

LITERATURE REVIEW ON PARENT-IMPLEMENTED
PIVOTAL RESPONSE TRAINING

A Thesis
Submitted to
the Temple University Graduate Board

in Partial Fulfillment
of the Requirements for the Degree of
MASTER OF SCIENCE IN EDUCATION
IN APPLIED BEHAVIOR ANALYSIS

by
Rubina A. Bilal
May 2021

Examining Committee Members:

Amanda G. Fisher, Advisory Chair, Department of Education and Human Development
Matthew Tincanni, Department of Education and Human Development
Art Dowdy, Department of Education and Human Development
Jason C. Travers, , Department of Education and Human Development
Saul Axelrod, Department of Education and Human Development
Phillip N. Hinline, External Member, College of Liberal Arts-Psychology

ABSTRACT

Pivotal Response Training (PRT) is an intervention that was originally developed by Koegel & Koegel (2006) that teaches pivotal behaviors to children with Autism Spectrum Disorder (ASD). Research places a significant emphasis on teaching parents and other caregivers to implement these procedures with their children. However, PRT is often implemented and trained with wide variability. The purpose of this literature review was to critically review the literature on parent-implemented PRT and evaluated the issues identified within the literature. A multiple step search procedure is conducted for this literature review and eighteen articles were selected based on the inclusionary criteria. Results of the review identify trends in the current literature of how parents have been trained to implemented PRT. This review also highlights the need for future research on parent implemented PRT to assess parent's treatment integrity once initial competency with the PRT intervention has been met, and the need for future research to focus on assessing social validity in several ways.

Keywords: autism spectrum disorder, pivotal response training, parent

I would like to dedicate this
paper to my parents for always supporting
me throughout my educational journey.

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CHAPTER 1

INTRODUCTION

Children with autism spectrum disorder (ASD) have displayed positive outcomes from early intensive behavioral interventions; however, parents of children with ASD in the USA report limited access to services, trouble obtaining funding, and high costs associated with implementing the intervention (Koegel & Koegel, 2006; Koegel & Koegel, 2018). Treatment onset for children with ASD often occurs past the recommended age which can lead to delays in improvements for the children. Therefore, there is an increasing need for more accessible educational interventions for children with ASD (Verschuur, Huskens, & Didden, 2019). Coolican, Smith, and Bryson (2010) suggest that an efficient method to expand the availability of intervention services for children with ASD is to provide training to parents in evidence-based intervention techniques. Engaging parents in delivering effective and cost-efficient interventions to their children might ensure that these children are provided with intensive early intervention to treat some of the social and communicative deficits associate with ASD (Koegel & Koegel, 2006).

ASD is characterized by impairments in social interaction, deficits in speech/language and communication development, and restricted/ repetitive behaviors (American Psychiatric Association, 2013). According to the Centers of Disease Control (CDC), the prevalence of ASD is 1 in 54 children have been identified with ASD. Currently, there are several interventions that can be found for treating children with ASD (e.g., medications, speech/language therapy, assistive technology interventions,

sensory integration therapy, music therapy, gentle teaching, holding therapy, special diets, and vitamin supplements). However, there is lack of sufficient evidence to support the use of many of these interventions (Goin-Kochel, Meyers, & Mackintosh, 2007). Research supports positive outcomes from interventions based on the principles of applied behavior analysis (ABA), particularly when teaching functional skills and decreasing problem behavior in children with ASD.

One method of ABA instruction is discrete-trial training (DTT), that occurs in a structured one-to-one format, teaching single, discrete responses. DTT has been associated with progress for children with ASD in intellectual functioning, language, and social skills and with reductions in problem behaviors (Lovaas, 1987; Smith, 2001; Vismara & Rogers, 2010). However, DTT has some intervention boundaries. First, it has been noted that an extensive amount of time and training is required to correct implementation of the intensive teaching procedures involved (Smith, 2001; Vismara & Rogers, 2010). Second, stimulus and response generalization may not occur, due to the adult-directed nature of the instruction and strict stimulus control (Smith, 2001; Vismara & Rogers, 2010). Third, the highly structured teaching environment and use of artificial or unrelated reinforcers can prevent the learner from generalizing to the natural environment which can lead to cue dependency and repetitious responding (Vismara & Rogers, 2010).

Several interventions have been developed that extend the boundaries of DTT. Namely, these interventions include more naturalistic, spontaneous types of learning situations that embed the child's interest into teaching opportunities (Koegel & Koegel,

2018). These include Natural Environment Teaching (NET; Sundberg & Partington, 1998), incidental teaching (Hart & Risley 1980), and milieu teaching (McGee, Morrier, & Daly, 1999). NET emphasizes the importance of early intervention and applied language in informal settings such as the playground, lunchroom, library, restaurant, or home (Sundberg & Partington, 1998). This is because treatment rooms that contain a variety of toys based on the child's motivation are inadequate in enhancing generalizations that are achieved through natural settings (Sundberg & Partington, 1998). Incidental teaching takes advantage of naturally occurring "incidents" to teach important skills to children (Hart & Risley, 1980). Typically, it is taught in a natural environment and the learning opportunity is initiated by the child's interest in an object or activity (Hart & Risley, 1980). Milieu teaching uses a set of behavioral strategies that include time delay, mand model, modeling, and incidental teaching opportunities (McGee, Morrier, & Daly, 1999). These techniques have been identified as the best practices to enhance social and communication skills for individuals with ASD (McGee, Morrier, & Daly, 1999). Overall, these interventions are more lightly structured when compared to DTT, while targeting clusters of responses, rather than teaching skills that produce a single response (Koegel & Koegel, 2018; Smith 2001; Verschuur, Huskens, & Didden, 2019).

Pivotal Response Training

One naturalistic intervention that has yielded positive outcomes in various settings, and in core areas of ASD, is Pivotal Response Training (PRT), which was previously referred to as the Natural Language Paradigm (NLP; Koegel & Koegel 2006). PRT aims to teach pivotal behaviors to children with ASD in order to achieve generalized

improvements in their functioning. Research has identified four pivotal behaviors including motivation, self-initiations, responding to multiple cues, and self-management (Koegel, Koegel, Shoshan, & McNERney, 1999). When these pivotal areas are established, Koegel, Koegel, Shoshan, and McNERney (1999) explain that it will be followed by advances in autonomy, self-learning, and generalization of new skills. Some of the motivational procedures that are incorporated to teach pivotal behaviors include following the child's lead and offering choices, gaining the child's attention, providing clear opportunities to respond, including shared control and turn taking, varying activity types and interspersing maintenance and acquisition tasks, using contingent and natural reinforcement, and reinforcing attempts at target skills (e.g., Koegel et al. 1999; Koegel et al. 1989; Koegel & Koegel, 2006; Koegel et al. 2001).

Research has emphasized the effectiveness of PRT on increasing abilities to seek information through question-asking for children with ASD (Koegel, Koegel, & Green-Hopkins et al., 2010). Typically developing children use language to exhibit early forms of question-asking within their first group of words; however, children with ASD use language almost exclusively for requesting objects/actions, and protesting. Children with ASD experience significant limitations in both quality and quantity of verbal and non-verbal initiations (Koegel, Carter, & Koegel, 2003). Social initiations have been suggested as a key variable in improving long term outcomes in children with autism (Koegel et al.1997). Previous research has shown that the use of the motivational procedures of PRT in the context of a question-asking (e.g., teaching wh-questions such as: "What is it?" "Where is it?" "Who is it?" and "What happened?") has resulted in

generalized gains of learned questions in novel settings (Koegel et al. 1997; Koegel, Koegel, Green-Hopkins, & Barnes, 2010). Verschuur, Didden, Lang, Sigafoos, and Huskens (2014) conducted a systemic review on PRT as a treatment for children with ASD. The researchers identified 37 studies and found that a majority of the reviewed studies had serious methodological limitations; however, many of the reviewed studies provided conclusive or preponderant evidence that PRT results in increases in self-initiations and collateral improvements in communication and language, play skills, affect and reductions in maladaptive behavior for a number of children.

PRT places a significant emphasis on family involvement in the form of teaching parents and other caregivers to implement the motivational procedures (Koegel & Koegel, 2006). Research in the efficacy of PRT indicates parents are capable of learning required strategies to deliver PRT with fidelity to their children with ASD (Brookman Frazee, 2004; Koegel, et al., 2002; Stahmer & Gist 2001). Researchers have reported positive impacts of parent delivered PRT techniques in which problem behaviors are decreased and functional verbal communication skills are increased (Koegel, Symon, & Koegel 1996; Stahmer & Gist 2001).

Research on Parent- Implemented PRT

Due to the complex nature of ASD, particularly the deficits in social communication skills, parents of these children are often uncertain about their abilities to engage in positive communication with their children (Koegel et al. 2002). Parents also face other barriers such as working extended hours, providing care for other children, pressure/stress of having a child with a disability, and no or limited background in special

education strategies. Therefore, providing parents with a guided training on how to teach and instruct their children with autism will support them to develop a better understanding of autism and could enhance interaction with their children (Coolican, Smith, & Bryson, 2010). Given the large numbers of children being diagnosed with ASD and the shortage of trained clinicians, many programs are assessing the feasibility and effectiveness of short-term parent-mediated interventions with success (Coolican et al. 2010; Bradshaw, Koegel, & Koegel, 2017). A number of studies have shown that parents can effectively improve their child with ASD's communication through PRT, if working collaboratively with a professional, however, PRT can be very vaguely defined and is often implemented with wide variability (Koegel, Symon, & Koegel, 2002; Baker-Ericzén, Stahmer & Burns, 2007; Stahmer & Gist, 2001). The instructional strategies, the duration of training, and the training format to teach caregivers and staff members to correctly implement PRT techniques varies across the literature base for parents who implement PRT.

