

*A Pilot Examination of the Adapted Protocol for Classroom Pivotal Response Teaching*

**Aubyn C. Stahmer, Ph.D.**  
**University of California, Davis**

**Jessica Suhrheinrich, Ph.D.**  
**University of California, San Diego**

**Sarah Rieth, Ph.D.**  
**San Diego State University**

*Abstract*

Pivotal Response Training (PRT) is a naturalistic, behavioral intervention with a strong evidence-base that is designed to increase generalization and maintenance of responding in children with ASD. Although special education teachers report using PRT, little research to date has examined PRT use in the context of community school programs. There is some research to support that teachers have challenges implementing PRT with fidelity in the classroom. To address this issue, a research community partnership was used to adapt PRT specifically for classroom environments. The pilot project used a multiple baseline design across training groups to examine 20 teachers' use of Classroom Pivotal Response Teaching (CPRT) with students with ASD in special education settings. Results indicated that teachers learned the strategies after a relatively brief training period that included coaching, were satisfied with the training and adapted materials, and that use of CPRT was associated with improved student engagement.

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Recent reviews of the literature for children with autism spectrum disorders (ASD) have identified several evidence-based practices that may be efficacious with this population (National Research Council, 2001; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; National Standards Project, 2009; Rogers & Vismara, 2008; Wong et al., 2014). Pivotal Response Training (PRT) is one practice that has been acknowledged as evidence-based for teaching a variety of skills relevant to ASD including symbolic and sociodramatic play, self-initiations, and joint attention. Several independent reviews of the research for use of PRT recommend it as an efficacious intervention (Humphries, 2003; Odom et al., 2010; National Standards Project, 2009; Simpson, 2005; Verschuur, Didden, Lang, Sigafoos, & Huskens, 2014; Wong et al., 2014).

PRT is a naturalistic, behavioral intervention designed to increase generalization and maintenance of responding in children with ASD. The "pivotal" responses trained in PRT are *motivation*, *initiation* and *responsivity to multiple cues* (i.e. increasing breadth of attention). Specific components include providing clear and appropriate instructions, sharing control with the child, interspersing maintenance (i.e., already mastered) tasks and acquisition (more difficult) tasks, requiring responding to multiple aspects of items in the environment (e.g., color and shape), providing contingent consequences, reinforcing goal directed attempts at correct responding, and providing reinforcement directly related to behavior. While research highlights

the efficacy of PRT as an appropriate teaching tool for education programs (Koegel, Openden, Fredeen, & Koegel, 2006), parents or clinicians working one-on-one with a child with ASD in highly controlled settings have been the implementers in most PRT efficacy studies.

Very little research to date has examined PRT use in the context of community school programs (Stahmer, Collings, & Palinkas, 2005). This is important because large-scale research in the United States indicates that children with ASD are likely to receive school-based services as a primary intervention service (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). Though limited, evidence on how teachers implement PRT indicates modification of the protocol (Stahmer, 2005) and low fidelity (Suhrheinrich, Stahmer, & Schreibman, 2007). Some recent studies have indicated that PRT may be more challenging to implement in classroom settings. For example, in a recent study examining implementation of a comprehensive program for children with ASD that included PRT along with more structured interventions, researchers found that teachers were less likely to implement PRT than more structured interventions early in training. When they did begin using PRT consistently, it was challenging for them to meet fidelity of implementation criteria (Stahmer et al., 2015). It is possible that teachers have difficulty with specific components of PRT that are not well-suited to the classroom environment. Recent data indicate that teachers may consistently leave out some components of PRT, thus reducing overall implementation fidelity of the intervention (Suhrheinrich et al., 2013).

These findings are not unexpected as the traditional unidirectional method of translation of evidence-based practices (EBPs) from research to practice is not likely to be effective. Research in other areas of child psychotherapy indicates that outcomes may not be as positive as initial studies when EBPs are used in community settings (Kurtines, Silverman, & Hoagwood, 2004; Weisz, Donenberg, Han, & Weiss, 1995). There is clear evidence that “simply creating an inventory of evidence-based treatments will not result in their broad implementation in practice.” (National Advisory Mental Health Council's Services Research and Clinical Epidemiology Workgroup, 2006). Rather, EBPs need to be adapted in collaboration with community members to fit the appropriate context.

To that end, an earlier study utilized a collaborative approach to adapt PRT for use in public school classrooms. Qualitative and quantitative methods were used to examine the use of PRT in the classroom, obtain information from teachers about their use of PRT, and to test adaptations to the protocol designed to enhance fidelity in the classroom. Feedback from special education teachers indicated general support for PRT, with teachers finding the approach intuitive and effective; however, certain components of the intervention were challenging to implement in the classroom (Stahmer, Suhrheinrich, Reed, & Schreibman, 2012). There were several components the teachers valued and found easy to implement and those did not require adaptation. Some components were valued but difficult to implement, indicating a need for improved training or modifications to the component to ensure appropriate implementation. Two areas were reported by teachers to be both not valued and difficult to implement: taking turns and responsivity to multiple cues. Observational studies of the use of PRT in special education classroom by teachers trained in PRT confirmed teacher report that these elements were especially difficult to use, as evidenced by teacher difficulty reaching fidelity on these components (Suhrheinrich et al., 2013).

