Published in final edited form as:

J Clin Child Adolesc Psychol. 2018 ; 47(SUP1): S445–S455. doi:10.1080/15374416.2017.1381913.

Parent Education for Young Children with Autism and Disruptive Behavior: Response to Active Control Treatment

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Abstract

Objective: This study examines parent and child characteristics in young children with autism spectrum disorder (ASD) and disruptive behavior who showed a positive response to a parent education program in a randomized clinical trial of parent training

Method: Children with ASD (N=180) were randomized to parent training (PT) or parent education program (PEP) for six months. Using the Clinical Global Impression – Improvement scale, masked independent evaluators rated positive response in 68.5% of children in PT compared to 39.6% in PEP. We compared baseline characteristics and change in parental stress, strain, competence, and mental health for participants who showed a positive response to PEP (PEP-R) to those who did not (PEP-NR). We also compared change in child and parent measures for PEP-R participants to those who showed a positive response to PT (PT-R)

Results: At baseline, PEP-R and PEP-NR participants did not differ on any demographic or clinical characteristics. Parents in PEP-R reported significant reductions on the Parenting Stress

Index, Caregiver Strain Questionnaire, and Parent Health Questionnaire, and increases on the Parenting Sense of Competence scale. Improvements in child disruptive behavior and parental stress, strain, competence and mental health for PEP-R participants were similar to PT-R participants. Vineland Daily Living Skills improved only for children in PT-R.

Conclusions: PEP was an active control treatment with nearly 40% of participants showing a positive response. Change in child disruptive behavior and parental stress, strain, competence, and mental health were remarkably similar for participants independently rated with a positive response to PEP and PT.

Keywords

autism; parenting; treatment; randomized controlled trial

Introduction

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by social-communication impairments, repetitive behaviors, and restricted interests (American Psychiatric Association, 2013). As many as 50% of young children with ASD also exhibit disruptive behaviors including tantrums, noncompliance, aggression, and self-injury (Hartley, Sikora, & McCoy, 2008; Mazurek, Kanne, & Wodka, 2013). Disruptive behaviors in children with ASD are associated with decreased social, communication, and daily living skills (Mazurek et al., 2013; Williams et al., 2006), increased anxiety (Hallett et al., 2013; Hill et al., 2014), and placement in more restrictive educational settings (Mandell, 2008). Disruptive behaviors also contribute to parental stress and may lower quality of life for the family (Lecavalier, Leone, & Wiltz, 2006; Sikora et al., 2013).

To teach parents of children with ASD how to manage disruptive behavior, the Research Units on Behavioral Intervention (RUBI) Network developed a structured, 11-session parent training (PT) program (Bearss et al., 2013; Bearss, Johnson, & Handen, et al 2015). PT uses direct instruction, video examples, practice activities, role play with parents, and homework assignments. These methods help parents identify the purpose or function of behavior, and to apply effective strategies to prevent disruptive behavior and maintain improvements over time. The RUBI Network evaluated PT in a randomized controlled trial (RCT) comparing PT to a Parent Education Program (PEP) in 180 children aged 3 to 7 years (Bearss, Johnson, Smith, et al., 2015; Scahill et al., 2016). PEP was an active control condition designed to control for the passage of time and therapist attention. PEP provided essential information on the diagnosis of ASD, clinical evaluations, educational planning, resources for support and advocacy, and treatment options. It offered no instruction on the management of disruptive behavior.

PT was superior to PEP in reducing child disruptive behavior, improving daily living skills, reducing caregiver burden, and increasing parenting sense of competence (Bearss, Johnson, & Handen, 2015; Iadarola et al., submitted.; Scahill et al., 2016). Although PEP did not provide instruction on parent-child interaction, nearly 40% of children in PEP showed a positive response when assessed by an independent evaluator who was masked to treatment condition. In parent-mediated interventions for children with disruptive behavior (not