Research conducted on parent-implemented PRT has incorporated several instructional strategies to teach parents and caregivers skills to implement PRT with their children. For example, Koegel, Symon, & Koegel (2002) assessed parents' implementation of the PRT techniques on increasing the child's motivation to communicate in play and other natural daily-life settings. The participants consisted of five families of children with ASD that are geographically distant from behavioral treatment facilities. The procedures included a pre-intervention phase, which was followed by the parent education program, in which the parents received a week-long,

intensive clinic-based training that was individualized to their child. Follow-up data were collected at least three months later. A nonconcurrent multiple-baseline-across-participants design was utilized by the researchers. The results showed that all the parents reached a criterion level of 80% correct use of the motivational procedures and effectively incorporated the pivotal response techniques during interactions with their children. Ultimately, the researchers concluded that the caregivers successfully transferred the use of the pivotal response techniques into their home environment. However, the design of this study could have impacted the results. A nonconcurrent multiple baseline provides control for the number of observations, but does not provide all the same controls as a concurrent multiple baseline design. It is possible that the nonconcurrent multiple baseline design affected the results by the threats of validity (e.g., confounding variables) and history effects. However, if the researchers used a concurrent multiple baseline design, it would have allowed all the participants to undergo the treatment simultaneously and avoid some of these limitations.

The duration of training for parents and caregivers has varied in research conducted on parent-implemented PRT. For instance, a large-scale study was conducted by Baker-Ericzen, Stahmer, and Burns (2007) with 158 families of children with ASD that assessed an accelerated parent-education program. The families were taught how to implement PRT, with a focus on increasing their ability to facilitate play and language skills in their children, for a 12-week period. The results showed that overall, children significantly improved from pre- to post-intervention on measures of the communication, daily living skills, socialization, motor skills, and adaptive behavior composite domains

of the Vineland Adaptive Behavior Scales. The researchers concluded that PRT made a positive difference in the areas of communication, daily living, social, and maladaptive behaviors. These results suggest that training families in PRT may be an effective tool to promote growth across multiple domains for children with ASD. However, a notable limitation of this study was that the researchers did not evaluate other child outcomes except the parent-reported domains of the Vineland Adaptive Behavior Scales before and after intervention and did not assess results using direct measures. Although this instrument is used to assess the adaptive behavior of individuals with developmental disorders, it is subjective to the parents' perspective as they may complete this instrument based on their interpretation of their children's behavior. This is not a representative measure of improvement in the children's behavior. Additionally, the researcher did not assess the parents' fidelity of implementation to see if they were implementing the PRT procedures as they were initially trained. There was no follow-up evaluation to analyze the long-lasting effects of the intervention on the children.

Research have also assessed the training format that is most effective for teaching PRT to parents and caregivers. A community group parent training model of PRT has been previously assessed by Stahmer and Gist (2001). The researchers compared the effects of a group support parent training to an individual parent training of PRT in a pre-post group treatment design. The participants consisted of 22 children with ASD and their families. All the parents were trained in a 12-week period that consisted of a one-hour per week individual session. Half of the families also attended a weekly parent education support group. Behaviors were measured before and after participation in the education

program. The results revealed that the number of words children used increased from pre- to post-intervention, regardless of parental skill level. The researchers also found that parents who participated in both the parent training sessions and a parent support group were more likely to master the strategies than parents who completed the training sessions alone. The authors examined fidelity of implementation of PRT by parents and a majority of parents were able to learn the techniques in the program and most children improved their language and play skills and reduced their amount of difficult behavior as a result. However, there are some considerable limitations that can impact the effectiveness of group parent PRT training. First, no follow-up data were collected to analyze the long-lasting effects of the intervention. Second, child outcomes were based largely on parent-report measures because the researchers did not measure the child outcomes. Third, the authors did not examine family or child characteristics that might predict success in the program due to small sample size. Fourth, the results showed evidence of maturation effects if the child's behavior improved regardless of parent skill level in demonstrating PRT.

Additionally, research has analyzed various levels of parent involvement in their children's PRT treatment (e.g., Popovic, Starr, & Koegel, 2020; Brookman-Frazee, 2004; Koegel, Bimbela, & Schreibman, 1996). For instance, parent support interventions involve the parent receiving information regarding techniques and support from the clinician when implementing PRT (Popovic, Starr, & Koegel, 2020). The parent support intervention is utilized in a study conducted by Brookman-Frazee (2004) that compared the effects of two parent education models for PRT. The researchers compared a

parent/clinician partnership model with a clinician-directed model on three children with ASD and their mothers. A repeated reversals design was utilized to measure parent stress/confidence, child affect, and child responsiveness/ engagement. The parent education sessions focused on teaching parents to implement strategies that increase the child's motivation to engage in verbal communication, appropriate social interactions, and learning interactions from the natural environment. An observation rating of parent stress and parent confidence, as well as composite child affect was measured by the researchers. The results showed that children demonstrated more positive affect, higher levels of responding, and appropriate engagement when parents were partners in the intervention process. The researchers concluded that forming a collaborative relationship between clinicians and parents in PRT positively affects parent– child teaching interactions. However, it is possible that the results of this study were biased towards the parents/clinicians model because parents had the advantage of knowing what activities motivates their children, increasing the likelihood that children will be engaged in the activity and respond to their parents.

Although PRT can be very vaguely defined and is often implemented with wide variability, as demonstrated in the above studies, family involvement is still an integral aspect of PRT. Active parent involvement in their children's treatment supports the efficacy of targeted pivotal areas when they are the ones providing the interventions (Koegel, Bimbela, & Schreibman, 1996). This is evident from the significant improvements in communication for children with ASD found in multiple research

studies on parent-mediated PRT interventions (Koegel, Symon, & Koegel, 2002; Baker-Ericzén, Stahmer & Burns, 2007; Stahmer & Gist, 2001; Brookman Frazee, 2004).

Purpose of Literature Review

There is an increasing need for accessible, effective, and cost-efficient educational interventions for children with ASD (Verschuur, Huskens, & Didden, 2019). Engaging parents in delivering interventions to their children might ensure that these children are provided with intensive early intervention from significant persons in their natural environment (Koegel & Koegel, 2006). Research on the efficacy of PRT indicates parents are capable of learning required strategies to deliver PRT with fidelity to their children with ASD (Koegel, Symon, & Koegel, 2002; Baker-Ericzén, Stahmer & Burns, 2007; Stahmer & Gist, 2001). However, because PRT can be very vaguely defined, it is often implemented and trained with wide variability.

First, research has shown that parent-implemented PRT has been taught to parents in both an individual and a group format using a variety of training techniques (Stahmer & Gist, 2001). Researchers have trained parents and caregivers in PRT using many different methodologies (Koegel, Symon, & Koegel, 2002). The varying format of the training and the duration of the training can be analyzed to understand which training techniques are used most commonly. A better understanding of the methodologies that have been used to train parents in implementing PRT could help future researchers develop a parent-implemented PRT training that has shown the greatest impact on parent's implementation. In addition, analyzing the differences in research designs of past

studies will allow us to understand how researchers assessed their training methods most frequently.

Second, PRT may be implemented with varying degrees of treatment integrity by parents following training (Koegel, Symon, & Koegel, 2002; Baker-Ericzén, Stahmer & Burns, 2007; Stahmer & Gist, 2001). Treatment integrity is the extent to which the parents implement procedures in a manner consistent with the study's definition of the PRT procedures. Assessing the treatment integrity following the parent trainings allows us to understand whether the parent implemented the skills taught correctly in a study (Gresham, Gansle, & Noell, 1993). The consideration of treatment integrity is important in the research, because it allows for researchers to make accurate conclusions regarding functional relations between dependent and independent variables, while also increases the internal validity of a study (Ledford & Gast, 2018). Thus, treatment integrity minimizes the possibility that variables not related to the study are affecting outcomes, however, not all studies have incorporated treatment integrity (Gresham, Gansle, & Noell, 1993). A better understanding of the studies that have included treatment integrity and the levels of treatment integrity observed will be beneficial for researchers in the future, especially when determining the procedures they can use to effectively train parents to competency.

Third, monitoring social validity becomes crucial when training parents how to engage in specific intervention procedures. Social validity measures may help examine the social goals of the treatment from a parental perspective, the social appropriateness of the procedures in the treatment, and to understand the social importance of the effects a

treatment may have (Ledford & Gast, 2018; Carter, 2010). In a systematic review on PRT literature, the researchers noted that social validity was measured in only 10 out of the 39 studies included in the review (Verschuur, Didden, Lang, Sigafoos, & Huskens, 2014). The consideration of social validity in a study is important because it allows for an understanding of which procedures are preferred and disapproved (i.e., high social acceptance or low social acceptance) and it allows for innovation in the field surrounding the intervention practices (Carter, 2010). Gaining insight into parent training procedures offers useful information regarding training protocol along with helping to potentially determine the amount of training hours that a parent may require.

To evaluate these issues in the literature, three research questions will be addressed. The first research question addressed in this literature review: What has current research on parent-implemented PRT shown to be the most often used parent training strategies to teach parents of children with autism?