Confirmation studies were then conducted to examine the necessity of these two difficult components. Specifically, teachers reported that the multiple cues component was not developmentally appropriate for all of their students (Stahmer et al., 2012). An examination of the acquisition of simple simultaneous conditional discriminations (color and shape) in typically developing children indicated that this skill is not fully developed until 36 months of age, at which time typically developing children are consistently able to respond to two aspects of one item in making discriminations (Reed, Stahmer, Suhrheinrich, & Schreibman, 2013). An additional study indicated that a majority of children diagnosed with ASD did not have difficulty with these discriminations either (Rieth, Stahmer, Suhrheinrich, & Schreibman, 2015). Similarly, an examination of turn taking indicated that teacher use of different types of turns may interact with child developmental level and target skills (i.e., object play, requesting commenting) to affect child responding (Rieth et al., 2014).

In our prior study, special education teachers participating in focus groups asked for specific materials to assist them with implementation in the classroom, such as examples of how to use PRT in group activities, methods to address individualized education plan (IEP) goals and specific curriculum areas using PRT, data collection forms and materials for training paraprofessionals in PRT. Training materials were developed based on teacher input, and in collaboration with teachers and administrators. An advisory board assisted in developing real-world examples of how to use the strategies in schools serving children with ASD. The adapted program is called Classroom Pivotal Response Teaching (CPRT) to distinguish it from the traditional model (Stahmer, Suhrheinrich, Reed, Bolduc, & Schreibman, 2011).

The purpose of the present study is to conduct an examination of the feasibility of implementation of CPRT by public school teachers serving children with ASD in the classroom. The specific aims of the project are to (1) examine teacher fidelity of implementation to CPRT during classroom implementation; (2) to examine teacher satisfaction with the CPRT methods and training materials; (3) preliminarily examine student outcomes after CPRT implementation.

## *Method*

### **Participants**

*Teachers.* Participants included 20 teachers working in preschool to 3rd grade special education classrooms serving children with ASD in Southern California. Teachers participated in one of four training groups, grouped by school district and availability. Teachers met the following inclusion criteria: (a) a full or part-time position as a teacher in a special education classroom, (b) at least two students with a primary educational classification of autism who had parental consent to participate in this study, and (c) no prior training in CPRT.

Teacher demographics by training group are provided in Table 1. As a group, nineteen teachers were female, one was male. Teachers ranged in age from 24 to 52 years ( $M = 36.69$ ). Seventy percent held Masters Degrees or were enrolled in Masters programs, and three teachers participated in an autism-specific Masters program. They had an average of 8.15 years of experience teaching special education (2 to 13 years) and an average of 7.46 years of experience working with children with ASD (3 to 17 years). Six teachers were Hispanic or Latino (30%), 2 were Asian/Pacific Islander (10%) and the rest were Caucasian non-Hispanic (50%). Thirty

percent of teachers worked in autism specific classrooms serving exclusively children with autism, 65% of teachers had cross-categorical special education classrooms and 5% were resource teachers working with students from a variety of classrooms. Sixty percent of the teachers had preschool classrooms and 40% served children ages 5-9. Sixty-five percent of teachers ( $n = 12$ ) reported having some familiarity or training with the original PRT model, however none reported it as the primary intervention used in their classroom. If they reported using it often in the classroom ( $n = 5$ ), they indicated that they used parts of the intervention integrated with other strategies. In terms of training, five teachers had attended a two day conference specific to PRT (didactic only), 2 had attended a 1-hour workshop in their district, four reported receiving “on the job” training from a supervisor or autism specialist, and one reported watching a video on the use of PRT strategies.

Table 1  
*Teacher Demographics by Training Group*

Teacher Characteristic	Training Group				Total ( $n = 20$ )
	1 ( $n=6$ )	2 ( $n=4$ )	3 ( $n=5$ )	4 ( $n=5$ )	
<b>Age in years (M)</b> (Range)	45.67 (29-17)	34.75 (27-52)	31.75 (25-36)	34.60 (24-41)	36.69 (24-52)
<b>Highest Education Level (% of group)</b>					
Associate Degree	17				5
Bachelor of Arts	17			20	10
Masters of Arts	50	75	60	75	60
Enrolled in MA	17		20		10
Teaching Cred		75	60	20	45
<b>Teaching experience (years)</b>					
<i>M</i> (Range)	7.8 (3-11)	8 (2-13)	7.8 (3-10)	9 (2-12)	8.15 (2-13)
<b>Experience in ASD (years)</b>					
<i>M</i> (Range)	5.5 (3-10)	7.75 (3-13)	7 (6-10)	9.6 (4-17)	7.46 (3-17)
<b>Race/Ethnicity (% of group)</b>					
Hispanic	50	25	0	20	20
Asian/Pacific Is.	0	0	40	0	10
Caucasian	100	100	60	100	90
<b>Classroom age group (% of group)</b>					

Preschool (3-5yr)	66	75	60	40	60
Elemen. (5-9yr)	33	25	40	60	40
Classroom type (% of group)					
Autism Only	50			60	30
Cross Categorical	50	75	100	40	65
Resource		25			5
PRT familiarity/use (% of group)					
Familiar w/ PRT	100	25	40	80	65
PRT as primary	0	0	0	0	0
PRT: Use parts	33	0	20	50	25

*Students.* Forty students were enrolled in the current project. Three students moved from their teacher's classroom during the course of the study and data collection was discontinued for these participants. Students met the following inclusion criteria: (a) a primary educational classification of autism, and (b) a chronological age of three to nine years. This age group was chosen because it has been the focus of the majority of the evidence supporting PRT. Each teacher selected two students, and parental consent was gathered. *The Autism Diagnostic Observation Scale* (ADOS) was conducted to confirm the presence of symptoms of an autism spectrum disorder. On the ADOS, 32 children met the Autistic Disorder cut off, 6 met criteria for ASD and 2 were categorized as non-spectrum. The average student age was 5 years 5 months (range = 3 years 2 months to 9 years 6 months). Students displayed a wide range of communicative functioning examined through standard scores on the Preschool Language Scales 4<sup>th</sup> Edition. The average auditory comprehension standard score was 62.44 (range = 50-148) and mean expressive communication was 59.81 (range = 50-150). Average expressive communication age equivalence was 31 months, with a range of 3-81 months. A majority of students (97%) had verbal ages of less than 36 months, and/or successfully completed a simple conditional discrimination task (see below). Because the focus of the study was on teacher implementation of CPRT, we did not ask the parents to complete any information beyond the consent form. Therefore, additional demographic information on student participants is not available.

