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ARTICLE

Efficacy of a Parent-Implemented Pivotal Response Treatment for Children with Autism Spectrum Disorder

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Abstract

Purpose Pivotal response treatment (PRT) is a well-established intervention addressing core symptoms of autism spectrum disorder (ASD), with parent involvement as a key component. The current study aimed to examine the effects of PRT parent training on parent fidelity and provide descriptive analyses of parent-child interactions before and after parent training. It also probed parental acceptance and satisfaction with the program.

Methods A concurrent multiple baseline design across participants was used to evaluate the effectiveness of the parent training program. Four parents (range 32–47 years old) and their children with ASD participated in the study. The intervention comprised 12 one-on-one parent training sessions over six consecutive weeks. The visual analysis and effect size calculation (Tau-*U*) were used to evaluate functional relationship between independent and dependent variables. The descriptive analysis was used to analyze parent–child interaction data.

Results The findings reveal that all parents learned and maintained PRT with a high level of fidelity, they also enhanced awareness to create more opportunities for interactions during free play, and the parents were very satisfied with the program. The results also indicate that the six-week parent training program is effective in teaching parents to implement PRT with their children.

Conclusion These results suggest that the parent training program may be a promising treatment model that is effective, efficient, and cost-effective. Implications for future research and practice are then discussed.

Keywords Pivotal response treatment · Autism spectrum disorder · Parent training · Treatment fidelity · Parent implemented PRT

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by limitations in social communication and interaction skills, restricted interest, and repetitive behaviors (American Psychiatric Association [APA], 2013). Children with ASD may exhibit challenging behaviors such as aggression, tantrums, and self-injuries, and 70–92% of them may have at least one comorbid psychiatric disorder accompanying the diagnosis (Brookman-Frazee et al., 2018; Jang et al., 2011). Challenging behaviors in addition to psychopathological conditions negatively affect children and their parents (Karst & Van Hecke, 2012). Parents of children with ASD may have more parental stress, lower parental self-efficacy levels, and a lower quality of life (e.g., Frantz et al., 2018; Hayes & Watson, 2013; Karst & van Hecke, 2012). These parents may also show higher levels of depression and anxiety (e.g., Cohrs & Leslie, 2017; Kuusikko-Gauffin et al., 2013; Singer, 2006). Thus, parenting a child with ASD might be challenging (Hayes & Watson, 2013; Lai et al., 2015).

The difficulties, parents face include few trained educators (Brookman-Frazee et al., 2012) and educators' high workload (Burrell et al., 2020). This limits access to education for children with ASD, which often results in high costs for traditional interventions (intensive school-based or clinic-based; Solomon et al., 2007) and lengthy delays in receiving education (Lindgren et al., 2016). This situation

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has caused greater interest in parent training, given its various advantages: no time constraints, the possibility of training in different settings, low cost, increased intensity of intervention, and more significant maintenance and generalization of behaviors (Burrell et al., 2020; Elsabbagh et al., 2012; Stahmer & Gist, 2001; Steiner et al., 2012; Symon, 2005).

Parents play a crucial role in their child's development, so parental involvement in the intervention of young children with ASD is vital (National Research Council, 2001). Training parents of children with ASD to act as intervention providers for their children is now considered to be an essential component of successful training programs. The last fifteen years have seen a rapid increase in the number of studies supporting the effectiveness of parent-implemented interventions to develop language and communication skills and improve parent–child interaction in young children with ASD (e.g., Althoff et al., 2019; Oono et al., 2013).

Parent training is a core component of pivotal response treatment (PRT; Koegel et al., 2016). Taking its theoretical foundations from applied behavior analysis and developmental approach principles, PRT is a comprehensive evidence-based intervention that focuses on teaching children with ASD in their natural environment to improve social communication skills (Hume et al., 2021; Steinbrenner et al., 2020). The core assumption of PRT is that when children with ASD are taught critical developmental skills (e.g., spontaneous initiation), they will spontaneously learn many skills not being taught or improve in other developmental areas (Bozkus-Genc & Yucesoy-Ozkan, 2021; Koegel et al., 2014). PRT teaches parents to create learning opportunities for social communication, for example, following the child's interests, gaining the child's attention, presenting prompts, reinforcing responses to the child's initiations or attempts, and interspersing maintenance and acquisition tasks (Koegel & Koegel, 2012). The emphasis of PRT parent training is implementing these principles as part of the child's daily routines. This helps ensure that the intervention will continue in different settings, the generalization of learned skills will be more straightforward, and teaching intensity will increase (Steiner et al., 2012).

Systematic reviews, meta-analyses, and randomized controlled studies on PRT reveal that parents are able to implement PRT and children with ASD show promising results for language and communication development as well as collateral gains (e.g., Bozkus-Genc & Yucesoy-Ozkan, 2016;, 2021; Gengoux et al., 2019). Additionally, PRT parent training seems to increase parent–child interaction and decrease parental stress levels (Minjarez et al., 2013; Nefdt et al., 2010). However, contrary to previous reviews reporting that PRT has positive results (Bozkus-Genc & Yucesoy-Ozkan, 2021; Oono et al., 2013; Rispoli et al., 2011; Schultz et al., 2011; Sisavath, 2014), there are inconsistent results about the effects of parent training on child outcomes (Cadogan & McCrimmon, 2015; Hardan et al., 2015; Verschuur et al., 2014). For example, one review concluded that PRT is not a promising intervention (Boudreau et al., 2015); this view was echoed in the latest review (Ona et al., 2020). Inconsistent results may be due to the high variability of the research methods, educational models, the number of studies included, the research results, and especially child outcomes. However, the internal validity of the studies included in the latest review indicates that reaching fidelity of implementation before providing the intervention may positively affect the results (Ona et al., 2020). This suggests that more focus is needed on PRT treatment integrity, regardless of whether the practitioner is a parent or educator.