The second research question addressed in this literature review: How many parent-training of PRT studies included parent treatment integrity measures and trained parents to a competency level. If the study included treatment integrity, what are the levels they observed immediately after training and were those maintained?

The third research question addressed in this literature review: How many parent-training of PRT studies include social validity measures? If the study included social validity measures, what are the types of measures used and what were the results of those measures?

CHAPTER 2

METHOD

Inclusion Criteria

To be included in this review, studies were required to meet the following criteria:

(a) the intervention had to be classified as either Pivotal Response Training or the previously known name, Natural Language Paradigm, which is defined as the following:

A comprehensive service delivery model that uses both a developmental approach and ABA procedure, PRT aims to provide opportunities for learning within the context of the child's natural environments. Pivotal areas are areas that, when targeted lead to large collateral changes in other—often untargeted—areas of functioning and responding. Pivotal responses, once acquired, result in widespread and generalized improvements in children with autism. Four pivotal response area have been studies: motivation, responsivity to multiple cues, self-management, self-initiations, and empathy (Koegel & Koegel, 2006, p.4).

(b) the participant's language and/or communication skills (self-initiations, verbalizations, utterances, etc.) was monitored as a dependent variable (c) the study included implementation of a parent/caregiver training to implement PRT (d) participants had a diagnosis of autism or another developmental disability (participants with co-existing disabilities such as intellectual disabilities qualified as well as long as they also had a diagnosis of autism) (e) the study was published in a peer-reviewed journal.

Search Procedure

The article extraction occurred in January 2021. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) extraction model was used for searching and screening the literature (Moher Liberati, Tetzlaff, Altman, & the PRISMA Group, 2009). An electronic search was conducted on two databases, including APA

PsycArticles and APA PsycInfo. The following search terms were used without quotations: (pivotal response treatment) AND (parent). The limiters that were selected included: the years of 1900-2020, academic journals and journals. The selection of search terms was intended to yield as many relevant results as possible. A total of 42 articles were identified during the initial database search. Following this search, index of the journal with the highest number of relevant articles (the Journal of Autism and Developmental Disorders) was searched for any additional relevant articles. The limiters that were selected included the years of 1900-2020. The journal search was added because some articles were not coming up in the database search and doing both revealed some articles that didn't show the first time due to keywords in the abstract not entire article. A total of 242 articles were identified through the journal search. All search results were screened by the titles of the articles for possible inclusion. If the article's title was related to parent-implemented PRT or included terms such as PRT and/or parent, then the abstracts of the possible article was screened using the above inclusion criteria. After the exclusion of articles in which it was clear by their abstracts that they did not meet the established criteria or the article was a duplicate, then the reference lists of the 22 eligible studies was screened. The reference list was screened by the article's title and if it was related to parent-implemented PRT or included terms such as PRT and/or parent, then the abstracts of the possible article was screened using the above inclusion criteria. Studies that were included are provided in the reference list (identified through an asterisk). See Figure 1. Of all the articles found in the search procedure, a total of 18

articles met all the inclusion criteria and were selected for this review. A retrospective search was conducted, but no further studies met the inclusionary criteria.

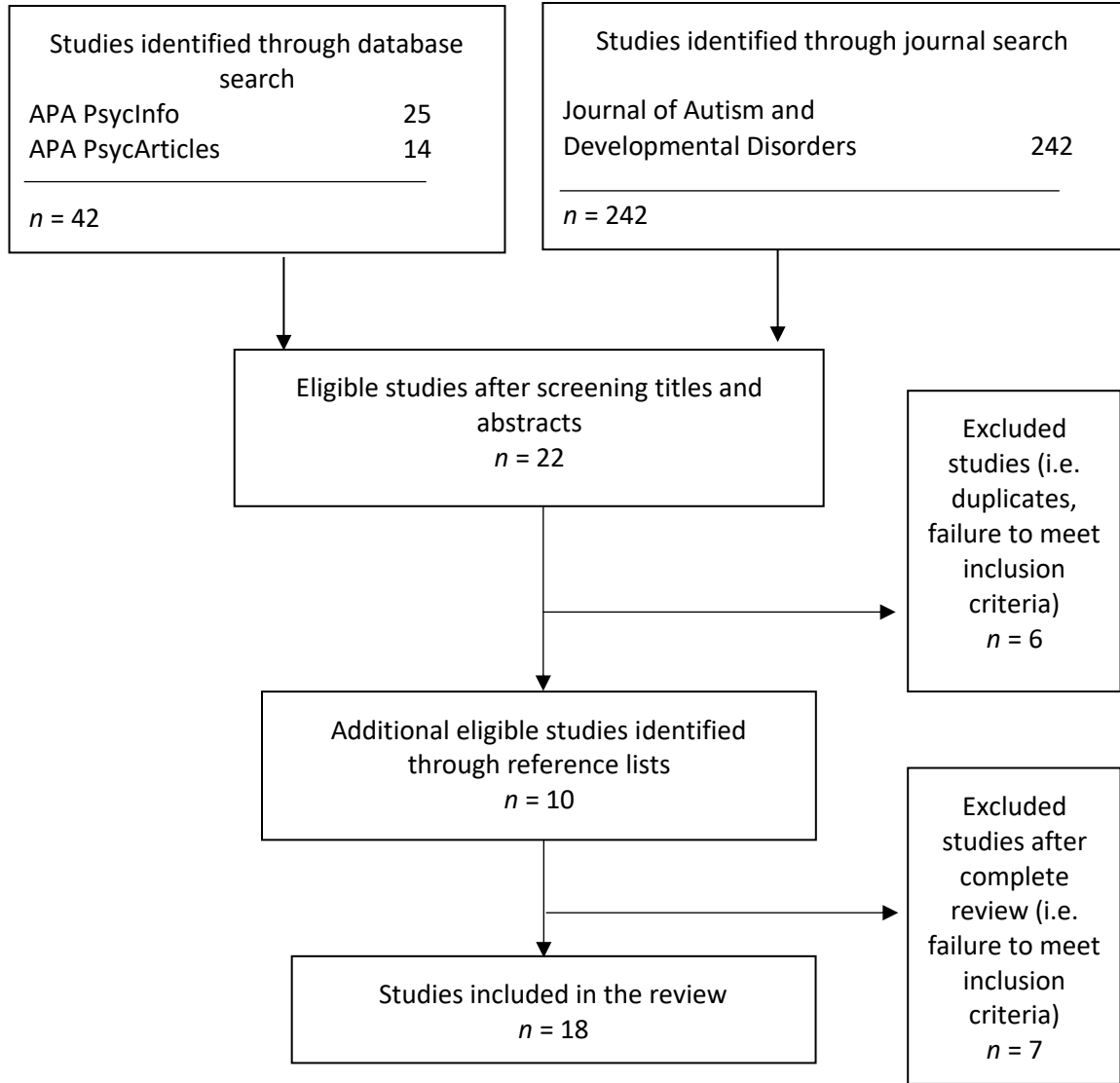


Figure 1. Flowchart depicting the process to select studies for inclusion.

Article Coding

The selected characteristics are dependent upon the research questions. The extracted articles were read and coded according to the citation, the year of publication, and the categories listed below.

Design

The author coded the type of research design the study utilizes. The article was coded on whether it evaluated the effectiveness of their parent training via a single subject design or a randomized control trial design. To count as a single-subject design, the study must have employed at least an A-B design in which there was a baseline and intervention. The categories of designs that reviewed studies included are: multiple baseline, non-concurrent multiple baseline, and pretest–posttest (no other designs were identified). To count as a randomized control trial, the study must have included at least one group receiving the intervention with one group that did not receive the intervention and functioned as the control in the study.

Number of Participants

This was the number of families that participated in the study who received an intervention. To count as one family, there is a child that participated in the intervention procedure and at least one parent or family member that implemented the intervention.

Participant Characteristics

The characteristics of the children, including the gender and the chronological age were coded. The gender of the child was coded into three categories: male, female, no gender provided. The chronological age was coded into three categories: less than 5 years old, greater than 5 years old, and no age provided.

Parent Training Format

The format of the training consisted of how the training for the parents was conducted. This was coded into three categories: self-directed, individual, and group. The

self-directed teaching format included teaching the parents through a self-directed web-based structure (e.g. computer, laptop, tablets, etc.) with the use of slideshows, videos, and recordings. The individual training format consisted of training sessions between the parent, the trainer, and the child. These could be conducted in the home and/or clinical setting. The group with trainer format includes training sessions with one PRT trainer, more than two parents, and more than two children.

Duration of Parent Training

The amount of time the parents received training on implementing the PRT strategies is recorded in number of weeks.

Instructional Strategies

The use of strategies that were utilized to teach the parents in implementing PRT with their children were coded into categories: training manual, modeling, feedback, prompts. The use of training manuals included programs that were developed by Koegel & Koegel (e.g. *How to Teach Pivotal Behaviors to Children with Autism*, *Teaching First Words to Children with Autism and Communication Delays Using Pivotal Response Training*, etc.). The trainer may use modeling which involved a demonstration of the PRT strategy to the parent with the use of themselves or another person through a video or an audio example. The trainer may provide feedback that includes observing the parent implementing a PRT strategy with their child and trainer providing positive or corrective written/oral statements to guide that parent's future implementation of that strategy. The trainer could instruct the parent by utilizing prompts. The trainer may use a physical prompt which involves the form of physical guidance to assist the parent to perform a

PRT strategy. The trainer may use a verbal prompt which involves the form of auditory cue (i.e., words describing the correct response) that guides the parent to correctly perform a PRT strategy. The trainer may use a visual prompt which involves a visual cue to the parent that allows the parent to correctly perform a PRT strategy. Studies may utilize more than one instructional strategy to teach parents PRT in the intervention.