accompanied by ASD), maternal mental health, child clinical characteristics, and parenting style, have been identified as predictors of treatment outcome (e.g., Beauchaine, Webster-Stratton, & Reid, 2005; Hoza et al., 2000; Owens, Hinshaw, McBurnett, & Pfiffner, 2016; Webster-Stratton & Hammond, 1990). Here, we explore the characteristics of children who benefited from PEP, whether parents of these children also benefited, and whether the observed benefits were similar to children who showed a positive response to PT. First, we examined differences in pre-treatment measures of child disruptive behavior, child adaptive behavior, and parent self-report measures in children who showed a positive response to PEP compared to those who did not. Second, we tested whether change in parent self-reported stress, strain, sense of competence, and mental health predicted positive response to PEP. Third, we compared change in parent-reported disruptive and adaptive behavior measures in children who showed a positive response to PEP to those who showed a positive response to PT.

Methods

In a six-month, randomized trial focused on disruptive behaviors in children with ASD, 180 children (ages 3 to 6 years 11 months) were randomly assigned to Parent Training (PT, $n=89$) or Parent Education Program (PEP, $n=91$). The primary outcome measures focused on parent-ratings of disruptive behavior (see below). The study was conducted at six medical centers (Emory University, Indiana University, Ohio State University, University of Pittsburgh, University of Rochester, and Yale University) from 2010 to 2014. The study was approved by the institutional review boards at each site. Participants were recruited from urban medical centers well-known for providing research and clinical services for children with ASD. Written informed consent was obtained from a parent or legal guardian prior to data collection. The randomization used permuted blocks with allocation concealed from investigators. Parents and therapists were not masked to treatment. Assessments, completed every 4 weeks, included parent ratings and follow-up interviews by an independent evaluator masked to treatment group. Participants were compensated at each assessment and clinic treatment session to cover travel costs. An independent data and safety monitoring board reviewed study results, enrollment, and procedures every 6 months during the trial.

Participants

Participants were diagnosed with ASD based on clinical assessment and corroborated by the *Autism Diagnostic Interview-Revised* (ADI-R; Rutter, Le Couteur, & Lord, 2003) and *Autism Diagnostic Observation Schedule* (ADOS; Lord et al., 2000). All therapists were master's level or higher and were supervised by licensed clinical psychologists with expertise in ASD. To be eligible, participants had to have moderate or greater behavioral problems as measured by a pretreatment score of ≥ 15 on the Irritability subscale of the Aberrant Behavior Checklist (ABC; Aman, Singh, Stewerat, & Field, 1985; Kaat, Lecavalier, & Aman, 2014) and a rating of moderate or higher (score ≥ 4) on the Clinical Global Impression–Severity (CGI-S) by an independent evaluator (IE).

Participants on medication were required to be on stable medication for 6 weeks with no planned changes for the course of the study. Participants who had a serious medical

condition or psychiatric disorder in need of immediate treatment, receptive language skills 18 months, or current or past enrollment in structured PT, were excluded.

Measures

Pre-treatment Severity and Treatment Response—IEs used the Clinical Global Impression – Severity scale (CGI-S) to rate pre-treatment severity (Aman et al., 2009; King et al., 2009; Shea et al., 2004). The CGI-S is a 7-point scale of overall impairment ranging from 1 (normal) through 4 (moderately ill) to 7 (extremely ill) (Guy, 1976). As noted, a CGI-S score of 4 (moderate or greater) was required for eligibility. Change from baseline was rated on the Improvement scale of the Clinical Global Impression (CGI-I; Guy, 1976). The CGI-I is a 7-point scale ranging from 1 (very much improved) through 4 (unchanged) to 7 (very much worse). At Week 24 (endpoint), CGI-I scores of 1 (very much improved) or 2 (much improved) were used to define positive treatment response. To rate the CGI-S and the CGI-I, IEs considered all available information. Pre-treatment, IEs asked parents to identify the child's two most pressing problems and documented the frequency, duration, and impact of these behaviors in a brief narrative. IEs also considered scores on parent-rated disruptive behavior measures (see below). At subsequent evaluations, IEs reviewed and revised the narrative descriptions and examined scores on current parent-report measures of disruptive behavior.

