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BRIEF REPORT

Implementation Challenges in Translating Pivotal Response Training into Community Settings

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Abstract Implementing evidence-based practices (EBPs) for children with autism is challenging for teachers because these practices are often complex, requiring significant training and resources that are not available in most school settings. This brief investigation was designed to identify areas of strength and difficulty for teachers implementing one such EBP, pivotal response training (PRT). Observational data were gathered from 41 teachers participating in two separate investigations involving PRT. Despite differences in training procedures, teachers demonstrated similarities in areas of strength (clear opportunities/instruction and child choice) and difficulty (turn taking and multiple cues). These findings suggest next steps toward systematic adaptation of PRT for classroom use. The research may serve as a model for the process of adapting EBPs for practice settings.

Keywords Fidelity of implementation · Pivotal response training · Translation · Special education

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Introduction

Serving students with autism spectrum disorders (ASDs) poses a challenge to public schools because very few interventions have been developed for and systematically tested in school settings. Most evidence-based practices (EBPs) for children with ASD are complex, requiring specific training or resources that may not be available in most schools. Many teachers report using EBPs, but also report modifying them for use in the classroom (Stahmer et al. 2011; Stahmer et al. 2005). Teachers report combining and adapting EBPs from various training protocols to fit their own teaching preferences and the perceived needs of their students. Research in other areas suggests that the positive outcomes demonstrated in research settings may not be maintained when programs are modified in this way (Weisz et al. 1995).

One EBP for students with ASD that is used in classrooms is pivotal response training (PRT; Koegel et al. 1989). PRT is a naturalistic intervention, based on the principles of applied behavior analysis, which is soundly supported in the scientific literature (National Autism Center 2009; Humphries 2003; Lord and McGee 2001; Wilczynski et al. 2011). A recent review listed PRT as one of 24 EBPs with evidence of efficacy for teaching students with ASD (Odom et al. 2010).

Both comprehensive intervention packages and eclectic educational programs often include PRT as a teaching

technique (Arick et al. 2003; Stahmer et al. 2011; Stahmer and Ingersoll 2004), and in one survey most teachers reported using PRT (Stahmer 2007). However, it is unclear how teachers use PRT. It's not known whether (1) the adaptations teachers make to PRT; or (2) the combination of PRT with other methods, as commonly occurs in comprehensive programs, compromises its effectiveness.

Evaluating teacher implementation of PRT and identifying challenges to its use in classrooms is an important first step in the larger effort to improve the quality of educational services for children with autism. Improved training protocols, additional materials, or adapted procedures may be needed to maximize the effectiveness of PRT in classroom settings. The purpose of this brief investigation was to identify areas of strength and difficulty for teachers implementing PRT as an initial step toward translation of PRT for classroom use.

Method

Video observations of two groups of teachers using PRT in their classrooms were analyzed. One group of teachers was trained by a researcher as part of an efficacy trial (Research Trained; RT). The second group was trained by clinical trainers as part of an effectiveness trial (Clinically Trained; CT). Though training and observation procedures (see below) were not consistent across the studies, the two groups provide a preliminary view of fidelity of implementation of PRT in school settings.

Participants and Training

Group 1 (RT)

Participants included 19 teachers working in preschool-2nd grade special education classrooms serving children with ASD in Southern California. Teachers participating in this study were part of a larger study examining the efficacy of training classroom teachers in PRT procedures (Suhrheinrich 2011). All teachers were female. Fifty-three percent held Masters degrees. They had an average of 6.5 years of experience teaching special education (.25–30 years) and 6.2 years of experience teaching children with ASD (.25–30 years). Participants attended a 6-h workshop on PRT that incorporated didactic instruction, modeling, and a manual created for clinical training by PRT developers (Koegel et al. 1989). The manual was slightly adapted to include examples of teachers, rather than parents, implementing the PRT components. All training was conducted by the principal investigator, who completed graduate level training in PRT with one of the program developers (L. Schreibman). After the workshop, teachers received feedback during two individual coaching sessions in their classrooms, which occurred weekly (approximately) after the workshop was completed. A complete description of the training received by RT teachers is available in Suhrheinrich (2011).

Group 2 (CT)

Participants included 22 teachers working in K- 2nd grade ASD classrooms in an urban school district in Philadelphia, PA (Mandell et al. 2013).These teachers were part of a larger study examining the implementation of EBPs in community programs. Of the 49 teachers participating in the larger study, these 22 were chosen for the current study because the dates of observation and coaching made their training most comparable with the Southern California group. All teachers were female. Sixty-four percent held Masters degrees. They had an average of 11.4 years of experience teaching special education (3–38 years) and an average of 6.5 years of experience teaching children with ASD (1–24 years).