The effectiveness of group and individual PRT parent training (including parent-child sessions) on PRT use was recently examined in different community-based treatments (e.g., Hardan et al., 2015; Verschuur et al., 2019). In contrast to individual parent training, findings indicated that group parent training resulted in a decrease in parental stress and an increase in self-efficacy gains. However, individual parent training resulted in large increases in spontaneous child initiations, whereas parent group training resulted in moderate increases (de Korte et al., 2022). Group parent training on PRT may be an effective treatment model, yet results regarding fidelity currently are mixed. For example, in an uncontrolled trial of a 10-week PRT parent group training ($n = 17$), most parents learned PRT at the end of the intervention, and their children improved in functional communication (Minjarez et al., 2013). However, in a recent randomized controlled group study of a 14-week protocol of PRT parent group training ($n = 20$), results did not include the examination of fidelity of implementation, and there was no insight into the continuation of PRT implementation and perceived effects after completion of the intervention (de Korte et al., 2022). These findings justify further research on parent-delivered PRT programs.

To address this, the goal of the present study is to examine the effect of the PRT parent training program on parent fidelity for parents with ASD children. We sought answers to the following questions: (a) Is the parent training program effective for parents of ASD children in acquiring and maintaining PRT with fidelity? (b) Is there any difference in the interaction behaviors of parents (e.g., responsivity, sensitivity, acceptance) with their children during free play before and after PRT parent training? (c) Did parents find the training program to be acceptable and satisfactory? This study is significant in that in addition to focusing on parental fidelity in PRT, this is the first study on the use of PRT in parent training in Türkiye.

Method

Participants

Four parents with young ASD children participated in the study. They were the primary caregivers and did not have previous experience participating in such a study. The inclusion criteria were that they: (a) had not received PRT training before, (b) were willing to participate in one-on-one training sessions, (c) had a child diagnosed with ASD or other unspecified pervasive developmental disorder, (d) lived in the city where this study was done during the study, and (e) speak Turkish. Also, four Turkish males with ASD participated in the study, aged 49–61 months. The mean age was 54.75 months. All four had a history of PRT intervention with question-asking (Bozkus-Genc & Yucesoy-Ozkan, 2021). Table 1 summarizes the participants' characteristics.

Experimental Design

A concurrent multiple baseline design across participants was used to evaluate the effectiveness of the parent training program (Gast & Ledford, 2018). The experimental conditions included; (a) baseline, (b) intervention (parent training), and (c) follow-up sessions. The number of baseline sessions for each parent ranged from three to nine. This study was approved by the Anadolu University's ethical board. The full trial protocol is available upon request.

Settings and Materials

We used different settings in the study. Parent training sessions and free play parent–child interaction sessions took place in a meeting room and a classroom in Anadolu University's Special Education Research and Development Center. Both rooms were carpeted, and all walls were covered with sound-absorbing materials. The meeting room had a large meeting table, chairs, a projection screen, and two windows. The classroom (2 × 14 m) had a child-sized table, two chairs, two cabinets, and a two-way mirror. All experimental sessions took place in a setting familiar to the participants (e.g., home or educational center). In all locations, a video camera facilitated data collection.

In the parent training program, the researchers trained parents using six manuals. These manuals covered PRT basics, following the child's lead, providing natural reinforcement, praising attempts, interspersing maintenance and acquisition tasks, and task variation. They included basic information, examples, and homework for parents. In addition to these manuals, the first author made a presentation on PRT basics and had parents watch twenty videos with examples. The researcher recorded all sessions using a video camera, which was positioned in the room's corner.

Outcome Measures

Parent Implementation of Intervention

The study's main dependent variable was the percentage of parents' implementation fidelity. We collected parents' PRT implementation data through videos of parent–child free play interactions. We used the partial interval recording procedure (Verschuur et al., 2017). We used a continuous 1-minute interval coding system. In this procedure, we evaluated the correct parent-created opportunity by analyzing each time the parent prompted initiation or responded to the child's communicative attempt during parent–child interactions.

We coded each interval according to whether it was in accordance with the PRT techniques or not. The following categories were considered correct per interval: (a) gaining the child's attention and providing clear opportunities to respond, (b) varying tasks and interspersing maintenance (for tasks the child has already mastered) and acquisition (targeted skills the child has not yet mastered) to enhance child motivation, (c) following the child's choice/shared control, that is, following the child's lead in the selection of toys and activities to enhance motivation, (d) providing immediate and contingent reinforcement when the child does target behaviors, (e) providing natural reinforcers that are directly and functionally embedded in the interaction, and (f) providing reinforcers following expressive verbal attempts and correct responses. Operational definitions of these behaviors may be found in the previous studies (e.g., Randolph et al., 2011; Verschuur et al., 2017). We considered the parents who implemented in accordance with the PRT components during at least 80% of the trials to have met fidelity. We terminated the sessions when the parents performed the target behaviors at 80% or more in three consecutive sessions.