IEs were trained to reliability on the CGI-S and CGI-I using written vignettes that included scores on parent ratings of disruptive behavior. To be considered reliable, IEs had to achieve a pre-determined level of agreement with gold standard ratings on the CGI-S and CGI-I. IEs also reviewed cases in monthly conference calls. The CGI-I was a key secondary outcome measure in this RCT (Bearss, Johnson, Smith, et al., 2015).

Demographics—Baseline demographic information included maternal education, maternal age, family income, and two-parent vs one-parent household. Clinical characteristics of child participants included age, sex, race/ethnicity, DSM-IV-TR diagnosis (autistic disorder, PDD-NOS, Asperger disorder), educational placement (regular class setting vs. special education), and IQ (<70 or ≥70). IQ was determined using the Abbreviated Stanford-Binet Fifth Edition (SB-V; Roid, 2003) or the Mullen Scales of Early Learning (MSEL; Mullen, 1995), according to the developmental level of the child. The SB-V was attempted with all children. The Mullen was administered to children who were unable to complete the SB-V.

Screen for Emotional and Behavioral Disorders—The *Early Childhood Inventory* (ECI; Sprafkin, Volpe, Gadow, Nolan, & Kelly, 2002) is a DSM-IV-referenced, parent report of child behavior. Items are scored from 0 (never) to 3 (very often). The scale has been shown to be valid in preschoolers with ASD (Lecavalier et al., 2011). Of interest in the current study were the following subscales: attention-deficit/hyperactivity disorder (ADHD; 18 items), oppositional defiant disorder (ODD; 8 items), pervasive developmental disorder (PDD; 12 items), and anxiety (16 items). Symptom severity (sum of the item scores for the specific subscale) was used in the current analyses.

Vineland Adaptive Behavior Scales, Second Edition, Parent/Caregiver Rating Form(Vineland-II; Sparrow, Cicchetti, & Balla, 2005)—The Vineland-II is a parent rating of adaptive behavior skills. Here we focus on standard scores across three domains: Socialization, Communication, and Daily Living Skills. The standard scores have a population mean of 100 and standard deviation of 15, with higher scores indicating better adaptive behavior skills.

Child Outcome Measures.

Aberrant Behavior Checklist(ABC;Aman et al., 1985; Kaat et al., 2014)—The ABC is a reliable and valid, 58-item parent-report measure of child disruptive behavior scored from 0 (not a problem) to 3 (severe in degree). It includes five subscales: I) Irritability (tantrums, aggression, and self-injury; 15 items), II) Social Withdrawal (response to others, initiation of interaction; 16 items), III) Stereotypic Behavior (mannerisms and repetitive movements; 7 items), IV) Hyperactivity/Noncompliance (hyperactivity and noncompliance; 16 items), and V) Inappropriate Speech (repetitive vocalizations; 4 items). The ABC Irritability was one of two co-primary outcome measures in this RCT.

Home Situations Questionnaire – Autism Spectrum Disorder(HSQ-ASD; Chowdhury et al., 2016)—The HSQ-ASD is a 24-item parent rating scale that assesses noncompliant behavior in everyday circumstances. Parents are asked to indicate whether or not each item is a problem (i.e., “yes” or “no”). Parents are then asked to rate each “yes” item from 1 (mild) to 9 (severe). The HSQ yields two factor scores (Socially Inflexible and Demand Specific) and a total score. The HSQ-ASD has good test-retest reliability, demonstrates convergent validity with measures of disruptive behavior (e.g., ABC Irritability and Hyperactivity subscales), and divergent validity with IQ measures and Vineland (Chowdhury et al., 2016). Scores are expressed as per item mean (total severity scores for yes items divided by 24). The HSQ-ASD was a co-primary outcome measure in this RCT.

Parent Self-report Measures.

Parent Stress Inventory-Short Form(PSI-SF;Abidin, 1995)—The PSI is a reliable and valid 36-item parent-completed questionnaire designed to measure parental impressions and difficulties about the parenting role. The PSI consists of three subscales: Parental Distress (level of burden with the parenting role), Parent-Child Dysfunctional Interaction (level of dissatisfaction with parent-child interactions), and Difficult Child (behavioral characteristics of the child that are challenging for the parent). The total PSI score is an index of overall parenting stress. Parents rate each item on a 5-point scale. The 90th percentile of the total PSI score represents a “clinically significant” level of parenting stress.