### Research Design

This study employed a single-subject, multiple baseline design across four training groups. This type of design has the advantage of controlling for developmental maturation and exposure to the treatment (Kazdin, 1982; Kratochwill et al., 2010). Training groups consisted of 4-6 teachers, and 8-12 students each. Each group participated in a baseline condition for 3-6 sessions, determined a priori according to the design. Because this was a community implementation

study designed to examine response to training in CPRT, time was the criteria used to advance groups from baseline to training. This ensured the entire group of teachers in each district could participate in the group training together. Weekly data collection began at the start of baseline and continued through treatment. Teachers were filmed twice per week (total of 19-22 observations). Data were also obtained during a single observation after a 2-month follow-up period.

### **CPRT Intervention**

CPRT is based on the principles of applied behavior analysis (ABA), which are soundly supported in the scientific literature (National Research Council, 2001). The original PRT program, and thus CPRT, was designed based on a series of empirical studies identifying important treatment components that address “pivotal” areas of development affecting a wide range of functioning for children with ASD. CPRT was developed to reflect adaptations and applicability to the classroom while maintaining all the fundamental components of PRT. Specific modifications based on qualitative and quantitative data include: (1) Recommending that conditional discrimination training only be conducted with students with a cognitive age over 3 years (Reed et al., 2013). (2) Emphasizing the use of multiple exemplars rather than conditional discrimination training (Rieth et al., 2015) and providing recommendations for determining when to provide discrimination training. (3) Describing methods of using a token system to provide direct reinforcement. (4) Providing strategies for differential use of turns based on language level and target skills, and methods for facilitating turns between students (Rieth et al., 2014) and (5) Providing examples and recommendations for using CPRT with groups of students. Teachers requested a variety of resources to assist with overcoming barriers to using the intervention in the classroom and these are included in the CPRT manual and training materials. Specific resources requested by teachers include: (1) basic background information about ABA in general; (2) description of the theory behind each CPRT component; (3) examples of how to target IEP goals and curriculum areas using CPRT; (4) adaptable data collection materials; (5) paraprofessional training materials; and (6) materials to facilitate communication about CPRT and student progress with parents. In addition, we developed a CPRT logo, had the manual professionally edited, and developed a training DVD. More details regarding the adaptation of the PRT procedures and development of materials can be found in (Schreibman, Suhrheinrich, Stahmer, & Reed, 2012; Stahmer et al., 2012). A complete description of CPRT can be found in (Stahmer et al., 2011).

### **Teacher Training**

Teachers were trained by the principal investigators, both of whom had several years of experience using and training others in the traditional PRT model. After each group completed baseline, training began. Teachers received 12 hours of group instruction (6 weekly 2-hour sessions) in the use of CPRT in the classroom including lecture material, video examples, case illustrations, hands-on practice with feedback and group discussion. The specific topics covered in each session are as follows: (1) Learning Your ABCs – An introduction to behavioral principles as the foundation for CPRT, (2) The Components of CPRT, (3) Modeling and practice with students (hands-on practice with feedback session), (4) Using CPRT in Groups and Goal Setting, (5) Data Collection, (6) Training Others in CPRT. Sessions 3 involved hands-on practice with coaching in the context of the group. Between session activities included practice using CPRT and curriculum materials in the classroom. A complete curriculum for the training

including PowerPoint presentations, group activities, coaching procedures etc. can be obtained from the authors.

After training was complete, coaching began, with each participating teacher in his or her own classroom with his or her own students. Training continued for 2-3 sessions, until each teacher reached a mastery criterion for CPRT (see assessments below) or the school year ended. After a participant reached the criteria for mastery of CPRT, a 2 month follow-up condition began. During the follow-up period, the teacher did not receive additional feedback or training.

## **Assessments**

### **Teacher assessments**

*Demographics.* Teacher demographics such as experience in special education and autism, classroom classification, education, race/ethnicity and age were collected at intake using a questionnaire developed for the project.

*Report of use.* Teachers were asked to complete a survey (developed by the research team) reporting their use of CPRT in their classroom each week after training began. For the previous week, they reported on the number of days they used CPRT, the number of minutes per day they used CPRT, activities in which CPRT was used, and who implemented CPRT (e.g., teacher or paraprofessionals).

*Satisfaction.* Teachers and paraprofessionals completed a satisfaction questionnaire addressing general issues of comprehension of the intervention as well as areas of difficulty in applying CPRT in the classroom. This survey was developed by the research team for this project. Teachers rated the quality of the training, their trainer's ability to answer questions, deliver the information, implement CPRT and understand classroom implementation issues, their own ability to use CPRT after training, the organization and structure of training and coaching, the CPRT manual, and whether or not they were still using CPRT and/or CPRT data collection materials on a 1-5 Likert scale (1 = *very dissatisfied*; 5 = *very satisfied*). The questionnaire was completed after follow-up video samples were taken.