Table 1 Participants' Characteristics

Child				Parent			
Child	Age	Gender	Ethnicity	Parent	Gender	Age	Education Level
Suat	58 months	Male	Turkish	Selin	Female	32	Primary school
Tarkan	61 months	Male	Turkish	Belma	Female	32	Middle school
Yavuz	51 months	Male	Turkish	Figen	Female	37	High school
Aras	49 months	Male	Turkish	Ali	Male	47	Doctoral degree

We calculated each parent's rate of parent-created opportunities by counting the number of completed strategies per 10-min recording and multiplying it by 100. In contrast to traditional fidelity methods, we scored the parents as using PRT strategies did or did not during a 1- or 2-min interval (e.g., Steiner et al., 2012; Verschuur et al., 2017). We believe this trial-by-trial method is a more conservative evaluation of fidelity that better captures parents' did and did not use of PRT strategies. Furthermore, this method comprehensively documents parent performance for the whole interaction.

Parent–Child Interaction

The secondary dependent variable are scores for parents' interaction behaviors. Interaction has been defined as the state of mutually affecting each other. In the current study, sensitivity, responsivity, effectiveness, and inventiveness were considered responsivity behavior. Acceptance, enjoyment, praise, warmth, and expressiveness were considered an affect behavior. Achievement, directiveness, and pace were evaluated as directiveness behavior. So, we used the Maternal Behaviors Rating Scale (MBRS), developed by Mahoney (2008), to assess parent and child interactional behaviors. MBRS is a five-point Likert scale ranging from 1 (very low) to 5 (very high). The Turkish version's validation and reliability were conducted by Diken and colleagues (2009). The Turkish version yielded three factors: responsivity (sensitivity, responsivity, effectiveness, and inventiveness), affect (acceptance, enjoyment, expressiveness, warmth, and praise), and directiveness (achievement, directiveness, and pace). These factors accounted for 73.4% of the variance of this scale. The Kaiser-Meyer-Olkin measure was 0.83. Cronbach's alpha was 0.87 for responsivity, 0.86 for affect, and 0.61 for directiveness.

In the parent–child interaction sessions, a parent placed toys suitable for the development and interests of children (e.g., parking lot and cars, toy house and dolls, puppets, animals, or a kitchen and utensils). Then the first researcher instructed the parent, "Play with your child as usual," and recorded parent–child interactions. The researcher neither interrupted interactions nor gave prompts. Parent–child interactions lasted 15 min on average (range: 12–20 min). We did not consider evaluating the recording's first three minutes. Because we wanted to have time for parents to initiate the play and acclimatize the play. In this way, we tried to reduce the camera effect either. Also, we did not evaluate in the last two minutes so that the children's boredom and the parents' decreased attention did not affect their interaction behavior. Thus, we coded only ten minutes of each session and scored parents' behaviors for each item (1–5 points). The program's goal is to raise parents' scores for "Responsivity" and "Affect" to five points while reducing "Directiveness" to three points (Diken et al., 2009 p. 31). The reason why the total score is not obtained in MBRS is due to this difference.

Acceptability and Satisfaction

After the last session of the parent training program, the second researcher conducted face-to-face interviews with the parents to assess the social validity of PRT and the training program. The second researcher collected social validity data so parents could express themselves more freely. The second researcher has a doctoral degree in special education and has experience working with and interviewing parents of children with ASD. The interview contained five semi-structured questions that addressed the feasibility and acceptability of implementing the PRT techniques. She asked the parents the following questions: (a) What changes do you notice in yourself when you think about before and after parent training? (b) What are your thoughts on the parent training program used to teach PRT? (c) What do you think about using PRT in the future? (d) When you think about the time you spend with your child, what can you say about the changes in your child after the study? (e) What can you say about the positive and negative aspects of parent training? Data were analyzed with the content analysis approach. The data were processed in five stages: (1) data organization, (2) data coding, (3) creating theme(s) and subtheme(s), (4) editing code(s), theme(s), and subtheme(s), and (5) explaining and writing them(s) and subtheme(s) (Creswell & Creswell, 2017). The main theme(s) and subtheme(s) were interpreted and direct quotations were provided to support the identified themes.

Procedure

Baseline

The purpose of baseline sessions was to assess the rate of parent-created opportunities for initiation before the parent training program. During these sessions, a variety of age-appropriate toys were available. Before each session, the researcher put the toys in locations accessible to the children. She instructed the parents to play with their children as usual and did not provide suggestions for materials or activities. The researcher did not interact or provide feedback during the parent–child interaction. A wide range of activities occurred including play with animals, cars at the car park, and mealtimes. A parent, child, and researcher were present during each baseline session.

Intervention

The intervention comprised 12 one-on-one parent training sessions over six consecutive weeks. The first researcher, certified at PRT level IV, conducted the parent training sessions. She has completed online PRT training and demonstrated fidelity in PRT implementation at or greater than 80% in self-initiation. She also has experience conducting research using PRT and more than ten years of experience teaching children with ASD. In these intervention sessions, she taught parents the core motivational strategies of PRT.