Intervention Strategies

The PRT intervention strategies that the parent were trained to use with their children was coded. The intervention strategies were coded into six categories: (1) incorporating the child's choice/shared control (2) clear opportunities, (3) contingent, (4) natural rewards, (5) reward attempts, (6) incorporating maintenance/ acquisition tasks, and (7) teaching initiations. The first category is when parents maximize the child's interest in the learning situation and the child is given a great deal of choice in choosing the specific stimuli and the nature of the interaction. The second category is when the parent is taught to present instructions only when the child is attending in a clear, unambiguous manner and to present instructions that are relevant and appropriate to the task. The third category is when the parent is taught to use direct reinforcers, which are consequences that are directly related to the response they follow. The fourth category is when parents provide natural reinforcers that are directly and functionally embedded in the interaction. The fifth category is when parents provide reinforcers following the child's both expressive verbal attempts and correct responses. The sixth category is when the parent varies the task, including interspersing maintenance (tasks the child has already mastered) and acquisition (targeted skills the child has not yet mastered) tasks to

enhance child motivation. The seventh category is when the child is protesting and requesting objects, help, or information from the parent.

Types of Dependent Variables

The dependent variables measured the parent's implementation of PRT strategies and the child's outcomes.

Child's Outcomes

The dependent variables that measured the child's outcomes were coded into two categories: communication and language. The communication of the child includes any DV definition that includes the word "communication" or types of communication such as verbal utterances, vocalizations, initiations, and question asking. The language of the child includes any standardized language measures (e.g. MCDI, VABS-II, Expressive Vocabulary Test).

Parent's Fidelity of Implementation

The article was coded on whether the parents implemented the PRT interventions that they were taught accurately by recording an average treatment integrity measure and/or the average percentage of the parents' treatment integrity post training and during follow-up. The studies that do not have treatment fidelity reported were noted.

Treatment Integrity

The article was coded on whether the experimenters measured their own treatment integrity of their training strategies used to teach the parents PRT by recording an average treatment integrity measure. The studies that do not have treatment integrity reported were noted.

Intervention Effectiveness

Intervention effectiveness of the parent training of PRT strategies were classified as positive, mixed, or negative. Results were classified as positive in single-case design studies if visual analysis of graphed data revealed that all participants improved on all dependent variables (parent treatment fidelity and child outcomes) and PND scores between 70% to 90% which are one way to evaluate if an intervention is effective. In studies using a RCT design, results were classified as positive if the PRT group made statistically significant improvements (i.e., $p < .05$) on all dependent variables. Results were classified as mixed in single-case design studies if some, but not all participants or dependent variables improved and the PND scores were between 50% to 70%. In the RCT design, results were classified as mixed if the PRT group statistically significant improved on some, but not all dependent variables. Results were classified as negative in single-case studies if none of the participants improved on any dependent variable and/or PND scores were below 50% which show ineffective treatments. In studies using a RCT design, results were classified as negative if the PRT group did not make statistically significant improvements (i.e., $p > .05$) on any dependent variable. To calculate the percentage of non-overlapping data point (PND), a Percentage of Nonoverlapping Data (PND) Calculator developed by Tarlow and Penland (2016) was utilized. This online calculator is based off a formula that calculates the PND of a study (Tarlow & Penland, 2016). To use this PND calculator, the researcher entered the number of scores in the baseline phase, the number of scores in the treatment phase, and the number of treatment phase scores that exceeded the maximum score in the baseline phase.

Social Validity

We coded whether the researchers evaluated social validity within the study. If the article did assess the parent's social validity, then we noted the stage in which the study collected social validity, the type of social validity measurement, and the results of the post-training social validity. The stage that social validity is collected is coded into four categories: pre-training, during training, post-training, and follow-up. The social validity measure type was coded. The social validity type was coded into two categories: standardized assessment or a questionnaire created by the researchers of the study. A standardized assessment included a questionnaire that has already been established as the measure with high reliability in research (e.g., TARF-R). A questionnaire created by the researchers of study includes a survey developed for the purpose of evaluating the intervention of the study itself. The studies that do not have social validity reported were noted. The results of the post-training were coded into two categories: positive or negative. Results were classified as positive if the average scores reflect that the parents rated the training experience as satisfactory. Results were classified as negative if the average scores reflect that the parents rated the training experience as unsatisfactory.

Quality of Study

Horner, Carr, Halle, McGee, Odom, and Wolery (2005) describe 21 quality indicators for single subject research to assess rigor and quality of SCD research. The indicators are divided into seven areas: descriptions of participants and settings, dependent variable measurement, independent variable measurement, baseline, experimental control, external validity, and social validity. Each article was scored on

these 21 quality indicators in the form of a checklist in which the article could be scored: yes, no, part, or N/A. For an article to be scored yes, then the article met the criterion. A yes is scored with a 1-point. For an article to be scored no, then the article does not meet the criterion. For an article to be scored part, it must meet the criterion partially. For an article to be scored N/A, then the criterion did not apply to the paper. If the paper met the criterion for a specific quality indicator, it was given one point for that item. If partial criterion was met, 0.5 point was given. To provide a common metric across studies, we calculated the proportion of applicable quality indicators met. The calculated scores were divided by the total items scored and then multiplied by 100 to convert as a percentage. For example, if the study received 15 points across 18 applicable items, its total score was $15/18 (*100) = 94\%$. See Appendix A.

Interobserver Agreement

To assess interobserver agreement of the search procedure, the first author and a research assistant independently conducted the same search in the databases. The total number of results that appeared once duplicates were removed in the database search was the same for both raters. Each rater identified whether or not each search result met the inclusionary criteria by selecting yes/no on a checklist and comparing the results. There was one disagreement which was that the researcher selected one study that meet the inclusionary criteria, however the research assistant did not include that study. We calculated interobserver agreement by dividing the number of studies that each rater agreed should be included by the number of agreements plus disagreements, which is

then multiplied by 100 and converted it to a percentage. Interobserver agreement was 97%.

To assess interobserver agreement of the article coding, the two authors separately coded five articles (28%) and then compared the coding and resolved any disagreements until interobserver agreement was 100% for each coding category. There was only one disagreement between the researcher and the research assistant. The disagreement was whether to code the age of the participant as above 5 years old or below 5 years old in one study which the participants were in both categories. This disagreement was resolved when both of the coders agreed on the same resolution. According to Horner et al. (2005), a secondary coder should code a proportion (e.g., 20–33%) of the identified studies to ensure reliability. Thus, five articles were randomly selected to ensure reliability. In cases where there was insufficient information provided by the authors to determine information for a particular category, that category was coded as unspecified.

To assess interobserver agreement of the quality indicators checklist, primary researcher and research assistant scored four articles using the checklist. The four articles were randomly selected ensure reliability. Each rater scored whether each study included the indicator by identifying whether the author included that component in the manuscript by selecting yes/no on a checklist. Then, the results of both raters was compared. We calculated interobserver agreement by dividing the agreements of each indicator by the number of agreements plus disagreements, which is then multiplied by 100 and converted it to a percentage. Interobserver agreement was 100%.

CHAPTER 3

RESULTS

Study Characteristics

The results in Table 4 show that the research design of the studies that evaluated the effectiveness of their parent training was through a single subject design (14 studies) and only a few used a randomized control trial design (4 studies). The single subject designs included multiple baseline (4 studies), non-concurrent multiple baseline (4 studies), and pretest–posttest (6 studies). The number of families per study that participated in the study who received an intervention was an average of 28 families that ranged from 1—158 families included in this literature review. The children that participated in the study consisted of 85% male and 15% female and the participants' chronological age predominately was less than 5 years old (10 studies) as compared to greater than 5 years old (8 studies).

Parent Training Format

The training format to teach parents to implement PRT varied in each study, however all the studies utilized an individual instruction, group instruction, or online instruction. Figure 2 shows that the most often used format to conduct the parent training was the individual instruction (72%, n=12 studies). The group instruction and online instruction were only 3 studies.

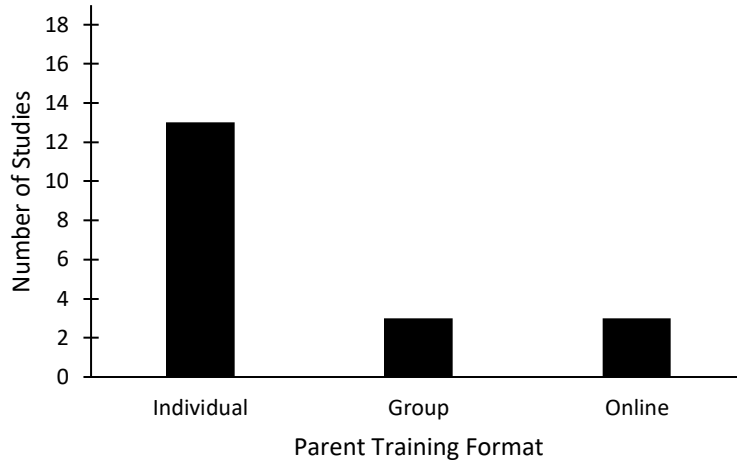


Figure 2. The training format utilized to teach parents PRT in parent implemented PRT studies

Duration of Parent Training

The amount of time the parents received training on implementing the PRT strategies is recorded in Table 2. The most often amount of time the parents received training on implementing the PRT strategies is 12 weeks (22%, n=4 studies). However, parents were trained in PRT for shorter amounts of time with a duration of 1 week (17%, n=3 studies), 6 weeks (17%, n=3 studies), and 10 weeks (17%, n=3 studies). Parents were trained for longer amounts of time as well, in which parents received 24 weeks of training (11%, n=2 studies).