Caregiver Strain Questionnaire(CGSQ; Brannan, Heflinger, & Bickman, 1997)—The CGSQ is a 21-item scale scored from 1 (*not a problem*) to 5 (*very much a problem*). It consists of three subscales (Objective Strain, Internalized Strain, and Externalized Strain) and a Global Score. Here we focus on the Global score, with higher scores indicating greater levels of caregiver strain.

Parent Sense of Competence (PSOC; Johnston & Mash, 1989)—The PSOC is a 17-item questionnaire that measures parental satisfaction and self-efficacy. Each item is measured on a 6-point scale from 1 (*strongly agree*) to 6 (*strongly disagree*). Higher scores reflect greater sense of competence. The PSOC Satisfaction subscale reflects feelings of frustration, anxiety, and motivation in the parenting role. The PSOC Efficacy subscale reflects parental feelings of competence, familiarity, and problem-solving capability in the parenting role. The PSOC has good internal consistency and demonstrates convergent validity with measures of parental self-esteem (Ohan, Leung, & Johnston, 2000). In these analyses, we use the PSOC total score, satisfaction subscale, and efficacy subscale.

Patient Health Questionnaire (PHQ; Kroenke, Spitzer, Williams, & Löwe, 2009)—The PHQ is a 4-item measure comprising two depression items and two anxiety items. Each item is rated from 0 (*not at all*) to 3 (*nearly every day*). A total score ≥ 3 is considered a positive screen for current mental health problems. We use the total score in these analyses.

Treatments

Parent Training (PT)—Parent Training consisted of eleven 60- to 90- minute core sessions, up to two optional sessions, and a home visit over 16 weeks. A home visit and two telephone booster sessions were provided between weeks 16 and 24. Sessions were delivered individually to parents and included direct instruction, video vignettes, role playing, and homework assignments to be completed between sessions. Homework assignments encouraged parents to use newly acquired techniques with their children in the home environment. Parents were educated on behavioral principles for reducing child disruptive behavior, including identifying the purpose (i.e., the function) of behavior and applying antecedent or consequence strategies to manage disruptive behavior. Examples of specific behavioral intervention strategies include: use of visual cues to establish daily schedules, positive reinforcement of appropriate behavior, planned ignoring of inappropriate behavior, and techniques to promote compliance and adaptive skills. The last few sessions focused on maintenance of learned strategies over time.

Parent Education Program (PEP)—PEP consisted of twelve 60- to 90-minute individually-delivered sessions, including one home visit over 24-weeks. PEP sessions provided parents with information about the ASD diagnosis, understanding clinical evaluations, educational planning, identifying sources of support and advocacy, as well as how selecting treatment options. It provided no instruction on the management of disruptive behavior.

Therapists for each intervention had master's degrees (or higher) and were trained to reliability on each treatment manual. Therapists participated in weekly supervision at their study site and in monthly cross-site teleconferences with senior therapists to review cases and treatment implementation. All sessions were video-recorded and a 10% randomly selected sample of recordings was reviewed for fidelity.

Statistical Analysis

Statistical analyses were conducted using SAS v. 9.4 (Cary, NC) and statistical significance was set at 0.05, unless otherwise noted. Descriptive statistics were calculated for all variables of interest. As noted, positive treatment response was defined by a rating of “much improved” or “very much improved” on the CGI-I. For the first aim, we compared demographic and pre-treatment clinical characteristics of children who showed a positive response to PEP (PEP-R) to those who did not (PEP-NR). Two-sample t-tests were used for continuous variables and chi-square tests for categorical variables. When expected cell counts were <5 , an exact test was used.

Second, to test whether the change on parent self-reports differed in PEP-R and PEP-NR children, we conducted a mixed model using baseline and all post-randomization parent-self report measures. Estimation of response differences was conditional on baseline score. This conditional joint response model is more tolerant of missing data than analysis of covariance and avoids potential bias of carrying baseline data forward to endpoint (Carpenter & Kenward, 2008). Effect sizes were computed by subtracting the change from baseline to Week 24 (or early termination) in the mean outcome measure score in positive response group minus the change in negative response group divided by the pooled standard deviation at baseline for the entire PEP sample ($N=91$).