One week before the first session, the researchers provided parents with a set of six manuals. Training procedures were based on the published manual *How to Teach Pivotal Behaviors to Children with Autism: A Training Manual* (R. L. Koegel et al., 1989). PRT was introduced to parents through lectures and standard video examples. The parents discussed PRT techniques shown in videos. Individual sessions were held in a meeting room. Children did not attend these sessions. The content of the training sessions is outlined in Table 2.

Training sessions were embedded in games so that the children could have fun. In the hands-on training, the researcher first modeled the use of each PRT technique and showed the parents how they could use them with their children. The researcher provided verbal narration as she modeled the techniques and asked parents to practice the PRT technique with their children. Then, the parent organized the classroom environment and started playing, following the child's lead. Meanwhile, the researcher observed the parent and provided immediate corrective feedback on the parent's appropriate and inappropriate behaviors. She re-modeled any technique when the parent needed it. At the end of this session, the researcher assigned the parents homework. She asked them to use PRT techniques during parent–child interactions at home and record these interactions on video for at least ten minutes. Each parent e-mailed the video weekly to be assessed by the researcher before the next session.

The third session was based on the evaluation of the video recordings of parents. In individual sessions, they received weekly feedback about their implementation of PRT at home based on the videos they recorded. Before this session, the researcher watched the video and wrote down the feedback for parents. During the session, the researcher divided the video into one-minute intervals and watched them with the parent. At the end of one minute, the researcher stopped the video, provided written feedback, and praised appropriate parent behaviors, and provided corrective verbal feedback for inappropriate parent behaviors. At the end of the session, she asked the parents to record another video for the following week. Video evaluation sessions were held twice a week. Sessions 5–11 were conducted the same way as session 3.

The fourth session was carried out at the parents' home. The researcher observed how the parents designed and organized their home environment for PRT implementation, provided immediate feedback on PRT, discussed how they could best use teaching opportunities, and answered the parents' questions. At the end of the session, she reviewed the training program and PRT implementation and discussed what could be done after the program ended. She assigned the same homework as before, to record and e-mail a video of parent–child interactions. Finally, follow-up sessions were held after training, when the parents returned to their city of residence.

In addition to PRT techniques, the researcher taught parents how to use naturalistic time delay. This gives the child a chance to use their own words (maintenance tasks). During training for naturalistic time delay, the researcher taught parents to offer an interaction or play opportunity and to wait at least ten seconds for the child's response. If the child did not respond after ten seconds, the researcher showed parents how to use the model prompt, especially for acquisition tasks the children just learned.

Follow-up

We collected follow-up data two, four, and six weeks after the last session. The follow-up sessions were identical to the baseline session. A parent directed a parent–child interaction play session, recorded it, and e-mailed it to the researcher. The researcher collected data without giving parents any praise or feedback, as in the baseline session.

Reliability

Interobserver Agreement (IOA)

An observer unaware of the study's hypotheses coded the dependent variable (percentage of parents' implementation fidelity) for at least 20% of each condition (baseline, intervention, and follow-up) and each participant. The first researcher trained the observer using the PRT implementation video clips. These videos were parent–child interaction samples that did not include the participants' videos. Training continued until the observer's and researcher's scores agreed 80% of the time. After the training, videos were randomly selected to reduce observer drift (e.g., Bradshaw et al., 2017). To determine IOA, the observer and researcher coded the video clips simultaneously and independently. IOA was calculated as the number of agreements divided by the total multiplied by 100. The mean IOA for implementation

Table 2 Overview of PRT Training Content

Session	Session Duration	Session Content/ Researcher's Behavior	Setting	Participant	Homework
Preparation	1 week	Giving PRT manuals to parents	Home	Mothers Father	Reading PRT manuals
1	4–6 h	Introduction of the day's topic In-depth overview of PRT Discussion of PRT techniques View video examples Discussion of videos Wrap-up	Meeting room	Researcher Mothers Father	Repeating the topics Reading PRT researches Completion of worksheet in manuals
2a	45–60 min	Introduction of the day's topic Review of PRT techniques Checking homework of worksheet in manuals Discussion of corrects/incorrect in worksheet	Meeting room	Researcher Mothers Father	NA
2b	15–20 min	Modeling use of PRT to parents	Classroom	Researcher Mothers Father Child	NA
2c	30–60 min	Environmental arrangement Parent use of PRT with child Provide suggestions and feedback simultaneously Showed examples of PRT techniques Discussion of parent behavior Wrap-up	Classroom	Researcher Mothers Father Child	Begin implementing PRT during parent–child interactions
3	60 min	Introduction of the day's topic Review home videos of parent use of PRT Provide feedback to video Parent individual progress reviewed Wrap-up	Meeting room	Researcher Mothers Father	Implement PRT during parent–child interactions based on feedback during session
4 Home visit	60 min	Introduction of the day's topic Environmental arrangement Teaching session Provide suggestions and feedback simultaneously Discussion of application Wrap-up	Home	Researcher Mothers Father Child	NA
5–11	Same as session 3				
12 Final sitting	60 min	Review of general situation Discussion of future goals Say goodbye	Meeting room	Researcher Mothers Father	Video for follow-up data every two weeks
Validity	254–5 min	Collecting social validity data	Second researcher's room	Second researcher Mothers Father	NA

fidelity across parents was 100% for baseline, 90% for intervention, and 85.7% for follow-up sessions.