Clinically trained teachers received training in a comprehensive instructional program for children with ASD (Strategies for Teaching based on Autism Research, STAR; Arick et al. 2003), which includes PRT, discrete trial training and teaching within functional routines. As part of their training, teachers and classroom staff participated in 6 h of training focused on PRT strategies exclusively, based on the STAR manual developed for teacher use (Arick et al. 2004). Initial training was conducted by one of the authors of the STAR program, who completed graduate level training in PRT with one of the program developers (L. Schreibman) and followed a traditional PRT training format. After participants attended the workshop, coaching was provided on a monthly basis for the entire classroom intervention program; on average, teachers received 3.3 h of coaching per month (range = 0–5.9 h per month). Coaching was provided by local coaches with MA and doctoral level training in behavioral strategies, whom the STAR program developers trained in PRT. There is no estimate of the amount of coaching specifically for PRT. A complete description of the training received by CT teachers is available in Mandell et al. (2013).

Measures

Video Observations

Research trained teachers were filmed during weekly coaching sessions following the group training workshop. Data from the two coaching sessions following training were averaged. One RT teacher had only one observation due to scheduling difficulties. CT teachers were scheduled

to be filmed monthly using PRT. Data for CT teachers with at least one PRT segment filmed during the 2 months following PRT training were used in the current analyses. If two segments were available ($n = 7$), the average was used in all analyses. For both groups, a trained research assistant filmed the teacher conducting PRT in the classroom.

For both groups, visits were scheduled with the teacher beforehand; all teachers were aware when videotaping would occur. In both groups, the teacher selected the materials for the teaching interaction and worked one-on-one with a student with ASD in their classroom using PRT.

Fidelity of Implementation Coding

Video observations were coded to assess the teachers' fidelity of implementation of PRT. Research assistants, who were blind to the research hypotheses and teachers' training group or experience level, were trained to code the video samples using a set of behavioral definitions for each component of PRT (see Table 1 for abbreviated procedures and definitions).

Coders observed a 10-min video clip in which the teacher used PRT with an individual student. Coders rated the use of each component of PRT 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 particular component of PRT, teachers needed to receive a score of 4 (implements the component competently a majority 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. The development process included systematic comparison of trial-by-trial and interval based coding of occurrence/non-occurrence of each component of PRT to the adapted Likert scale model. A regression analysis indicted a significant correlation between the Likert coding and the trial by trial method ($R^2 = .72$). Overall pass/fail agreement for PRT fidelity occurred in 90 % of cases when passing on the trial by trial coding was defined as correct implementation in 80 % of trials and passing on the Likert rating was defined as a rating of 4

Table 1 Summary of PRT Components

PRT component	Definition
Gains attention	Teacher must have student's attention before presenting an opportunity to respond
Clear opportunity/ instruction	The question/opportunity to respond must be developmentally appropriate for the child and & appropriate to task
Maintenance tasks[a]	Tasks that are easy must be interspersed with more difficult tasks (acquisition)
Child choice (shared control)	Teacher must follow the student's choice of tasks, to a large extent and/or provide choices within tasks
Turn taking (shared control)	Teacher models appropriate behavior while maintaining control of the instructional materials in the context of a give and take interaction with the student
Multiple cues	Some instructions should involve cues that include multiple components (two or more aspects of the environment, stimuli or activity)
Contingent consequences	Reinforcement must be contingent on the child's behavior
Direct reinforcement	Reinforcement should be natural and directly related to the desired behavior
Reinforcement of attempts[a]	Goal-directed attempts to respond are reinforced
Coding criteria	Definition
1	Teacher does not implement throughout session
2	Teacher implements occasionally, but misses majority of opportunities
3	Teacher implements up to half the time but misses many opportunities
4	Teacher implements a majority of the time but misses some opportunities
5	Teacher implements competently through the session
Coding procedures	
Score each component based on your observation of the teacher-student interaction. Observe the session or selected video segment and take notes as needed to indicate correct/incorrect use of the components. Then, select one code that best represents the amount of time in which the teacher correctly implemented each component.	

[a] Not coded for fidelity of implementation in the current investigation

or 5. 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.

Double scoring of 33 % of the video samples from the CT group and 27 % of the video samples of the RT group estimated 86 % inter-rater agreement for videos of CT teachers and 83 % for videos of RT teachers.

Data Analysis

The Likert rating for each PRT component was averaged across observations for each teacher (when multiple observations were available), in order to calculate a single 1–5 score per component, per teacher. Scores on individual components across teachers in each group were then averaged to compare PRT implementation between RT and CT teachers. A mixed model ANOVA with PRT component as a within subject factor and RT versus CT group as a between subjects factor was used to examine differences in performance across both training groups and components.