*Fidelity of implementation.* Prior to beginning the baseline phase, teachers chose two activities in collaboration with the research team they felt to be appropriate for CPRT (based on a general description of the intervention) with their students and classroom schedule. Activities were a small group or one-to-one format and either play-based or academic in nature. This procedure was used to ensure external validity of the procedures in typical classrooms. These activities were video recorded by a research assistant on a weekly basis. Video observations were coded to assess the teachers' fidelity of implementation of CPRT. Research assistants, who were blind to the research hypotheses and teachers' training group/timeline, were trained to code the video samples using a set of behavioral definitions for fidelity of each component of CPRT (see Table 2 for Scoring Criteria and Table 3 for abbreviated definitions; complete definitions are available from the authors). The fidelity coding system was developed by the authors, based on the original PRT fidelity coding and changes made to the protocol for classroom use.

Table 2  
*Fidelity of Implementation Score Criteria*

Score	Description
1	Teacher does not implement during session or never implements appropriately.
2	Teacher implements competently occasionally, but misses the majority of opportunities.
3	Teacher implements competently up to half of the time, but misses many opportunities.
4	Teacher implements competently more than half of the time, but misses some opportunities.
5	Teacher implements competently throughout the session.

Table 3  
*Fidelity of Implementation: Component Descriptions*

Component	Component Definition
<b>Teacher Maximizes Student Motivation</b>	
Incorporates student choice into activity	The teacher follows the students' interest in materials, toys, or activity by providing choices, either within or between activities, as a way to determine the students' interest or engage the group.
Takes turns by modeling appropriate behavior	The teacher takes or facilitates turns in the activity, including modeling (or peer modeling) developmentally appropriate behavior.
Presents opportunities at various levels (maintenance/acquisition)	The teacher should clearly intersperse tasks that are easy with tasks that are difficult for the target students.
<b>Teacher Facilitates Student Responding</b>	
Gains student attention before providing a cue	The students are attending to the teacher <i>before</i> the teacher presents a cue. In a group situation, the majority of students should be attending when a whole-group cue is presented.
Provides clear and developmentally appropriate cues	A clear cue indicates to the students how they should respond and is at or slightly above the students' response level. In a group situation, the cue should be clear to the least advanced student in the group. The teacher may also adjust the cues to the various ability levels in the group, or provide additional support for some students.
<b>Teacher Provides Appropriate Consequences</b>	



Provides appropriate consequences based on student behavior (contingent)	The teacher should provide consequences that are dependent on the student's behavior <i>immediately</i> after the response. If the students do not respond appropriately, the teacher withholds reinforcement. The teacher may appropriately reinforce brief chains of responses.
Provides reinforcement directly related to the activity	The teacher uses rewards that are directly related to the teaching activity. If the teacher is using a token system, the final reward for which the tokens are exchanged should be related to the activity.
Reinforces the student's goal-directed attempts	The teacher provides reinforcement after most of the students' reasonable, goal-directed attempts (good trying)

The research team established correct codes for a subset of videos through consensus coding (keys). Each research assistant coder then was required to achieve 80% reliability across two keys before coding independently. One-third of all videos were double coded to ensure ongoing reliability of data coding throughout the duration of the project. If there was less than 80% agreement between the reliability coder and the research assistant, additional training and coaching were provided until criterion was achieved and previous videos were re-coded. Coders observed the activity in the teacher selected for observation. Coders rated the use of each component of CPRT on 1-5 Likert scale after viewing the entire clip. A score of one indicated the teacher did not use the strategy during the session or never implemented it correctly. A score of five indicated the teacher implemented the component competently throughout the segment. In order to meet fidelity of implementation on a component, teachers needed to receive a score of 4 (implements the component competently about 80% of the time, but misses some opportunities) or 5 (implements the component competently throughout the session). The Likert coding system was developed as part of a larger effort to adapt fidelity of implementation assessment procedures for feasibility in clinical settings and has been used in previous studies (Suhrheinrich et al., 2013). Coding involved direct computer entry while viewing the video using "The Observer Video-Pro" software (Noldus Information Technology, Inc.), a computerized system for collection, analysis and management of observational data.

### **Student assessments.**

*Eligibility category.* The eligibility category was assigned by the schools and determined by the eligibility criteria on the child's IEP.

*Symptom severity.* Each child received the *Autism Diagnostic Observation Scale* (ADOS; Lord et al., 2000), a standardized protocol for observation of social and communicative behavior associated with autism, to confirm diagnosis. It has been shown to have high reliability and discriminant validity. The ADOS was used at intake to provide a research-based description of autism severity in the sample.

*Communication.* Intake communication levels were examined using the *Preschool Language Scales-4* (PLS-4; Zimmerman, Steiner, & Pond, 2002). The PLS-4 assesses a child's auditory

comprehension (attention, semantics, structure, and integrative thinking) and expressive communication (vocal development, social communication, semantics, structure, and integrative thinking). The standardization sample included 1,200 children, ages 2 weeks to 6 years, 11 months, from the United States. The sample was stratified by parent education level, geographic region, and race, in order to represent the U.S. population. The assessment provides standard scores for Auditory Comprehension, Expressive Communication, and Total Language. The PLS was used to characterize communication skills in the sample.