Treatment Integrity (TI)

We calculated the researcher's treatment integrity percentage to evaluate whether the researcher implemented the training program as planned. An observer unaware of the study's hypotheses coded the researcher's behaviors (Table 2) for at least 20% of each condition and each participant. Within each session, the observer assigned a plus (+) if the researcher performed the planned behavior correctly and a minus (−) if the instructor did not complete

the behavior correctly. TI across all parents was 100% for baseline and 96.7% for intervention sessions.

Inter-Coder Agreement (ICA)

To determine ICA for the parent–child interaction data, an independent observer simultaneously and independently collected and coded data alongside the primary observer. The second observer watched 50% of the baseline and follow-up videos and coded the parents' interactional behaviors. The independent observer has a doctoral degree in special education and has previously conducted research using MBRS. The ICA was 100% for responsivity, 100% for affect, and 92.3% for directiveness.

Data Analysis

We used visual analyses and effect size estimates to evaluate the fidelity of parents' implementation of PRT. For parents' implementation, individual data were displayed graphically and inspected for changes coincident with the beginning of the training within and across consecutive phases (as recommended by Kazdin, 2011). In addition to visual analysis, we also used the Tau-*U* calculation (uncorrected baseline) to assess effect size, which ranging from 0 to 1 (Parker et al., 2011). We did this with an online calculator and interpreted the Tau-*U* scores as follows: ≥0.80 = very effective, 0.60–0.79 = effective, 0.20–0.59 = moderately effective, and ≤0.19 = mildly effective (http://singlecaseresearch.org/calculators/tau-u; Rakap et al., 2020; Vannest & Ninci, 2015).

We used descriptive analyses to analyze the parent–child interaction data. We rated parents' behaviors on a five-point scale (Table 3). The highest score was 20 for the sensitivity-responsiveness subscale, 25 for the emotional expressiveness subscale, and nine for the achievement-orientedness subscale. We considered parents with high scores on the first two subscales as having strong parent–child interaction. In contrast, we interpreted parents with a high score on the third subscale as having limited parent–child interaction.

We analyzed social validity data using thematic analysis. After completing the interviews, we transcribed them and verified their accuracy. Then we coded the interviews. We created a code list, combined some codes, and created new ones. After coding, we developed sub-categories, categories, and themes, which were also informed by the research log.

Results

Efficacy

Figure 1 demonstrates the percentage of parents' treatment fidelity during baseline, intervention, and follow-up sessions. During baseline sessions, the percentage of correct responses of all parents was low, but after the researcher introduced the parent training program, there was a gradual increase for all parents. Both combined and weighted average Tau-*U* score is 0.95 between baseline and intervention conditions for all participants. In addition, the 95% confidence interval is 0.63 <> 1.00. Based on the Tau-*U* score, the parent training program is very effective.

Table 3 Scores of Parents' Interactional Behaviors Obtained from the Subscales of Maternal Behaviors Rating Scale

MBRS	Selin		Ali		Figen		Belma	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Responsivity								
1. Sensitivity	3	5	2	3	3	5	2	5
2. Responsivity	2	5	1	3	3	5	1	5
3. Effectiveness	3	5	2	3	2	5	2	5
4. Inventiveness	2	4	1	2	2	4	2	4
Total Score	**10**	**19**	**6**	**11**	**10**	**19**	**7**	**19**
Affect								
1. Acceptance	3	5	2	3	3	5	2	5
2. Enjoyment	3	5	2	3	3	5	3	5
3. Praise	2	5	2	3	2	5	2	5
4. Warmth	2	5	2	3	3	5	2	5
5. Expressiveness	3	4	2	4	3	5	3	5
Total Score	**13**	**24**	**10**	**16**	**14**	**25**	**12**	**25**
Directiveness								
1. Achievement	5	3	5	4	5	3	5	3
2. Directiveness	5	2	5	4	5	3	5	3
3. Pace	4	3	4	4	5	3	5	3
Total Score	**14**	**8**	**14**	**12**	**15**	**9**	**15**	**9**