The percentage of teachers within each group who met fidelity on each component was calculated and examined visually to inform which components were easy or difficult for teachers to implement correctly and to examine potential differences based on type of training received. Based on the range of teacher fidelity, high fidelity was defined as 70 % or more of teachers within a group implementing the component correctly, moderate fidelity was defined as 40–69 % of teachers within a group implementing the component correctly, and low fidelity was defined as 39 % or fewer teachers within a group implementing the component correctly. These categories may be considered tools for descriptive analysis of the results.

Results

The fidelity of implementation of each component was examined across RT and CT groups (see Table 2).

There was no statistically significant association between teachers' fidelity of implementation of PRT (either individual components or overall) and years of experience teaching special education or teaching children with ASD. RT teachers, as a group, met the fidelity of implementation criteria for all of the PRT components except turn taking and multiple cues. As a group, CT teachers did not meet fidelity of implementation criteria for any of the components. CT teachers implemented the components child choice, clear instructions, and gains attention at the highest levels of fidelity out of all the components, with a majority of teachers passing (receiving a score of 4 or 5), but average scores across all teachers were not in the passing range.

Training group was associated with teachers' fidelity of implementation of PRT ($p < .01$). Post hoc t-tests revealed that RT teachers implemented all PRT components except turn taking and multiple cues with significantly higher fidelity than CT teachers ($p < 05$). Fidelity of implementation for turn taking and multiple cues components was similar across both groups.

Teachers' fidelity of implementation varied significantly by component ($p < .01$). Results from post hoc paired sample t-tests (corrected by Holm's method) revealed that three components, gains attention, clear instructions, and child choice, were implemented with significantly higher fidelity than all other components ($p < .05$). The components of turn taking and multiple cues were implemented with significantly lower fidelity than all other components ($p < .01$).

Examination of the percentage of teachers passing fidelity on each component also reveals similar areas of strength and difficulty across groups (see Figure 1).

Providing a clear opportunity/instruction and incorporating child choice were areas of strength, or high fidelity, with over 70 % of teachers in each group meeting fidelity of implementation criterion in this area (clear opportunity, RT = 100 %; CT = 77 %; child choice, RT = 100 %, CT = 73 %). Two components were implemented with low fidelity. Fewer than 40 % of teachers in each group implemented the turn taking and multiple cues components with fidelity (turn taking, RT = 26 %, CT = 36 %; multiple cues, RT = 0 %, CT = 0 %). The percentage of teachers correctly implementing the remaining components varied by group. For gaining attention (RT = 95 %, CT = 50 %), providing contingent consequences (RT = 78 %, CT = 45 %) and providing direct reinforcement (RT = 79 %, CT = 41 %), the RT teachers were at high fidelity while the CT teachers were at moderate fidelity.

Discussion

This initial investigation indicates similarity across two different groups of teachers in their implementation of PRT components after receiving training based on two widely available manuals developed for clinical use. These data demonstrate that teachers are skilled at using some components of PRT in classroom settings (child attention, clear opportunity/instruction, child choice). For other components, teachers may benefit from additional resources or training (contingent consequences, direct reinforcement). Two components appeared to be most problematic for

Table 2 Summary of observational findings by group

	Mean fidelity of implementation score	
	Researcher trained ($n = 19$)	Clinically trained ($n = 22$)
PRT component	M (SD)	M (SD)
Overall fidelity	4.23 (.27)	2.98 (.50)
Gains attention	4.86 (.36)	3.46 (.67)
Clear opportunity/ instruction	4.77 (.39)	3.77 (.55)
Child choice	4.74 (.51)	3.85 (.72)
Turn taking	2.74 (1.4)	3.05 (.99)
Multiple cues	1.33 (1.26)	0.88 (1.13)
Contingent consequences	4.35 (.69)	3.30 (.84)
Direct reinforcement	4.47 (.69)	3.20 (.89)

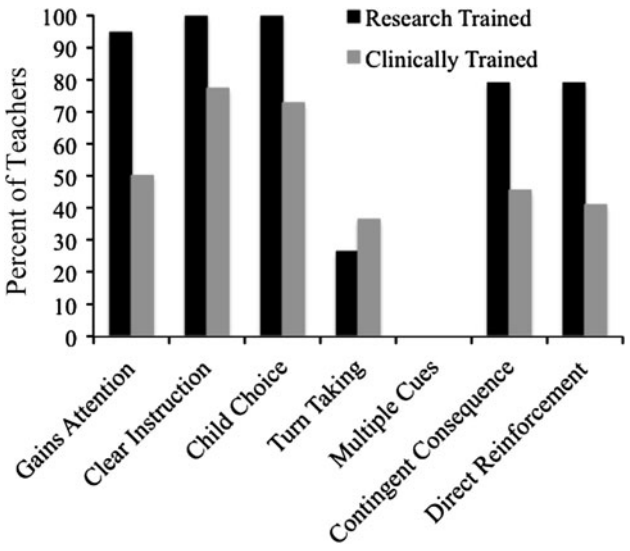

Fig. 1 Percent of teachers implementing PRT components at or above fidelity criteria

teachers, as evidenced by poor implementation or exclusion during their use of PRT (multiple cues, turn taking). Based on these preliminary data we provide several recommendations for possible next steps for translation of PRT to the classroom that include improved training, and further research to examine modifications.