*Engagement.* Classroom video samples were continuously coded for student engagement by direct computer entry using “The Observer Video-Pro” software (Noldus Information Technology, Inc.). Coding took place for one student (target student) at a time. The target student was required to be on camera for scoring to take place. If a target student was off camera for over 5 seconds, coding was paused. Coding resumed once the target student re-entered the camera’s view. Multiple types of student engagement were scored. Engagement codes included: (1) *active*, e.g. the student is engaged in a class activity or engaged appropriately with instructor (2) *passive*, e.g. the student is watching as the instructor presents materials or as the teacher or a peer is taking a turn with the materials (3) *waiting*, e.g. the student is waiting for the next activity to start (4) *object*, the student is independently engaged with an object (5) *peer*, e.g., the student is engaging appropriately with a peer (including playing, talking, gesturing to) independently or with adult facilitation, and (6) *inappropriate*, e.g. student behavior is disrupting the teaching activity. Complete student engagement definitions are available from the authors.

*Multiple cues assessment.* Each student completed a discrimination learning assessment modeled after simultaneous discrimination paradigms designed to assess response to conditional discriminations (Ploog & Kim, 2007; Schover & Newsom, 1976). A detailed description of the multiple cues assessment utilized in this study can be found in (Reed et al., 2013).

## **Procedure**

*Teacher recruitment.* Special Education directors in San Diego County school districts serving children with autism were contacted via email. Potential study participants (teachers) were identified by district Special Education directors. Interested teachers with at least 2 students with a primary educational diagnosis of ASD and no prior training in CPRT were recruited.

*Student recruitment.* Student participants were recruited through the participating teachers who sent home a flyer regarding participation. All teachers enrolled 2 students. Three teachers had only one student by the end of training due to student changes in classroom placement and/or family movement out of the area.

*Video collection and coding for dependent measures.* Video samples of each participant working in the classroom with his or her students were collected semi-weekly during baseline and weekly during treatment and follow-up phases. Each teacher selected two activities for filming in their entirety (e.g., small group activity, language arts) which were kept consistent throughout the study.

*Intake assessments.* Intake assessments were completed by teachers and parents; student testing was conducted prior to beginning baseline.

*Baseline.* The research team conducted video recordings of teachers during the chosen activities semi-weekly. The length of the baseline varied by training group based on design.

*Teacher training and coaching.* Once baseline for each group was completed, didactic training began. Teachers in each district were grouped together. A training time convenient for all of the teachers and approved by participating district directors was chosen. Three groups completed the training during regular work hours on student early release days and two groups completed the training after school. Coaching was conducted at a time scheduled with the teacher during the activities chosen for the project. Coaching involved the coach observing the activity, coding fidelity of implementation of CPRT, and providing feedback to the teacher using a standardized format that included describing what the teacher did well, areas of suggested improvement and eliciting questions from the teacher. Coaching sessions typically lasted 30-45 minutes. Teachers could ask questions regarding the use of CPRT or ask the coach to model the strategies with their students in the context of their activities.

*Follow up assessments.* Two months after the last coaching session, a final classroom observation was conducted. Teachers, parents and children repeated intake assessments to examine potential changes.

## **Data Analysis**

Visual inspection was used to examine differences between the baseline, treatment and follow-up conditions. In addition, the Percentage of Data Points Exceeding the Mean (PEM; Ma, 2006) was used to examine differences from baseline to treatment for both fidelity of implementation and engagement. In accordance with PEM analyses, the median point at baseline was used to calculate the percentage of treatment phase data points above the median line.