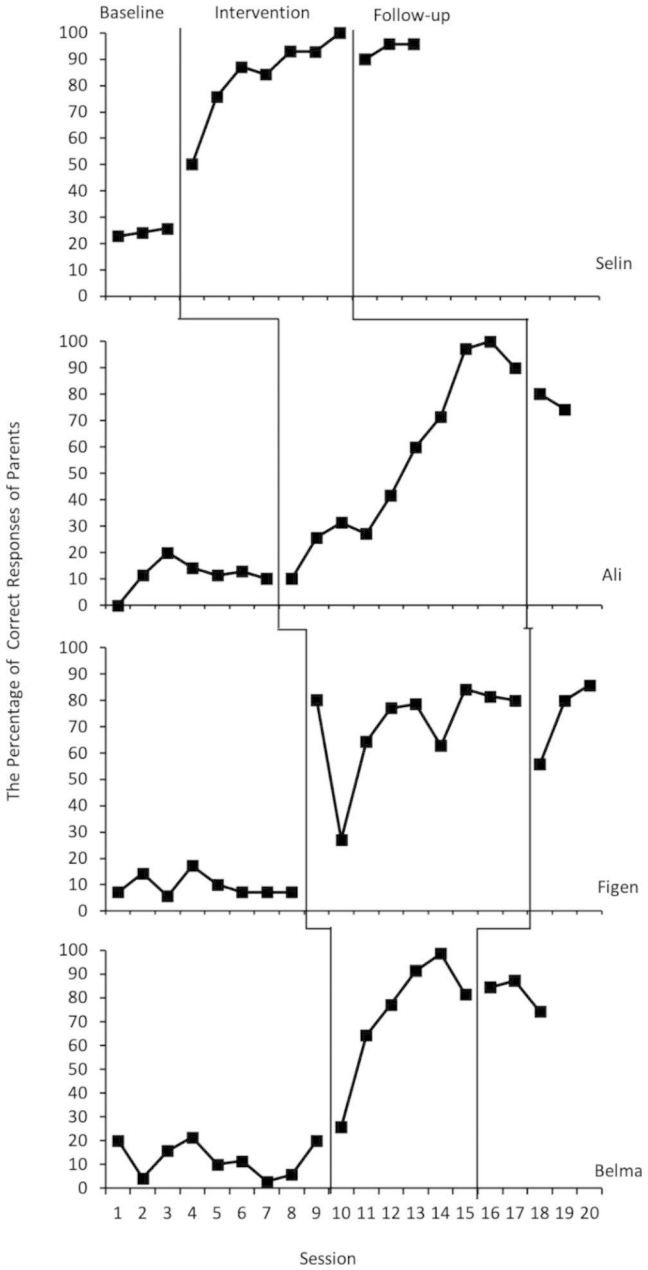

Fig. 1 The Percentage of Parents' Implementation Fidelity for PRT during Baseline, Intervention, and Follow-up

Parent–child Interaction

Table 3 contains the scores of parents' interactional behaviors obtained from the subscales of MBRS. The low pre-test for responsivity shows that parents had low sensitivity to the interests of their children's child-initiated activities or games before the parent training program. Parents occasionally took into account the interests and behaviors of the child, but they had limitations in observing the child's behaviors and did not support their children's activities. Additionally, the parents had limited ways of attaining their child's attention and tended to repeat themselves frequently during interactions, meaning they had few creative behaviors.

The pre-test score for affect shows that the acceptance level of parents was low, and they put some pressure on children to do things or respond in ways they could not. The parents had little enjoyment in interactions with children, used moderate-level praise, had little warmth, and expressed positive feelings with low-intensity touch or speech. Furthermore, parents were not very expressive, and occasionally communicated with their children during the interaction, and their body language, voice quality, and facial expressions ranged from neutral to medium.

The pre-test score of directiveness shows that the parents were strongly achievement-oriented and put a high level of pressure on their children's sensory/motor/cognitive achievement; in other words, children's achievement was essential for parents. The parents rarely allowed their children to manage themselves, tended to give strong direct suggestions and guidance, and tended to interfere with the children's activity choices. The pace of parents' interactions was faster than average, and the parents exhibited active participation too quickly to allow the child to react.

As seen in Table 3, there was a positive trend in the post-test scores of the first two subscales (range = 4–5). for three parents (S, F, and B; all mothers), and there was a notable decrease in the score of the third subscale (range = 2–3). For father A, there was an increase in the first two subscales (range = 2–4). and a decrease in the third subscale (range total score = 4), but this change was not as large as desired.

Acceptability and Satisfaction

We collected subjective evaluation data to determine the acceptability of the PRT parent training program and parents' satisfaction with the program. Based on the parents' opinions, we have developed six themes and 46 sub-themes (Fig. 2). As seen in Fig. 2, the themes were: changes in parents, changes in children, evaluation of the educational process, using the PRT in the future, positive aspects, and negative aspects.

None of the parents had previously participated in such an organized and systematic training program. They said they enjoyed the intervention and were extremely happy to be involved in such a study. Furthermore, the parents found the training program valuable because it involved one-on-one instruction. The parents could ask the research child-specific questions and share their experiences with the researcher. They also said that the training program helped them, because the manuals were written in clear and simple language, the explanations and discussions made the manuals easier to understand, the sample videos were explanatory, the researcher modeled behavior, they had a chance