Table 1. The duration of PRT parent trainings

Duration of Parent Training	
Number of Weeks	Number of Studies
1	3
3	1
6	3
8	1
10	3
12	4
24	2
48	1

Instructional Strategies

The use of strategies that were utilized to teach the parents in implementing PRT with their children are shown in Figure 3. The results show that the most often used parent training strategies are the use of a training manual (89%, n=16 studies) and modeling (78%, n=14 studies) in the parent-implemented PRT research. However, prompts (17%, n=3 studies) and feedback (67%, n=12 studies) were used less often.

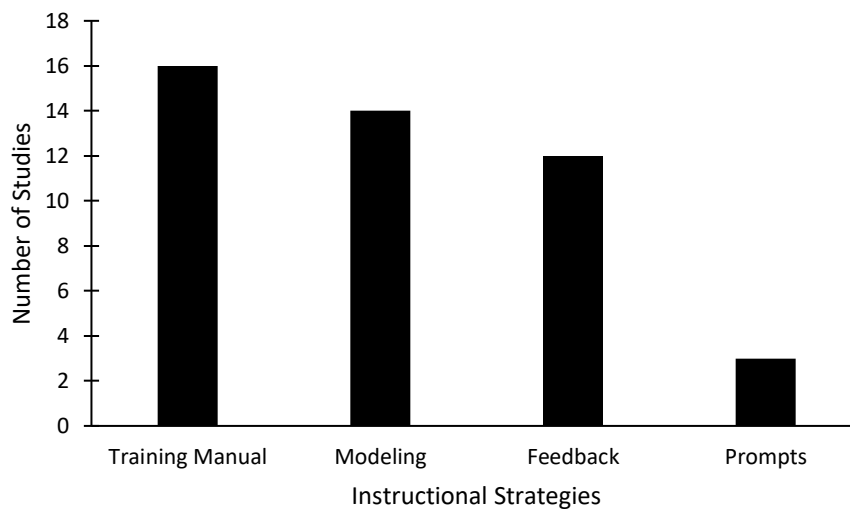


Figure 3. The type of instructional strategies used to teach parents in PRT parent trainings

Intervention Strategies

The intervention strategies that the parents were trained to use with their children are shown in Figure 4. The results show that the most often intervention strategies that parents were trained to use are incorporating the child's choice/shared control (83%, n=15 studies) and natural reward (78%, n=14 studies). The results also show that there are other strategies that were used often, such as: clear opportunities (67%, n=12 studies), contingent rewards (13 studies), and reward attempts (72%, n=13 studies). The intervention strategies that were used least were: incorporating maintenance/ acquisition tasks (50%, n=9 studies) and teaching initiations (11%, n=2 studies) However, it should be noted that 3 out of 18 studies did not specify what type of PRT intervention strategies the researchers trained the parent to use in PRT in the procedures section of the study. The researchers in those 3 studies used the RCT design. See Table 1.

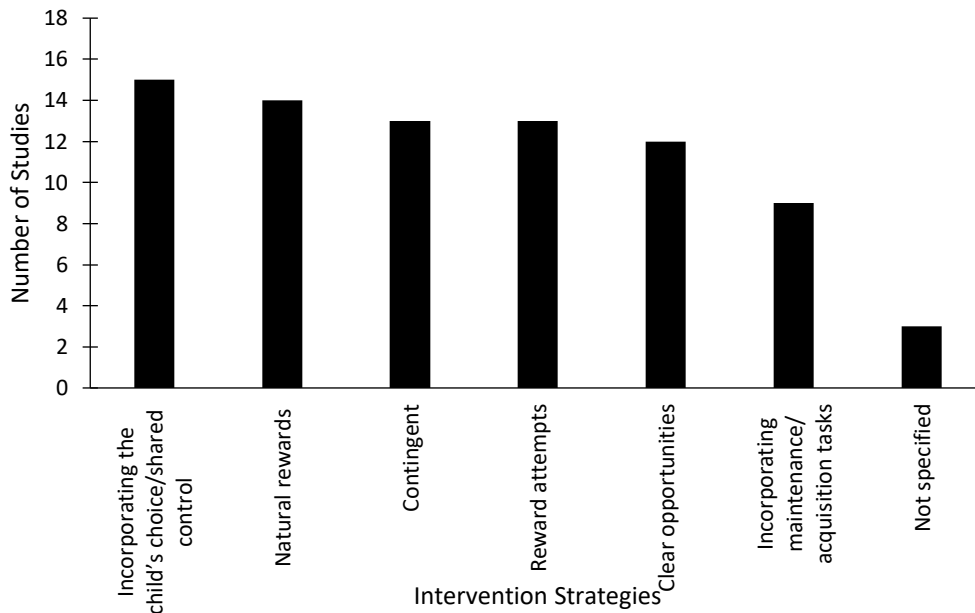


Figure 4. The type of PRT intervention strategies that parents were trained to use in parents in PRT parent trainings

Types of Dependent Variables

The dependent variables that measured the parent’s treatment fidelity and the child’s outcomes are shown in Table 2. The results show that the dependent variables measured the parent’s fidelity of implementation in 13 of the 18 studies and child outcomes in all 18 studies. While the dependent variables measured the child’s outcomes in communication (83%, n=15 studies) and language (33%, n=6 studies).

Table 2. The dependent variables that assessed parent and child outcomes in parent implemented PRT studies

	Dependent Variables	Number of Studies (Percentage of studies that included DV)
Parent	Fidelity of implementation	13 (72%)
Child	Communication	15 (83%)
	Language	6 (33%)
	Both	18 (100%)

Parents’ fidelity of implementation of the PRT strategies during post training and during follow-up are shown in Figure 5. The results show that parent’s fidelity of implementation was assessed during post training (72%, n=13 studies) and during follow up (33%, n=6 studies). Thus, there were 5 studies (28%) that did not measure parent’s fidelity of implementation post training phases. Also, 12 studies (28%) that did not conduct follow-up assessments on parent’s fidelity of implementation. Of the studies that observed treatment integrity immediately after training, it was found that the levels of the

parents' fidelity of implementation ranged from levels of 49- 93%. The results show that parents showed 80% proficiency in implementation of the PRT strategies after the training in 10 studies (56%). However, only 2 studies (11%) maintained those high levels of parents' fidelity of implementation in the follow up assessments. Parents showed below 80% proficiency in implementation of the PRT strategies after the training in 3 studies (23%) and during follow-up in 4 studies (66%).

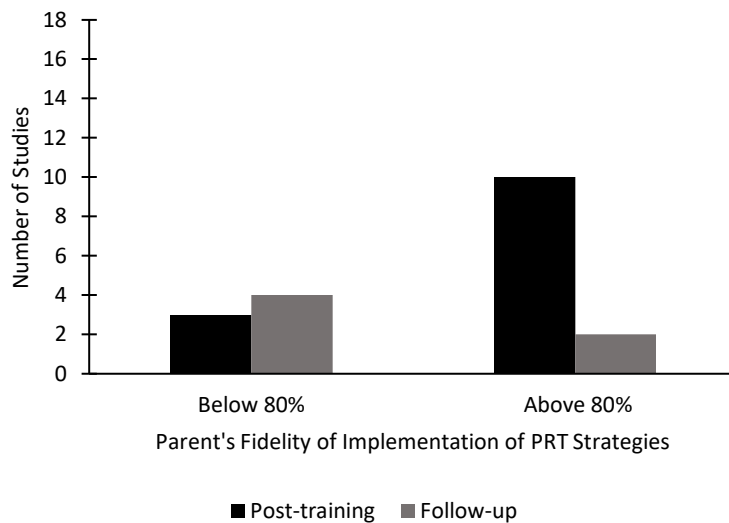


Figure 5. Parents' fidelity of implementation of the PRT strategies in post-training and follow-up stages of PRT parent trainings

Treatment Integrity

The number of studies that included treatment integrity measures are shown in Figure 6. The experimenters in only 1 study (5%) measured their own treatment integrity of their training strategies used to teach the parents PRT. However, the treatment integrity was not assessed in 17 studies (94%).