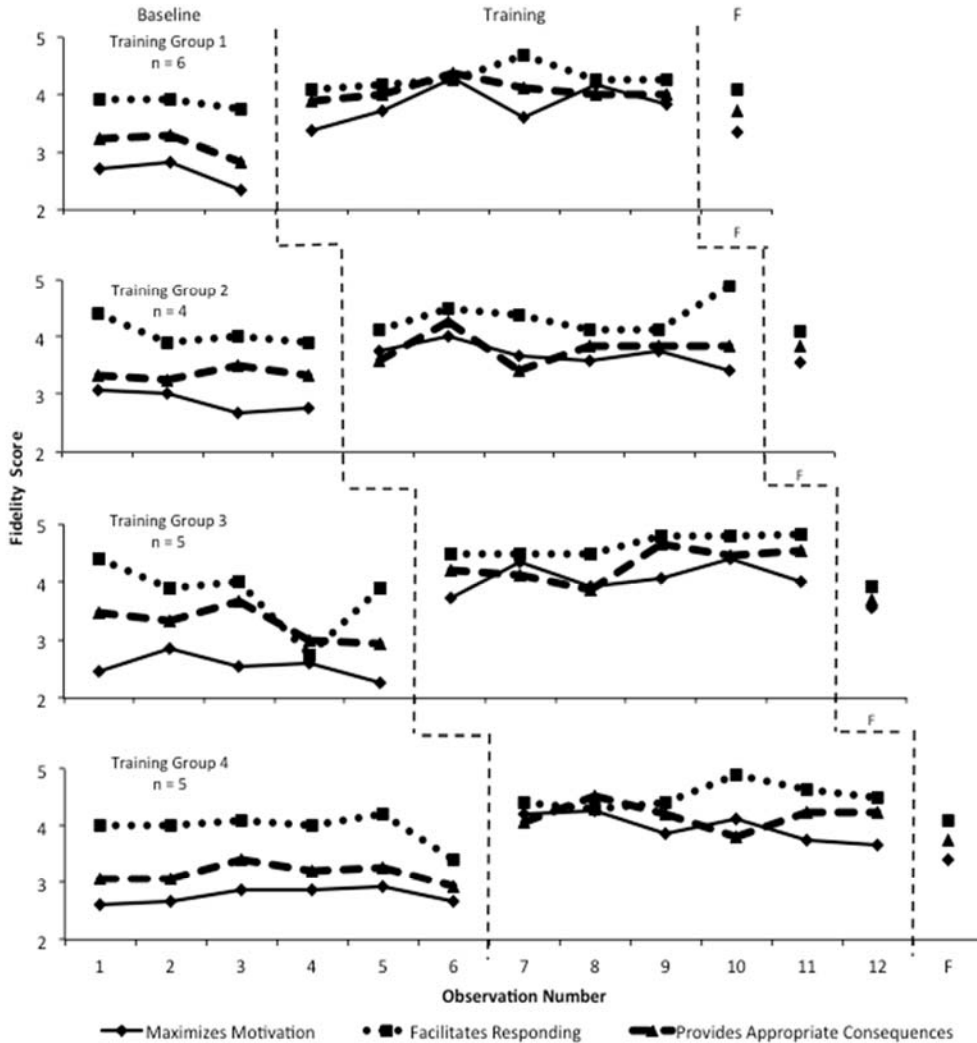
## **Results**

### **Teacher Fidelity of Implementation**

Data for each training group were average across teacher and component type because of similarity in the data and for clarity of presentation and visual examination (see Figure 1). Components were grouped and averaged by *Maximizes Motivation* (child choice, turn taking, easy and difficult tasks), *Facilitates Responding* (student attention, clear cues), and *Provides Appropriate Consequences* (contingent consequences, direct reinforcement, reinforcement of attempts). Because only 3% of students had difficulty responding to simple conditional discrimination, use of responsivity to multiple cues was not examined. Baseline data consisted of 3-6 sessions (1.5-3 weeks). Baseline data was relatively stable for all groups and CPRT component groups. Training Group 3 had very low use of *Facilitates Responding* during session 4, however session 5 remained lower than any other prior sessions, indicating a stable baseline. On average, during baseline, all groups used *Facilitates Responding* components with high levels of competence ( $M = 3.96$ ). On average, teachers were not meeting fidelity of implementation standards in the other two areas, but were more successful using components of *Provides Appropriate Consequences* ( $M = 3.23$ ) and had the greatest difficulty using *Maximizes*

Motivation ( $M = 2.70$ ) components.

Figure 1. Figure 1 depicts teachers' fidelity across phases. Each Training Group indicates fidelity data averaged across teachers and component areas. On the X axis is the observation number and on the Y axis is the average score that teachers received. The final point on the X axis in each graph represents follow-up, which happened after 2 months. Note that the Y axis starts at 2 for ease of visualization, as no averages were below 2.



*Summary of Fidelity Scores for CPRT Components Post Training (after Training Week 4)*

CPRT Component	Overall <i>M</i> (SD)	Group <i>M</i> (SD)	One-on-One <i>M</i> (SD)	% passing at least once	% passing at least twice
Overall Fidelity	4.12 (.54)	4.05 (.55)	4.22 (.51)	100	100
Maximizes Motivation					
Student Choice	3.99 (1.15)	3.86 (1.20)	4.18 (1.11)	100	85
Takes Turns	3.51 (1.22)	3.41 (1.34)	3.54 (1.07)	100	75
Maintenance/ Acquisition Tasks	4.37 (.74)	4.39 (.77)	4.39 (.70)	100	90
Facilitates Responding					
Gains Attention	4.31 (.72)	4.26 (.75)	4.38 (.70)	100	95
Clear Cues	4.65 (.52)	4.63 (.52)	4.69 (.51)	100	100
Provides Appropriate Consequences					
Contingent Consequences	4.22 (.70)	4.17 (.66)	4.31 (.74)	100	90
Direct Reinforcement	3.70 (1.24)	3.58 (1.34)	3.82 (1.15)	100	75
Reinforces Attempts	4.41 (.77)	4.44 (.71)	4.43 (.79)	100	95

A second coder double-scored 32% of the video observations ( $n = 86$ ) distributed equally across all phases to assess reliability of data coding for fidelity of implementation. Consistency intraclass correlation coefficients (ICC) for single rater scores were in the ‘Good’ range for all components except contingency and reinforces attempts, which were both within the fair range (Cicchetti, 1994). Exact ICCs are as follows: Gain attention,  $ICC = .79$ ; Clear instructions,  $ICC = .76$ ; Maintenance/acquisition tasks;  $ICC = .67$ ; Child choice,  $ICC = .71$ , Turn taking,  $ICC = .72$ ; Contingent consequences,  $ICC = .54$ ; Direct reinforcement,  $ICC = .72$ ; and Rewarding attempts,  $ICC = .58$ .

**Report of Use**

Thirteen of the 20 teachers (65%) completed the report of use survey at least one time after training began. The mean number of reports completed was 4.23, with a range of 1–9. Reports

were distributed across the training period. Teachers reported using CPRT in 70% of reports (range = 0-100%) overall. Eight (62%) reported using CPRT in 80%-100% of reports, and three (23%) included CPRT in 20%-67% of reports. For these teachers, CPRT use began towards the end of training and continued in all subsequent reports. Two teachers (15%) did not report using CPRT at all. These teachers had very structured classrooms and reported using only discrete trial training (DTT) and Treatment and Education of Autistic and Related Communication-handicapped Children (TEACCH) strategies on all reports. For teachers who reported using CPRT, the average number of days per week they reported using the strategy was 3.88 (range = 1-5). The average number of minutes per day using CPRT reported across all of these reports was 47.37 (range = 0-300).