First, teachers in both groups had moderate difficulty providing consequences that were contingent upon student behavior and providing direct reinforcement. Previous research suggests these components may be critical to student learning (Koegel et al. 1987; Koegel and Williams 1980; McGee et al. 1985; Schreibman and Koegel 2005; Williams et al. 1981). Achieving accurate implementation of these components in schools may require additional resources and strategies specific for classroom use. For example, to improve teachers' use of contingent consequences, resources may include information on why providing contingent and direct consequences is important (based on supporting research) and how teachers can improve their use of contingent and direct consequences with real-world examples and activity suggestions. In addition, creative methods of providing direct reinforcement, for example through token systems or other commonly used classroom procedures, may be helpful. Improved training procedures, such as providing more opportunity for behavioral rehearsal and coaching with feedback on the components, may also improve teacher implementation (Suhrheinrich 2011).

Teachers in both groups demonstrated difficulty implementing turn taking and multiple cues procedures. Traditionally, both of the components have been included in PRT training (turn taking as part of shared control; Koegel et al. 1989); however some recent publications on PRT have not included these steps explicitly. It is possible that this drift has occurred due to provider difficulty implementing these steps, but the effect of removing these specific components, described in the original manual and present in the early research, has not been empirically documented. Additionally, recent large-scale reviews of intervention practices for individuals with ASD have included these components. For example, responding to multiple cues is described as a pivotal area of PRT in the National Standards Project (National Autism Center 2009) and a component of the intervention in National Professional Development Center (National Professional Development Center on Autism Spectrum Disoders 2011). Next steps in translating PRT into community practice may require evaluating how modification or removal of these components affects overall efficacy of PRT for positive child outcomes. First, the specific factors that make each component difficult for teachers to implement should be explored. For example, the turn taking component may be difficult for teachers because they typically demonstrate new skills for students in an instructional manner, but do not model new skills by taking turns with students once an activity has begun. Identifying how providing a demonstration (rather than modeling in the context of a turn) affects student learning would inform the process of possible modification of turn taking for future classroom use. Additional research on the multiple cues component of PRT may involve exploration of how broadening attention can be achieved through other teaching methods and the investigation of the developmental appropriateness of conditional discriminations for some students with ASD. A recent report indicates typically developing children consistently respond to simultaneous multiple cues at 36 month on average (Reed et al. 2012). These findings may inform how developmental readiness of children with ASD impacts the added benefit of this component. Each of the components found to be difficult to implement should be deconstructed and systematically evaluated to best inform the process of translating PRT to the classroom.

Teachers in the RT group had higher fidelity of implementation overall than teachers in the CT group. There are at least two reasons why this might be the case. First, although teachers in both groups attended a 6 h workshop focused exclusively on PRT, teachers in the RT group were taught only PRT while teachers in the CT group were also taught a complete classroom curriculum during additional group workshops, which included two other intervention strategies. Anecdotally, CT teachers reported that the coaches put a strong emphasis on mastery of other methods and less emphasis on PRT, which may have impacted teacher mastery of the intervention. Additionally, although the workshop presenters for both groups were Master's level trainers with expertise in PRT trained at the same graduate institution, there may have been more subtle differences in the trainers or workshop presentations that led to differences in teacher implementation. Having a more detailed understanding of the content of training and coaching in future research will provide needed information regarding appropriate training methodology for translation of EBP to community settings.

Overall, the results of this investigation indicate PRT is a viable intervention for teacher use in classroom settings and add to the small body of literature describing teacher fidelity of implementation of PRT or similar techniques (e.g., Jones et al. 2006; Smith and Camarata 1999; Suhrheinrich et al. 2007). There was consistent evidence across participant groups to indicate areas for possible adaptation (i.e. turn taking, multiple cues). Additionally, this research may serve as a model for the process of adapting EBPs for clinical settings more generally. Innovative efforts toward dissemination of EBPs have shifted from the traditional, unidirectional models of translating research into practice toward a more reciprocal, interactive effort between researchers and practitioners (Bondy and Brownell 2004; Meline and Paradiso 2003; Weisz et al. 2004). Providing more opportunity for intervention in applied settings to inform research is a likely first step toward effective translation of EBPs. Additionally, the process of gathering information about what works in educational settings should improve the quality of resources resulting from systematic scientific adaptation of interventions.

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