Our third aim was to explore the change over time in children who showed a positive response to PEP. Using a mixed model approach, we evaluated change in parent ratings of disruptive behavior (ABC subscales and HSQ) and adaptive behavior (Vineland) in the PEP-R group and compared this to children who showed a positive response to PT.

Results

Predictors of Positive Response to PEP

Ninety-one children were randomly assigned to PEP. Of these, 36 participants (39.6%) showed a positive response (PEP-R) and 55 (60.4%) did not show a positive response (PEP-NR). A comparison of baseline demographic and clinical characteristics of PEP-R and PEP-NR groups is provided in Table 1. PEP-R and PEP-NR groups were similar on mean age of the child and mother, as well as distribution of gender, race, ethnicity, maternal education, family income, $IQ < 70$, and ASD diagnosis. No differences were observed between PEP-R and PEP-NR on pre-treatment child clinical measures or parent self-report measures, including the CGI-S, ABC, HSQ, ECI, Vineland, PSI-SF, CGSQ, PHQ-4, or PSOC (see Table 1). The only difference between groups was a higher rate of regular educational placement in the PEP-NR group than PEP-R group (60% vs. 36%, $p = 0.04$). This difference does not appear to be a site effect, because there was no difference in educational placement across study sites. To follow up this observed difference in the rate of regular educational placement in PEP-NR and PEP-R, we examined the rate of children with $IQ \geq 70$ by educational placement in each group. We also compared the two groups on the ECI PDD subscale. As shown in Table 1, 22 participants were classified as intellectually disabled and 67 had an $IQ \geq 70$ (missing data on 2 children). The rate of positive response was not different for children with $IQ \geq 70$ compared to those < 70 . Moreover, there was no

difference in rate of regular educational placement by IQ classification (54% of children with $IQ < 70$ and 51% for children with $IQ \geq 70$). ASD severity at baseline, as measured on the ECI ASD subscale, was lower in children in regular classroom placement ($mean\ 18.7 \pm 6.9$) compared to those in special education (21.7 ± 6.5 , $p = 0.04$). This indicates that children in special education were slightly higher in ASD severity than those in regular education.

Change in Parent Self-report Measures for PEP-R and PEP-NR

The mixed model conditional on baseline scores showed significant differences between PEP-R and PEP-NR on parent self-report measures from baseline to week 24 (see Table 2). Compared to parents of children in the PEP-NR group, parents of PEP-R children reported significantly greater reductions on the PSI total score, PSI Parent-Child Dysfunctional Interaction subscale, PSI Difficult Child subscale, CGSQ total score, and PHQ-4 total score. Parents of PEP-R also showed greater improvements in the PSOC total score and the PSOC Efficacy domain.

Change in Measures of Child Disruptive and Adaptive Behavior for PEP-R and PT-R

Disruptive Behavior—The mixed models comparing change from baseline on measures of disruptive behavior (ABC) and noncompliance (HSQ) did not detect any significant differences between children who showed a positive response to PEP (PEP-R) and those who showed a positive response to PT (PT-R). The two-way interaction between treatment condition and time showed no differences in the change in ABC-Irritability subscale ($F_{(6,64.4)} = 0.88$; $p = 0.513$) or the per item mean score on the HSQ ($F_{(6,59.7)} = 1.12$; $p = 0.360$) for PEP-R and PT-R.

Adaptive Behavior—The mixed model showed no difference in change on Vineland Communication ($F_{(1,58.6)} = 0.00$; $p = 0.984$) or Vineland Socialization ($F_{(1,69)} = 0.03$; $p = 0.868$) domains. In contrast, there was a statistically significant difference in the change in Vineland Daily Living Skills scores among PEP-R and PT-R groups ($F_{(1,75.8)} = 5.44$; $p = 0.022$; Figure 1). Conditioned on baseline Vineland Daily Living Skills scores, the PT group had a mean score 5.07 points higher than the PEP group at week 24 (95% CI: (0.43, 9.71), $p = 0.03$).