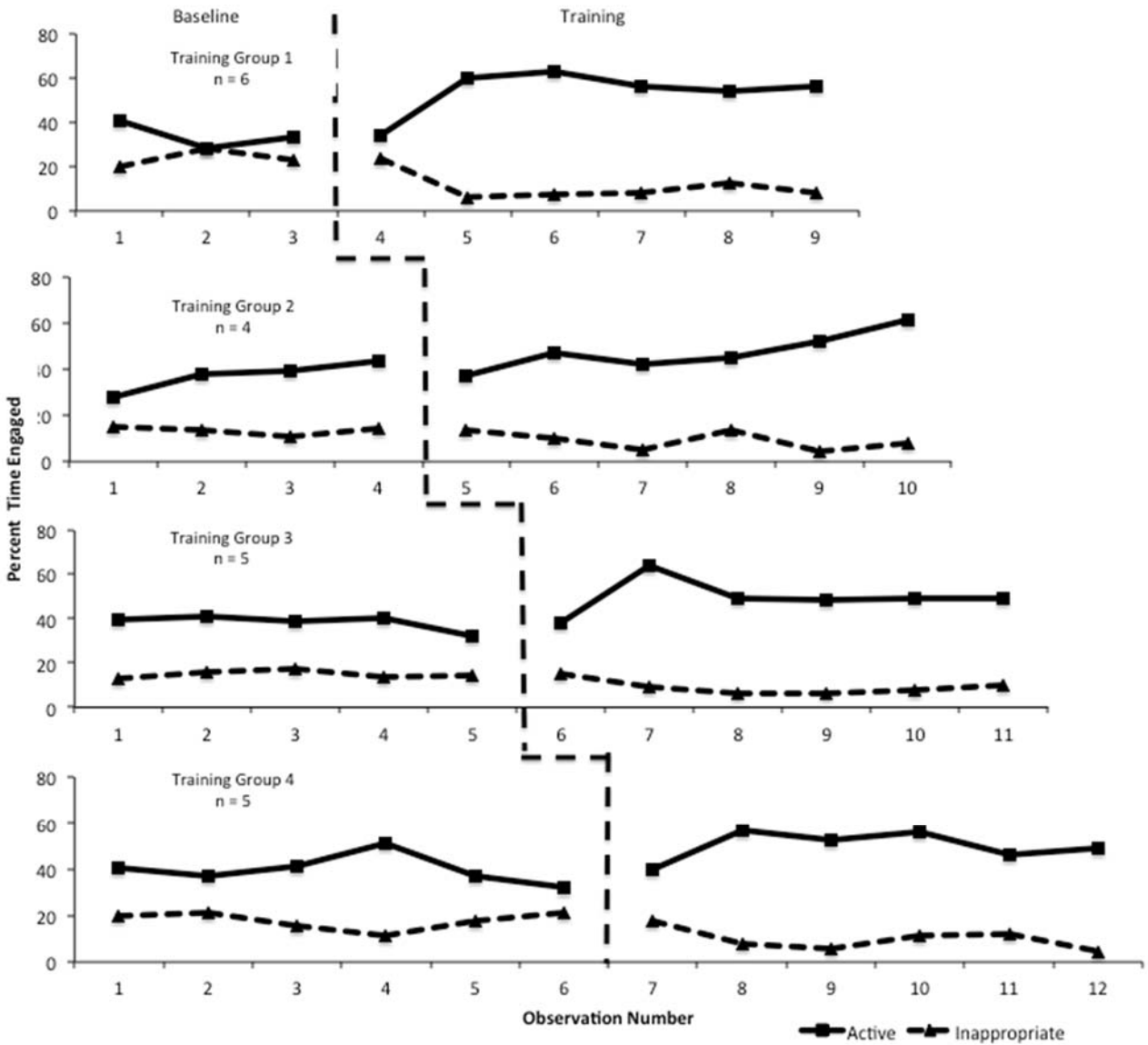
### **Teacher Satisfaction**

In general, the 17 teachers (85%) who completed the satisfaction survey were very satisfied with all aspects of CPRT training, materials and procedures with an overall satisfaction rating of 4.68 out of 5 (see Table 3). There were no ratings lower than 3 in any area. Teachers were most satisfied with the trainers' ability to answer questions about CPRT (4.94), and least satisfied with their own ability to implement CPRT with their students (4.18) and classroom video recordings conducted for research (4.24). Eighty-two percent of teachers reported that they were still using CPRT at follow-up, however only 18% were using data collection materials.

### **Student Engagement**

Active student engagement was coded for each of the recorded sessions during baseline and intervention (see Figure 2). Data are collapsed across students in each intervention group for ease of viewing. Baselines were relatively stable for all groups except group 2, which had an ascending baseline for active engagement. Overall active engagement averaged 37% at baseline, 50% across all treatment sessions, and 54% if only the final two treatment sessions are examined. The PEM was calculated for active engagement for each group with an overall PEM of .92 and a range of .83 (groups 2 and 3) and 1.0 (groups 1 and 4). The PEM was calculated for inappropriate engagement for each group with an overall PEM of .92 and a range of .83 (groups 1 and 3) and 1.0 (groups 2 and 4). These data would suggest that CPRT was moderately to highly effective for improving active student engagement and reducing disruptive behavior.

Figure 2. Figure 2 depicts students' active and inappropriate engagement in learning activities across phases. Each training group indicates data averaged across students and teachers for that group.



A second coder double-scored 31% of the video observations ( $n = 132$ ) across all phases to assess reliability of data coding for student engagement. Percentage of engagement in all six categories was examined using consistency intra-class correlation coefficients for single ratings. All ICCs were in the 'Good' range, with the exception of Object Engagement, which was in the 'Fair' range (Cicchetti, 1994). Exact ICCs for each engagement category are as follows: Active,  $ICC = .61$ ; Passive,  $ICC = .66$ ; Waiting,  $ICC = .67$ ; Object,  $ICC = .49$ , Peer,  $ICC = .71$ , and Inappropriate,  $ICC = .54$ .

