictive behavioral profile for treatment outcome in children with autism. *Research in Autism Spectrum Disorders, 3*, 163-172.
- Scruggs, T. E., & Mastropieri, M. A. (1994). The effects of generalization training: A quantitative synthesis of single-subject research. *Advances in Learning and Behavioral Disabilities, 8*, 259-280.
- Sherer, M. R. & Schreibman, L. (2005). Individual behavioral profiles and predictors of treatment effectiveness for children with autism. *Journal of Consulting and Clinical Psychology, 73*(3), 525-538.
- Sigman, M. & McGovern, C. (2005). Continuity and change from early childhood to adolescence. *Child Psychology and Psychiatry, 46*(4), 409 – 419.
- Simpson, R. L. (2005). Evidence-based practices and students with autism spectrum disorders. *Focus on Autism and Other Developmental Disabilities, 20*, 140-149.

- Skinner, B.F. (1938). *The behavior of organisms: An experimental analysis*. New York: D. Appleton-Century Company, Inc.
- Smith, T., Scahill, L., Dawson, G., Guthrie, D., Lord, C., Odom, S., Rogers, S., & Wagner, A. (2007). Designing research studies on psychosocial interventions in autism. *Journal of Autism and Developmental Disorders*, *37*, 354-366.
- Stahmer, A. (1995). Teaching symbolic play skills to children with autism using pivotal response training. *Journal of Autism and Developmental Disorders*, *25*(2), 123-141.
- Stokes, T. F. & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis*, *10*, 349-367.
- Stokes, T. F. & Osnes, P. G. (1989). An operant pursuit of generalization. *Behavior Therapy*, *20*, 337-355.
- Stone, W. L. & La Greca, A. M. (1986). The development of social skills in children. In E. Schopler and G. B Mesibov (Eds.) *Social behavior in autism* (pp. 35-60). New York: Plenum Press.
- Tapp, J., Wehby, J., & Ellis, D. (1995). A multiple option observation system for experimental studies: MOOSSES. *Behavior Research Methods, Instruments, and Computers*, *27*(1), 25-31.
- Volkmar, F. R., Lord, C., Bailey, A., Schultz, R. T., & Klin, A. (2004). Autism and pervasive developmental disorders. *Journal of Child Psychology and Psychiatry*, *45*, 135-170.
- VonBrock, M. B. & Elliott, S. N. (1987). The influence of treatment effectiveness information on the acceptability of classroom interventions. *Journal of School Psychology*, *25*, 131-144.
- Vukelich, C. (1994). Effects of play interventions on young children's reading of environmental print. *Early childhood Research Quarterly*, *9*, 153-170.
- Walker, H. M., Horner, R. H., Sugai, G., Bullis, M., Sprague, J. R., Bricker, D., & Kaufman, J. J. (1996). Integrated approaches to preventing antisocial behavior patterns among school-age children and youth. *Journal of Emotional and Behavioral Disorders*, *4*(4), 194-209.
- Wayne, A. J. & Youngs, P. (2003). Teacher characteristics and student achievement gains: A review. *Review of educational research*, *73*(1), 89-122.
- Weiss, M. J. & Harris, S. L. (2001). Teaching social skills to people with autism. *Behavior Modification*, *25*(5), 785-802.

- Wetherby, A. M. (1986). Ontogeny of communicative functions in autism. *Journal of Autism and Developmental Disorders, 16*(3), 295-316.
- Wolf, A. (1978). Social validity: the case for subjective measurement or how applied behavior analysis is finding its heart. *Journal of Applied Behavior Analysis, 11*(2), 203-214.
- Yell, M. L., Drasgow, E., & Lowrey, K. A. (2005). No child left behind and students with autism spectrum disorder. *Focus on Autism and Other Developmental Disabilities, 20*(3), 130-139.
- Witt, J. C. & Robbins, J. R. (1985). Acceptability of reductive interventions for the control of inappropriate child behavior. *Journal of Abnormal Child Psychology, 13*, 59-67.

## VITA

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