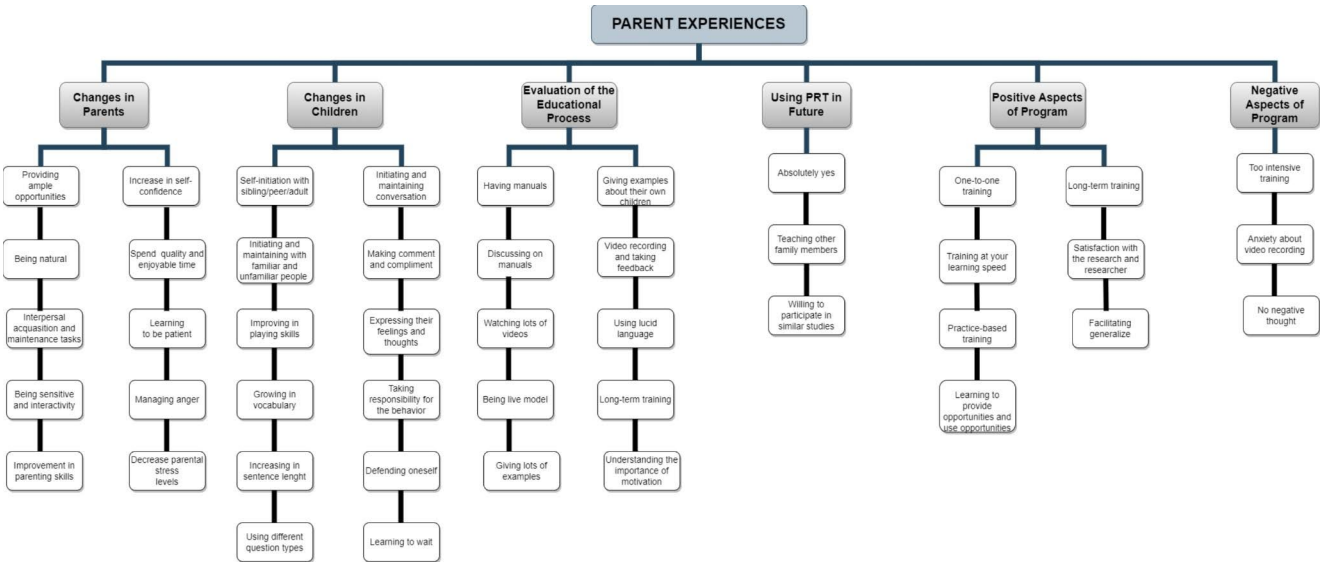

Fig. 2 Themes and Sub-themes of Acceptability and Satisfaction Results

to use PRT techniques, and they received both immediate and delayed feedback. The parents emphasized that the researcher's modeling and feedback helped them see their deficiencies more clearly. The following participant's statement confirmed this result: "*I read it, but when she explained me, I understood better. When I put it into practice, I understood it even better. We recorded videos at home, we brought them, and we had discussions on videos. After that, I started to understand even better. If I had read the manuals alone and we hadn't done other studies (e.g., modeling, guided practice, immediate feedback, and home visit), I might not be like I am now. I understood the intervention even better because we did these practices (Selin).*"

Parents stated that when the parent training program was completed, they learned to take advantage of learning opportunities that arise during daily routines, to follow the interests of their children, to offer opportunities for choice, to wait for a response after making a request, to use natural reinforcers, to keep children's motivation high, to plan new goals, and to intersperse new goals and the previously-learned skills in daily life. They also said that PRT is so straightforward that they could use it anywhere and anytime. All parents emphasized that their parenting skills and self-confidence increased by watching their children discover new things, observing them more closely, learning to play together, enjoying spending time together, improving family relationships, and learning to be patient. The following participant's statement supported this result: *"I realize now that we had squandered time before the program. Now we are full, our time is qualified, and we are having fun. We couldn't play games before. He was escaping. Even if he was interested in something, I didn't know how to behave him. But now we have a great time at home and everywhere (Belma)."*

The parents said that PRT also contributed to their children's outcomes. They noted incredible improvements in language, communication, and interaction skills, development in play, a greater ability to express their feelings and thoughts, initiating positive social interactions with siblings, family members, or peers, and a decrease in challenging behaviors. Parents also said that they would continue to use PRT after the study, teach it to other family members, and use it with their typically developing children. Furthermore, parents demanded that PRT be popularized in Türkiye. The statements in the researcher's log support the social validity findings. The following participant's statement verified this result: *"...I believe PRT is the most effective intervention for autism. I think this should be disseminated. I believe this intervention should be taught to families because family is a critical parameter (in education; Ali)."*

Discussion

The current study aimed to examine the effects of PRT parent training on parent fidelity. Secondly, it provided descriptive, but non-experimental, analyses of parent-child interactions before and after parent training. It also probed parental acceptance and satisfaction with the program. The findings reveal that all parents learned and maintained PRT with a high level of fidelity, they also enhanced awareness to create more opportunities for interactions during free play. The parents found the program acceptable and were satisfied with it. The results also indicate that the six-week

parent training program is effective in teaching parents to implement PRT with their children.

The findings are consistent with previous results showing that parents can learn PRT techniques and then generalize these skills to their interactions with their children at home (Coolican et al., 2010; Koegel et al., 2002; Stahmer & Gist, 2001; Symon, 2005; Vismara et al., 2009). Unlike previous studies, the current study compared parents' behaviors before and after the training program and we collected follow-up and social validity data. This improved method may be seen as a contribution to the literature in addition to the new data.

The results show that parents' implementation of PRT techniques increased after six weeks of intensive training. None of the parents met the criteria for implementation fidelity (> 80%) before the training program, but after an average of five sessions, all parents implemented PRT with high fidelity. Symon (2005) and Koegel and colleagues (2002) ran five-hour sessions over five consecutive days, and all participants (parents or primary caregivers) applied PRT at or above 80% fidelity. This agrees with our study. On the other hand, Stahmer and Gist (2001) reported this result for only four of 11 parents who completed 12 h of PRT training. For other programs with the same number of hours, Vismara and colleagues (2009) and Coolican and colleagues (2010) similarly report that only four of eight parents mastered PRT techniques. Although the participants were similar, it is not clear why the findings are inconsistent. One important difference may be the length of the program, which in the current study was 15.5–18 total hours over 12 weeks. Additionally, better materials or more effective training techniques may be factors Coolican and colleagues (2010) found that four of five mothers and only one of three fathers met the criteria for PRT implementation at the end of the program, suggesting that gender difference may be another possible factor.

A recent systematic review suggests that reaching implementation fidelity before delivering instructions improves results (Ona et al., 2020). This suggests focusing more on implementation fidelity, regardless of whether parents or professionals carry out the intervention. This study's primary variable is the effects of PRT parent training on parent fidelity. Hence these findings contribute to filling a current gap in the literature.