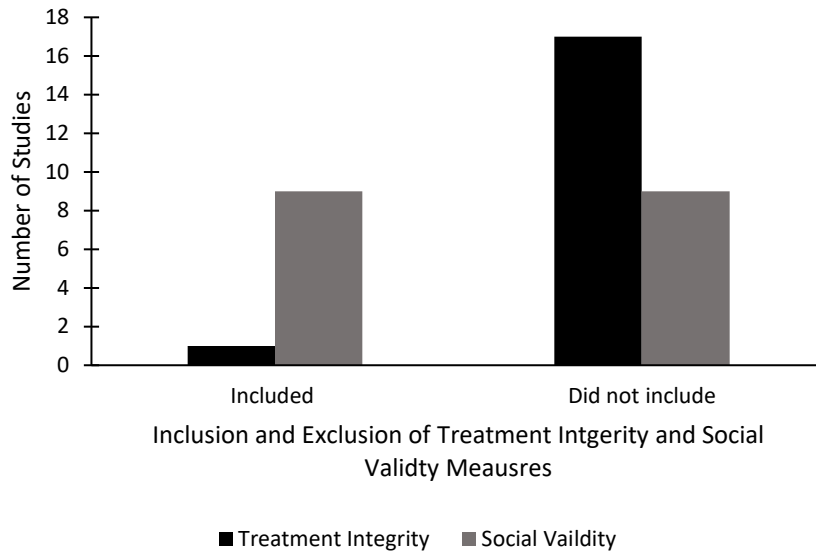


Figure 6. Parent implemented PRT studies that included treatment integrity and social validity measures

Intervention Effectiveness

Intervention effectiveness of the parent implemented PRT studies are shown in Figure 7. The children showed significant improvements in communication and language after the implementation of PRT. The parent's fidelity of implementation intervention outcomes showed positive results in 17 studies (94%). The participants in 17 studies (94%) improved on all dependent variables with PND scores between 70% to 90% or the group studies that did a statistical analysis made statistically significant ($p > .05$) improvements on all dependent variables. However, the intervention outcomes for one study showed negative results in the intervention outcomes and this study used the group instruction format.

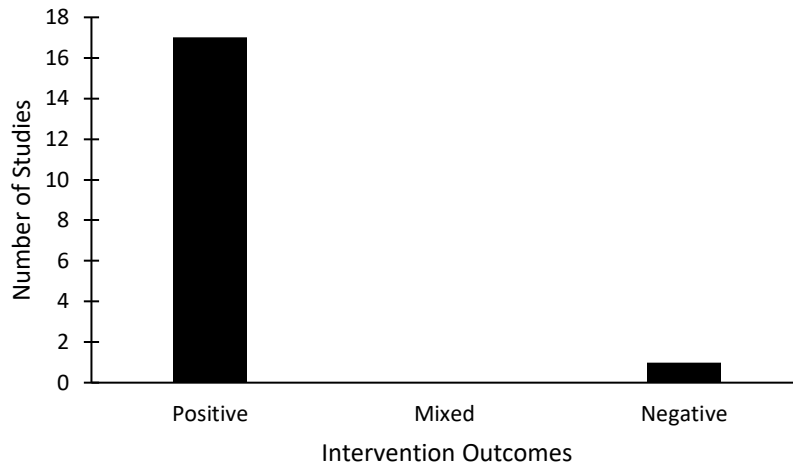


Figure 7. The results of the intervention effectiveness of the PRT parent trainings

Social Validity

Figure 6 shows whether the researchers evaluated social validity within the study. The results show that experimenters included social validity measures in 9 studies (50%). Social validity measures were not included in 9 studies. Figure 8 shows that the most common stage that experimenters collected social validity measures was during the post-training stage (50%, n=9 studies) However, social validity measures were also collected during the pre-training stage (17%, n=3 studies) and during the follow-up stage (11%, n=2 studies). The results also show that social validity measures were collected the least during the training stage (6%, n=1 study).

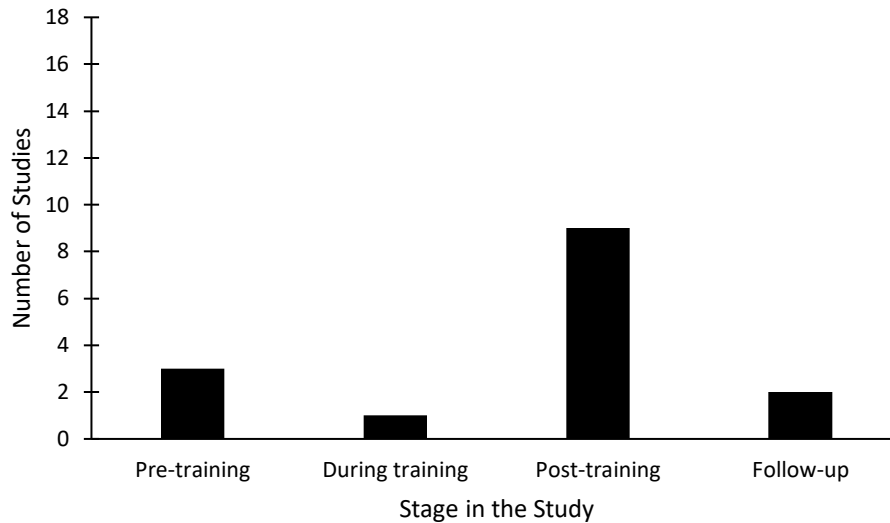


Figure 8. The stage in the study in which social validity was reported in parent implemented PRT studies

From the studies that included social validity measures, the most commonly used measures assessed parents in the form of researcher-created questionnaires (28%, n=5 studies). See Figure 9. However, the researchers also used a standardized assessment (22%, n=4 studies) to measure social validity in the study. The results of the post-training social validity measure show that the average scores reflect that the parents rated the training experience as satisfactory. As shown in Table 1, the parents in the studies that includes social validity measures rated the experience as satisfactory. The high scores of the social validity assessments indicate a high satisfaction with the PRT training. None of the parents rated the training experience as unsatisfactory in any of the studies.

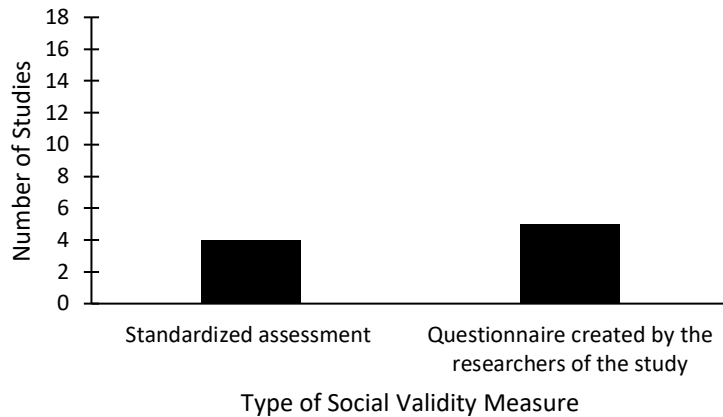


Figure 9. The type of social validity measure that was reported in parent implemented PRT studies

Quality of Single Subject Study

Table 3 presents the results across the 21 quality indicators that can be used to examine the overall quality of this small body of research and identifies specific problems that may be replicated across multiple studies. The quality of studies checklist was used on the articles that utilized a single subject design (13 studies). The total quality scores of the reviewed papers ranged 67%-100% over the 21 quality indicators. In all studies, the IV is described with replicable precision and implementation is practical, as well as the DV is generated quantifiable index, is measured repeatedly over time, and is socially important. However, the criteria that 87% of the papers did not meet was that social validity is enhanced by implementation of the IV over extended time period, by typical intervention agents in typical physical and social contexts. A majority of the papers reported a lack of social validity data assessed in multiple stages of the study, indicating that this is an area where there is ample room for improvement. Additionally, 27% of the studies did not include a baseline condition and/or a description of baseline condition.

Table 3. The percentage of studies meeting the criteria of each quality indicator

Quality indicators	%			
	Yes	No	Part	N/A
<i>Description of participants and settings:</i>				
Participants are described with sufficient detail to allow others to select individuals with similar characteristics (e.g., age, gender, disability diagnosis)	93	7	0	0
The process for selecting participants is described with replicable precision	93	7	0	0
Critical features of the physical setting are described with sufficient precision to allow replication	93	7	0	0
<i>Dependent Variables:</i>				
DVs are described with operational precision	93	7	0	0
Each DV is measured with a procedure that generates a quantifiable index	100	0	0	0
Measurement of the DV is valid and described with replicable precision	93	7	0	0
DVs are measured repeatedly over time	100	0	0	0
Data are collected on the reliability or IOA associated with each DV and IOA levels meet minimal standards (e.g., IOA = 80%; Kappa= 60%)	80	13	7	0
<i>Independent variables:</i>				
IV is described with replicable precision	100	0	0	0
IV is systematically manipulated and under the control of the experimenter	93	7	0	0
Overt measurement of the fidelity of implementation for the IV is highly desirable	87	13	0	0
<i>Baseline:</i>				
The majority of single subject research studies will include: a baseline phase that provides repeated measures of a dependent variable and establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the IV did not occur	60	27	13	0
Baseline condition are described with replicable precision	73	27	0	0
<i>Experimental control/internal validity:</i>				
The design provides at least three demonstrations of experimental effect at three different points in time	60	0	7	33
The design controls for common threats to internal validity (e.g., permits elimination of rival hypotheses)	67	0	0	33
The results document a pattern that demonstrates experimental control	67	0	0	33
<i>External validity:</i>				
Experimental effects are replicated across participants, setting, or material to establish external validity	93	7	0	0
<i>Social validity:</i>				
The DV is socially important	100	0	0	0
The magnitude of change in the DV resulting from the intervention is socially important	100	0	0	0

Implementation of the IV is practical and cost effective	100	0	0	0
Social validity is enhanced by implementation of the IV over extended time period, by typical intervention agents in typical physical and social contexts	13	87	0	0