### *Discussion*

This project provides a preliminary examination of the use of Classroom Pivotal Response Teaching (CPRT), adapted in collaboration with teachers from the evidence-based practice, Pivotal Response Training (PRT), for use in public special education settings. Overall, teachers learned the strategies after a relatively brief training period that included coaching, were very satisfied with the training and materials, and affected some change in student engagement. This provides preliminary evidence for the benefits of use of CPRT in classrooms.

When examining teacher use of specific CPRT components in comparison to teachers participating in previous PRT studies (e.g., Suhrheinrich et al., 2013), these teachers had higher fidelity overall than clinically trained teachers, and slightly lower fidelity than researcher trained teachers. When looking at performance during one-on-one sessions only, the teachers in this study performed more similarly to the researcher trained teachers, except in the area of direct reinforcement, where they had some difficulty. Fifty-nine percent of teachers in the current study used CPRT during group activities and continued to meet fidelity standards. Prior teacher reports have been that using PRT strategies in a group is more challenging, however many teachers were able to implement CPRT in groups with fidelity in the current study. There were few differences in teacher demographics across groups, with teachers in Group 1 having higher age, less education and greater PRT familiarity than the other groups. Teachers in Group 4 were more likely to be teaching elementary school and had more ASD experience. Teachers in Group 2 had the lowest level of PRT familiarity. However, these differences did not seem to affect PRT skill level at baseline or after training, as the groups were relatively similar. However, limited PRT familiarity may have been associated with less maintenance of skills at follow up. Although teachers in the current study continued to have some difficulty with the turn-taking component, they performed better than previously trained groups (Suhrheinrich et al., 2013). Anecdotally, teachers suggested that because improving peer social interactions is often a goal when they are using CPRT in groups, fidelity measures should include teacher facilitation of modeling and turn taking between students (rather than simply turns with the teacher). This is excellent feedback for future examinations of CPRT.

There is some evidence to indicate that teachers need practice over time to increase fidelity of implementation in complex models such as CPRT (Coddling, Livanis, Pace, & Vaca, 2008; Joyce & Showers, 2002). In fact, in an examination of the use of PRT in one-on-one settings in classrooms, teachers had difficulty implementing PRT in the first year of training but increased their fidelity in the second year (Stahmer et al., 2015). In the current study, teachers were assessed relatively immediately following initial training. In some cases, they did have difficulty using some strategies at follow-up when no additional training was provided. It is possible that



with ongoing coaching and practice, further integration into classroom activities and increased fidelity of implementation over time may occur. Our findings support recommendations that in-service teacher training which incorporates a combination of didactic training and coaching is needed for high fidelity in complex teaching methods (National Advisory Mental Health Council, 2001; Odom, 2009). There is evidence that effective training includes opportunities to practice skills while receiving feedback as well as ongoing coaching with feedback (Cordingley, Bell, Isham, Evans, & Firth, 2007; Cornett & Knight, 2008; Reid, Parsons, & Green, 1989; Scheuermann, Webber, Boutot, & Goodwin, 2003). Teachers in this study received both opportunities to practice and ongoing coaching, and they were able to reach acceptable levels of fidelity of implementation (at least 80% correct use) in most areas.

Although student outcomes were not the focus of the current study, we did see a slight increase in student engagement and decreases in disruptive behavior when teachers began using CPRT. Because the activities and child goals remained consistent and changes were commensurate with training in each group with varying baselines, we can make a preliminary suggestion that improvements were related to the CPRT strategies rather than simply maturation or familiarity with the activity. Our measurement of engagement is similar to that of other studies which define engagement as time on-task, time on-schedule, and appropriate interaction with learning materials (Bryan & Gast, 2000; Hume & Odom, 2007; MacDuff, Krantz, & McClannahan, 1993; Pelios, MacDuff, & Axelrod, 2003). It is a limitation that we did not assess student progress toward goals or specific gains in communication or academic skills. However, student engagement has been associated with increased skill acquisition and participation (National Advisory Mental Health Council, 2001; Iovanne, Dunlap, Huber, & Kincaid, 2003; Klem & Connell, 2004; Pelios et al., 2003). Future research should examine the relationship between engagement and fidelity of CPRT as a whole, as well as specific components of CPRT.

### **Limitations**

Of course, there are several limitations to this project that may limit the generalization of the results and provide suggestions for future projects. This was a small scale study in which the research team provided training to local teachers. Due to the community nature of the study, baselines were staggered based on time and stability of initial observations. Additionally, providing training on a larger scale with CPRT trainers who are not researchers will be important to understand the feasibility and generalization of the protocol.

### **Future Research**

Additional study is needed regarding the CPRT components that were altered. Most students in the study did not have difficulty with conditional discrimination, therefore use of this component was not examined in this project and feasibility of using the component for students with poor responsivity to multiple cues needs to be examined. In addition, measurement of the use of varied cues was not conducted as part of this study, but may end up being an important component for generalization of behavior change for children with autism.

Examination of the clear relationship between student learning and teacher use of CPRT components is a next step in this type of research. In addition, understanding more about the broader context in the implementation of evidence-based practices such as CPRT in schools is important. For example, administrative support for teacher training, presence of a specialist who can assist with ongoing coaching, teacher education, training and staffing in the classroom may

all affect fidelity of implementation of any intervention. Additional research is needed to clarify the prerequisite skills and supports needed for effective implementation of such practices.

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