Given that parents spend the most time with their children, they have ample opportunities to implement PRT throughout the day. These opportunities enable the child to learn and generalize in different settings, increasing the amount of appropriate intervention available to the child with ASD. So, it can be said that motivation-based PRT is similar to previous research that shows that targeting a crucial primary area such as parent–child interaction level leads to improvements in other areas (Hardan et al., 2015; Oono et al., 2013; Symon, 2005; Stahmer & Gist, 2001).

The results on parent–child interactions show that parents of children with developmental disabilities are less sensitive and responsive to their children than parents with typically developing children and they tend to be more success-oriented and directive (Blacher et al., 2013; Phillips et al., 2017). The scores they received before the implementation suggest that parents are directive and achievement-oriented. They try to keep their children busy and encourage them to play more appropriately and communicate better. The scores they received after the implementation support the conclusion that children's participation is positively related to the parents' sensitive responsiveness and emotional expressiveness. Hence, parents were pleased with their achievements in developing interaction behaviors with their children, learning to play, enjoying spending time together, and learning to be patient.

The study's findings suggest that using PRT by parents may have helped improve parental responsiveness and sensitivity to their child's developmental level, and communicative needs in play would be appropriate. Our results also support that mainly focuses on tying the positive parental reactions to the program with the literature (Stahmer & Gist, 2001; Vismara et al., 2009) and any culture-specific observations the authors have about the significance of positive parental reactions to this program given the cultural setting. However, it cannot be said that Turkish parents with children with ASD fully reflect the types of interaction that would maximize their child's developmental potential. When evaluating these results, it should be considered that they are based on the opinion of only four parents. Therefore, future research is needed to conclude that early intervention services such as PRT encourage parent–child interaction at the highest level.

Another critical point to be mentioned is the interactional behaviors of the father. The most significant progress in the father's interactional behavior has been in the areas of responsiveness and expressiveness. No change was observed in the pace. In other sub-scales, although there is an improvement compared to the pre-implementation score, it is not at the desired level. These results are not surprising when the literature is examined. It contains similar results to the findings of the research conducted by Aslan (2016) with a single study on the same subject, in which the interactional behaviors between fathers and their children with ASD were examined. In other research studies on the interaction of parents with children with ASD (Ceyhun et al., 2015; Oguz & Sonmez, 2018; Toret et al., 2015), the results indicate that parents can face difficulties in starting a conversation and sustaining. In addition, it can be said that when mothers' and fathers' average scores on the

subscale of sensitivity-response were compared, mothers displayed more sensitive-responsive interaction behaviors than fathers. In addition, although a comparison cannot be made, the research conducted by Diken (2012) and Diken and Mahoney (2013) is similar to the finding of this study that fathers of children with ASD have low interaction paces with their children. So, more research on fathers is needed to make an effective comparison.

During the interviews, the parents emphasized that they did not know how to interact with their children suitably or support their children's development in their natural environments. They observed improvements in their children's language, communication, and interaction skills and said that PRT helped reduce challenging behaviors. These positive impacts on children agree with other studies (e.g., Hardan et al., 2015; Nefdt et al., 2010; Openden, 2005). Likewise, many parents report that the services are more beneficial for their children when they are included in parent training programs (Hume et al., 2005).

Lastly, parents stated that the manuals alone were insufficient in training. They also said that having many implementation examples was essential, in addition to both immediate and delayed feedback. They frequently expressed their satisfaction with the one-on-one arrangement during training. Therefore, the one-on-one instructional arrangement is essential when planning future parent training programs. Additionally, future programs should measure parent satisfaction with a different data collection tool than interviews.

Limitations

While this study demonstrated an effective model for expanding services for children with ASD and their parents, there are several limitations: the sample size was small, there was no control group, and child outcomes were not directly evaluated. Another limitation of this study is that the sample group of validity and reliability in MBRS did not include the measure for paternal behaviors.

Suggestions

A recent systematic review of meta-analyses has shown that parent involvement is an essential predictor of better outcomes in children, particularly in adaptive behavior gains (Ona et al., 2020; Strauss et al., 2013). Given that parent education models offer unique opportunities to facilitate generalization (Steiner et al., 2012), increase service density (Kaiser et al., 2010), and improve parental psychological well-being (Minjarez et al., 2013), additional studies are needed to test the effect of parent training models. Apart from the current findings on the effect of PRT on communication and interaction skills, and inappropriate behaviors, more information is needed on outcomes for other variables, such as parents' quality of life, adaptive behaviors, and levels of stress and depression. Since these results are crucial for the long-term effects on the child and the family, further studies should consider evaluating these variables separately.

In this study, parents were only considered trainers for their children, and parents' outcomes were evaluated. The parents in the study taught the other parent how they could use PRT when they returned to their home city and they also implemented it with their children. Although no data have been collected on this, these indirect data will be a valuable source of information for future studies to examine the full impact of training and intervention in the family. Hence parents can also play a role as educators as they teach PRT techniques to others who spend time with their children. Although the role of supporting parents teaching each other is vital, this role is still underrepresented in research (Bailey, 2001; McConnell, 2001). Thus, further studies targeting parent-to-parent training are needed to test this. Future research with a larger group could provide more comprehensive support and promote PRT's popularization.

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