Table 4. Results of literature review

Citation	Research Design	N	Participant Characteristics	Parent training format	Duration of Parent Training	Instructional Strategies	Intervention Strategies	Types of Dependent Variables	Parent's Fidelity of Implementation	Treatment Integrity	Intervention Outcomes	Social Validity	% of Quality Indicators
Gengoux et al. (2019)	RCT	48	less than 5 years old, 38 males, 5 females	individual	24 weeks	training manual, modeling	Not specified	Parent: fidelity of the PRT implementation Child: communication, language	Post-training: M=91% Follow-up: M=4%	Not reported	Positive p= .026	Not reported	N/A
Hardan et al. (2015)	RCT	35	greater than 5 years old, 41 males, 12 females	group	12 weeks	training manual, modeling	Not specified	Parent: fidelity of the PRT implementation Child: communication, language	Post-training: M= 84%	Not reported	Positive p= .038	Not reported	N/A
Coolican, Smith, & Bryson, (2010)	non-concurrent multiple baseline	8	less than 5 years old, 7 males, 1 female	individual	6 weeks	training manual, modeling, feedback, prompts	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts	Parent: fidelity of the PRT implementation Child: communication, language	Post-training: M= 63% Follow-up: M=50%	Not reported	Positive PND= 100%	Stage in the study: pre-training, post-training, follow-up Type: standardized assessment Results post-training: positive	100%
McGarry, Vernon, & Baktha (2020)	pretest–posttest design	11	less than 5 years old, 8 males, 3 females	online	~10 weeks	modeling, feedback	clear opportunities, child choice/shared control, contingent, natural rewards, reward attempts	Parent: fidelity of the PRT implementation Child: communication	Post-training: M= 91%	Not reported	Positive p=.05	Stage in the study: post-training Type: Questionnaire Results post-training: positive	83%
Baker-Ericzén, Stahmer, & Burns (2007)	pretest–posttest design	158	greater than 5 years old, 131 males, 27 females	individual	12 weeks	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts	Child: communication, language	Not reported	Not reported	Positive p<.001	Not reported	67%
Smith, Flanagan, Garon, & Bryson (2015)	pretest–posttest design	118	greater than 5 years old, 101 males, 17 females	individual	48 weeks	training manual, modeling	child choice/ shared control, incorporating maintenance/ acquisition tasks, contingent, natural rewards	Child: language	Not reported	Not reported	Positive p<.001	Not reported	78%
Verschuur, Huskens, & Didden (2019) Study 1	multiple baseline design	16	greater than 5 years old, 10 males, 6 females	group	8 weeks	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, teaching initiations	Parent: fidelity of the PRT implementation Child: communication	Post-training: M= 84%;	M= 95%	Negative PND= 42%	Stage in the study: post-training Type: Questionnaire Results post-training: Positive	95%

Verschuur, Huskens, & Didden (2019) Study 2	multiple baseline design	13	greater than 5 years old, 11 males, 2 females	individual	10 weeks	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, teaching initiations	Parent: fidelity of the PRT implementation Child: communication	Post-training: M= 84%	M= 95%	Positive PND= 90%	Stage in the study: post-training Type: Questionnaire Results post-training: Positive	95%
Buckley, Ente, & Ruef (2014)	pretest–posttest design	1	greater than 5 years old, 1 male	individual	1 week	training manual, modeling, feedback	child choice/shared control, incorporating maintenance/ acquisition tasks, natural rewards	Child: communication	Not reported	Not reported	Positive PND= 86%	Not reported	76%
Bradshaw, Koegel, & Koegel, (2017)	non-concurrent multiple baseline design	3	Less than 5 years old, 3 males	individual	12 weeks	modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: communication	Post-training: M=24.9	Not reported	Positive PND= 100%	Stage in the study: post-training Type: Questionnaire Results post-training: Positive	93%
Minjarez, Williams, Mercier, & Hardan (2011)	pretest–posttest design	17	Greater than 5 years old, 17 males	group	10 weeks	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: Communication	Post-training: M =24.24 Follow-up: M=15.6	Not reported	Positive p<.01	Not reported	83%
Popovic, Starr, & Koegel (2020)	multiple baseline design	3	Less than 5 years old, 3 males	individual	3 weeks	training manual, modeling, feedback, prompts	child choice/ shared control, contingent, natural rewards, reward attempts, teaching initiations	Parent: fidelity of the PRT implementation Child: communication	Post-training: M= 67% Follow up: M= 33%	Not reported	Positive PND= 94%	Stage in the study: post-training Type: standardized assessment Results post-training: positive	95%
Nefdt, Koegel, Singer, & Gerber (2010)	RCT	27	Less than 5 years old, 25 males, 2 females	online	Not reported	training manual, modeling	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: communication	Post-training: M=75%	Not reported	Positive p=.000	Stage in the study: post-training Type: Questionnaire Results post-training: positive	N/A

Steiner, Gengoux, Klin, & Chawarska, (2013)	multiple baseline design	3	Less than 5 years old, 3 males	individual	6 weeks	training manual, modeling, feedback, prompts	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: communication	Post-training: M= 49-84%	Not reported	Positive PND=100%	Stage in the study: post-training Type: Questionnaire Results post-training: Positive	95%
Laski, Charlop, & Schreibman, (1988)	multiple baseline design	8	Greater than 5 years old, 7 males, 1 female	individual	6 weeks	training manual, modeling, feedback	clear opportunities, child choice/ shared control, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Child: communication	Not reported	Not reported	Positive PND= 75%	Not reported	90%
Stahmer & Gist, (2001)	pretest–posttest design	22	Less than 5 years old, no gender provided	individual	12 weeks	training manual, modeling	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts,	Child: language	Not reported	Not reported	Positive P< .05	Not reported	83%
Ingersoll et al. (2016)	RCT	28	Greater than 5 years old, 20 males, 8 females	online	12 weeks	training manual, modeling	Not identified	Parent: fidelity of the PRT implementation Child: language	Post-training: M =2.52	Not reported	Positive P<.001	Stage in the study: Pre-training, post-training Type: standardized assessment Results post-training: positive	N/A
Koegel, Symon, & Koegel (2002)	non-concurrent multiple baseline design	5	Less than 5 years old, 2 males, 3 females	individual	1 week	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: communication	Post-training: M=80-100% Follow-up: M=80-100%	Not reported	Positive PND= 100%	Stage in the study: Pre-training, during training, post-training, follow-up Type: standardized assessment Results post-training: positive	95%
Symon (2005)	non-concurrent multiple baseline design	3	Less than 5 years old, 3 males	individual	1 week	training manual, modeling, feedback	clear opportunities, child choice/ shared control, contingent, natural rewards, reward attempts, incorporating maintenance/ acquisition tasks	Parent: fidelity of the PRT implementation Child: communication	Post-training: M=82% Follow-up: M=93%	Not reported	Positive PND= 100%	Not reported	91%

DISCUSSION

Research Questions

The first research question addressed in this literature review was: What has current research on parent-implemented PRT shown to be the most often used parent training strategies to teach parents of children with autism? The results showed that the most often intervention strategies that parent were trained to use are incorporating the child's choice/shared control (15 studies) and natural reward (14 studies).

The second research question addressed in this literature review was: How many parent-training of PRT studies included parent treatment integrity measures and trained parents to a competency level. If the study included treatment integrity, what are the levels they observed immediately after training and were those maintained? The results show that 13 of the studies included parent treatment integrity measures; however only 10 of those studies trained parents to a competency level. Only 2 of the studies maintained high levels of parent treatment integrity in the follow up assessments.

The third research question addressed in this literature review: How many parent-training of PRT studies include social validity measures? If the study included social validity measures, what are the types of measures used and what were the results of those measures? The results show that 9 of the studies included social validity measures. However, social validity was only assessed in post training in all 9 studies. The most commonly used measures that assessed parents' social validity was in the form of researcher-created questionnaires. The results of those measures showed that parents in all the studies were satisfied with the PRT training intervention used in the studies. No dissatisfaction scores were reported by any parent with the intervention.

Conclusions

There are some trends that are evident in the results of this literature review that can be used to make conclusions about training parents in PRT. First, the duration of the training to teach parents on how to implement the PRT skills was most commonly 12 weeks. Second, the most common training format to teach parents to implement PRT was individual instruction. Third, parents were most commonly trained with the use of a training manual and modeling strategies. Thus, these trends in the parent training procedures may be helpful in designing future PRT parent trainings.

The results of this literature review of previous research on PRT confirms that parents can effectively be trained to implement PRT interventions (Koegel, Bimbela, & Schreibman, 1996). The improvements in communication and language for children with ASD with the implementation of PRT aligns with previous research on PRT that shows increases in self-initiations and collateral improvements in communication, language, and play skills for a number of children (Koegel et al.1997; Koegel, Koegel, Green-Hopkins, & Barnes, 2010; Verschuur, Didden, Lang, Sigafos, & Huskens, 2014). Previous research in the efficacy of PRT indicates parents are capable of learning required strategies in order to deliver PRT with fidelity to their children with ASD (Brookman Frazee, 2004; Koegel, et al., 2002; Stahmer & Gist 2001). The results of this literature review shows that parents are capable of learning required strategies in order to deliver PRT to their children with ASD with fidelity.