Change in Parent Self-report Measures for PEP-R and PT-R—There were no differences in the change in the PSI total score ($F_{(2,71.2)} = 0.79$; $p = 0.458$), Parent Distress subscale score ($F_{(2,66.2)} = 1.21$; $p = 0.305$), PSI Parent Child Interaction subscale score ($F_{(2,64.2)} = 0.20$; $p = 0.815$), or the PSI Difficult Child subscale score ($F_{(2,79.1)} = 1.76$; $p = 0.178$) for participants who showed a positive response to PEP compared to those who showed a positive to PT. Similarly, there was no difference in the change in the CGSQ Global score ($F_{(2,78.8)} = 0.94$; $p = 0.395$), parent self-reported anxiety and depression symptoms on the PHQ-4 ($F_{(2,70.8)} = 0.80$; $p = 0.455$), Parenting Sense of Competence total score ($F_{(2,77.8)} = 1.31$; $p = 0.26$), the PSOC Satisfaction subscale ($F_{(2,66.8)} = 1.07$; $p = 0.348$) or the PSOC Efficacy Subscale ($F_{(2,81.2)} = 0.73$; $p = 0.484$).

Discussion

Previous reports documented that PT was superior to PEP in reducing disruptive behavior and improving daily living skills for children with ASD (Bearss, Johnson, Smith, et al., 2015; Lecavalier et al., 2016; Scahill et al., 2016). Nonetheless, nearly 40% of PEP participants were rated with a positive response by an independent evaluator who was masked to treatment assignment (Bearss, Johnson, Smith, et al., 2015; Scahill et al., 2016). Here, we compared children who showed a positive response to PEP to those who did not. Across a range of baseline demographic and clinical characteristics, the only significant difference observed was in educational placement. Children in special educational placements were more likely to show a positive response to PEP. Factors contributing to special educational placement for children with ASD may be influenced by child characteristics such as level of disruptive behavior, IQ and ASD symptom severity. In addition, school placement practices vary widely by state (Kurth, 2015; White, Scahill, Klin, Koenig, & Volkmar, 2007). In this sample, however, special educational placement was not explained by differences in disruptive behavior, prevalence of children with IQ < 70, or regional differences. Children in special education had a slight, but significant, higher mean score on the ECI PDD subscale, indicating greater ASD severity. Thus, the explanation for the finding that children in special educational placements were more likely to show a positive response to PEP is unclear. It may be that the additional services provided to children in these special educational programs contributed to their overall improvement.

Parents of children who showed a positive response to PEP reported significant improvements in parental stress, strain, competence, and mental health compared to parents of children who did not show a positive response. The mean increase in the Parenting Sense of Competence total score was driven by improvement in the Efficacy subscale, suggesting that parents felt increased confidence and skill in the parenting role. This increase in self-efficacy is striking in that PEP did not offer specific behavior management strategies. It appears that education alone provided some parents with a greater sense of self-efficacy.

Gains in child disruptive behavior and parent reports of stress, strain, competence, and mental health, for children who showed a positive response to PEP were remarkably similar to those who showed a positive response to PT. This suggests a complex and mutually beneficial interaction between improvement in child disruptive behavior and these parental self-reports. The only observed difference between those who showed a positive response to PEP or PT was on Daily Living Skills domain on the Vineland. Improvement in Daily Living Skills was greater in children with a positive response to PT compared to PEP. This finding suggests that the specific tools provided in PT promote improvements in everyday living skills that education alone in PEP does not offer (Scahill et al., 2016).

Although response to treatment was ascertained by a masked evaluator using clinical judgment, several study outcomes relied on parent report of child behavior and measures of stress, strain, competence, and mental health. The level of parental stress, strain, competence, anxiety, and depression may have influenced parental responses on measures of child behavior. In addition, our sample was predominately white and middle to upper middle class, which may limit the generalizability of our findings.