An identified problem investigated in this systematic review was the wide variability of PRT implementation and the multiple techniques used to teach caregivers to correctly implement PRT. The results of the systematic review extend knowledge in this

area by identifying some trends of the techniques used in training of parent implemented PRT research in terms of the instructional strategies, the duration of training, and the training format. This offers useful information regarding training protocol for future research. This literature review also addressed the variety of PRT strategies that were used trained to parents. The most commonly used strategies in which parents were trained were found, however all the parent trainings did not teach parents the same PRT strategies. Also, 3 studies did not report the skills that the parents were trained in when implementing PRT with their children. This relates to previous research by showing that PRT is vaguely defined and therefore implemented with wide variability. Thus, the reliability of PRT as an intervention to teach parents is still questionable. The results in this systematic review extend this knowledge by highlighting the need for researchers to outline and systematize the PRT strategies so they can be implemented the same by all individuals.

Another identified problem investigated in the systematic review was the varying degrees of parent treatment integrity measured in parent-implemented PRT research. The results in this systematic review extend this knowledge by demonstrating that parents can implement PRT strategies with fidelity when assessed in post training; however, the skills learned by parents may not be maintained in the follow up assessments. Ultimately, this finding could help researchers effectively train parents for long-term competency. This systematic review addressed the extent to which social validity was assessed in parent-implemented PRT research. The results extend this knowledge by revealing that the social validity measures collected only assessed the parent's perception of the training through indirect surveys. Other indirect methods that could be used assess social validity

include the involvement of a variety of stakeholders (e.g., indirect consumers, members of the immediate community, members of the extended community). The researchers could also collect direct measures on the feasibility of implementing the intervention and the acceptability of cost, time, efforts, ethics, and appearance of the intervention (Ledford & Gast, 2018). Social validity measures that assess the parent training methods and various stakeholders will allow for a more comprehensive understanding of the PRT parent training intervention, this is a deficit identified in the current literature and provides an avenue for further research.

Limitations

There are multiple limitations in this literature review that should be noted. First, this literature review is limited by the small body of research. Only 18 studies met the inclusionary criteria. It is possible that if additional studies on parent-implemented PRT were included, then other trends may have been observed and ultimately may have led to other conclusions. Another limitation is that this review did not include unpublished literature (e.g., theses and dissertations, conference presentations, etc.). Thus, more research on the literature of parent implemented PRT is still necessary (including theses, dissertations, and conference proceedings) to get a better understanding of how researchers should teach parents to implement this intervention in the future.

Another limitation that should be noted is the quality of the studies that are used in this literature review. Horner et al. (2005) established these quality indicators to assess rigor and quality of SCD research. However, the overall quality of some the studies is used in this literature review are low. For example, the quality of the study conducted by Baker-Ericzén, Stahmer, and Burns (2007) was 67%. It is possible that some of the lower

quality studies do not represent reliable results and the conclusions identified from these studies may not be replicated across multiple studies. Another limitation is that the studies used in this literature review showed a lack of consistency in defining the interventions that the parents were taught to implement. The variations in each study when defining the procedures of PRT led to challenges when determining the coding categories of the strategies that the trainers used to teach the parents and the intervention strategies that the parents were taught to implement. These inconsistencies of researchers clearly defining the PRT training interventions in research, whose purpose is to analyze the effectiveness of a intervention, leads to us to question the overall effectiveness of PRT.

Additionally, a limitation in this literature review that should be noted is the lack of details in terms of the research methodology within the studies. There is the lack in measurement of fidelity of parents and researchers as well as a lack in measurement of social validity. These measurements play a significant role in the research questions of this literature review, so the inclusion of these measurements in the articles may have led to other findings. There is also a lack of baseline measurement or a description of the baseline condition in multiple single subject studies. This is an important consideration in research when assessing whether an intervention is effective. Another limitation is that the group design studies were not assessed with the quality indicators identified by Horner et al. (2005). The group designs lack a measurement of the baseline condition, hence they were excluded from the quality assessment. It is possible that if the group designs were assessed on their quality, then other strengths and deficits may have been identified in the literature.

Gaps in the Current Literature

This literature review highlighted several gaps in the current body of parent-training of PRT strategies research. One of the gaps in the current literature is that treatment integrity measures were only reported in one study. This shows that there is a lack of treatment integrity assessing the training procedures implemented by the experimenters. The literature focuses on only parent's fidelity of implementation, which is when the researchers are assessing the parents use of the training techniques on their children. In this case, the parent's fidelity functions as the dependent variable in the studies. However, the literature fails to assess the experimenter treatment integrity of training strategies (the independent variable in these studies). This is an important distinction, because treatment integrity is when the researcher collects integrity measures of the trainer teaching the parent. Another gap in the current literature is the use of only indirect surveys to assess the social validity of parents' satisfaction of the training that is evident in all the studies. This shows that there is a lack of variety in social validity measures (e.g., indirect, direct) assessing the parent training methods (e.g., researchers, extended family members, etc.).

Future Directions

Areas of future research in parent-implemented PRT research could analyze parent's fidelity of implementation during maintenance of the PRT intervention. Ledford and Gast (2018) recommended that researchers should do the following for a comprehensive procedural fidelity in their study: (a) measure all experimental variables, conditions, participants, and levels of implementation (procedural fidelity); (b) use direct systematic observations (counts derived from direct observation); and (c) report explicitly

(e.g., naming variables, conditions, and participants for which data were collected).

Parent trainings in PRT lacks the use of a comprehensive procedural fidelity in terms of measuring all conditions and levels of implementation. Only 6 studies (33%) have collected data on parent's maintenance of PRT skills after teaching them the intervention. These studies indicate that parents were not able to maintain the use of the PRT strategies they have learned in the training with fidelity in the post-assessments (66%, n=4 studies). However there is not enough data to validate this finding. Future research is necessary to clarify this perceived negative effect on the maintenance of parents' fidelity of implementation. Treatment fidelity will provide important information regarding feasibility and replicability of experimental procedures (Ledford & Gast, 2018). Thus, future research should conduct research on parent's fidelity of implementation in multiple stages of the study, which will allow researchers to understand whether PRT has long-lasting effects on parents' fidelity.

Another area of future research in parent-trained PRT is assessing social validity in several ways (e.g., indirect and direct) with many stakeholders (e.g., clients, parents, teachers, staff, etc.) before, during, and after the PRT training interventions. The studies that collected social validity in this literature review have primarily assessed social validity using surveys delivered only to parents and only at the end of the study. The researchers created the surveys which have the potential of experimenter bias. Also, the researchers are assessing the parent's perception of the outcomes of their children instead of the goals and procedures of the PRT training. Wolf (1978) recommended that researchers address three levels of social validation: goals, procedures, and outcomes. Future research on parent-implemented PRT should analyze the goals and procedures of

the parent training strategies when assessing social validity in the study. Additionally, social validity was primarily assessed using subjective measures (e.g., self-reported satisfaction) and is not based on observational data. A direct measure would be to assess the extent to which the children maintain the PRT interventions over time (before, during, after intervention). Social validity was only assessed on the child outcomes and PRT strategies, not on the experimenter training. Future research should focus on objective quantifications of social validity data in parent implemented PRT research.

Another area of future research in parent trainings for PRT is for researchers to systematize the procedures for implementation of the PRT strategies for the use of trainings. PRT trainings should be implemented the same by all individuals (parent, staff, educators, therapists, researchers, etc.) to ensure that the results are reliable and to ensure that all children are receiving the benefits of the intervention. PRT interventions continue to be vaguely defined and are therefore implemented with wide variability. Future research should focus on creating procedures for implementing PRT that can be used by all individuals teaching children PRT skills.

Another area of future research in parent-trained PRT is assessing which PRT intervention strategies have led to best child outcomes. Also, researchers can assess which PRT training strategies have led to the greatest improvement in the child's outcomes. This would be helpful in designing a PRT training protocol that has shown the most effective outcomes in the children's functioning. Future research should focus on understanding the results of the children receiving the parent- implemented PRT.

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APPENDIX A:

QUALITY INDICATORS WITHIN SINGLE-SUBJECT RESEARCH

Quality indicators	Yes	No	Part	N/A
Description of participants and settings:				
Participants are described with sufficient detail to allow others to select individuals with similar characteristics (e.g. age, gender, disability diagnosis)				
The process for selecting participants is described with replicable precision				
Critical feature of the physical setting are described with sufficient precision to allow replication				
Dependent Variables:				
DVs are described with operational precision				
Each DV is measured with a procedure that generates a quantifiable index				
Measurement of the DV is valid and described with replicable precision				
DVs are measured repeatedly over time				
Data are collected on the reliability or IOA associated with each DV and IOA levels meet minimal standards (e.g. IOA = 80%; Kappa= 60%)				
Independent variables:				
IV is described with replicable precision				
IV is systematically manipulated and under the control of the experimenter				
Overt measurement of the fidelity of implementation for the IV is highly desirable				
Baseline:				
The majority of single subject research studies will include: a baseline phase that provides repeated measures of a dependent variable and establishes a pattern of responding that can be used to predict the pattern of future performance, if introduction or manipulation of the IV did not occur				
Baseline condition are described with replicable precision				
Experimental control/internal validity:				
The design provides at least three demonstrations of experimental effect at three different points in time				
The design controls for common threats to internal validity (e.g. permits elimination of rival hypotheses)				
The results document a pattern that demonstrates experimental control				
External validity:				

Experimental effects are replicated across participants, setting, or material to establish external validity				
<i>Social validity:</i>				
The DV is socially important				
The magnitude of change in the DV resulting from the intervention is socially important				
Implementation of the IV is practical and cost effective				
Social validity is enhanced by implementation of the IV over extended time period, by typical intervention agents in typical physical and social contexts				