For parents of young children with ASD, our results suggest that education and support for parents may provide an indirect pathway for improvement in child disruptive behavior. Children with ASD who exhibit disruptive behavior can be especially challenging for parents. These challenges may amplify parental stress and strain and erode self-efficacy (Estes et al., 2013; Lecavalier et al., 2006). Several studies have shown that parental self-efficacy and competence are associated with maternal agency, decreased feelings of guilt and effective parenting in children with ASD (e.g., Hastings & Brown, 2002; Jones & Prinz, 2005; Kuhn & Carter, 2006; Sanders & Woolley, 2005; Sofronoff, Leslie, & Brown, 2004). Participation in PEP may increase feelings of agency and decrease feelings of guilt. For some parents, this alone could reduce stress and strain and boost self-efficacy. The boost in self-efficacy may enhance parents' ability to manage disruptive behaviors. This process has been reported in other parent education programs for young children with ASD (e.g., Keen, Couzens, Muspratt, & Rodger, 2010; Tonge et al., 2006).

PEP was an active control condition and nearly 40% of children in the PEP group showed a positive response. Parents of children who showed a positive response to PEP reported decreased stress and increased self-efficacy. Although these beneficial effects for parents suggest a possible mechanism for improvement in child behavior, the results do not identify which children will benefit from PEP. Children who showed a positive response to PEP were remarkably similar to those who did not show a positive response. Moreover, moderator analyses of this randomized trial did not identify baseline characteristics that predicted positive response to PT (Lecavalier et al., 2016). Although PEP was beneficial for some children and families, we did not identify which children would be more likely to show a positive response to PEP. In clinical practice, the parent education material in PEP may be a useful adjunct to PT. Research has demonstrated that PT was superior to PEP for reducing disruptive behavior and improving daily living skills in children with ASD (______). Thus, future research on wider implementation of PT into community settings is warranted. In keeping with the principles of implementation science, the next wave of translational research would do well to stay with the evidenced-based version of PT. As in the original randomized trial, PEP may once again serve as a control condition in future implementation research (Rabin and Brownson, 2012).

Acknowledgments

This research was supported in part by grants from the National Institute of Mental Health, the National Center for Research Resources, the National Center for Advancing Translational Sciences, and the Marcus Foundation. This empirical article is a secondary analysis of our multisite NIMH grant [Yale University/Emory University MH081148; L. Scahill, PI] *Randomized Trial of Parent Training for Young Children with Autism*. The primary report paper was published in JAMA in April, 2015. Three other reports have been published from this study, one additional manuscript is under review. The current study has no overlap with these prior reports.

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Figure 1.

Least Squares Means from the mixed model for children with positive response to Parent Training (PT) and positive response to Parent Education Program (PEP). Error bars represent the standard error (SE); Interaction p-value from mixed model is 0.02.

Table 1.

Baseline Demographic and Clinical Characteristics of Children and Parents by Treatment Response to PEP (N = 91)

Characteristic N (%) Unless otherwise noted	PEP-R: Positive Response to PEP (N = 36)	PEP-NR: No Response to PEP (N = 55)	P-value
Demographics			
Child Age (years), mean (SD)	4.0 (1.1)	4.6 (0.9)	0.844
Sex			1.000 ^a
Male	31 (86.1)	48 (87.3)	
Female	5 (13.9)	7 (12.7)	
Race			
White	34 (94.4)	44 (80.0)	0.217 ^a
Black	1 (2.8)	5 (9.1)	
Asian/ Pacific Islander	1 (2.8)	5 (9.1)	
Other	0 (0)	1 (1.8)	
Ethnicity			0.255
Hispanic	7 (19.4)	6 (10.9)	
Non-Hispanic	29 (80.6)	49 (89.1)	
DSM-IV-TR diagnosis			0.836 ^a
Autistic disorder	27 (75.0)	38 (69.1)	
PDD-NOS	8 (22.2)	15 (27.3)	
Asperger disorder	1 (2.8)	2 (3.6)	
Regular Education Classroom Instruction	13 (36.1)	33 (60.0)	0.043
IQ (n = 89) ^c			0.743
< 70	8 (22.9)	14 (25.9)	
70	27 (77.1)	40 (74.1)	
Maternal Education			0.871 ^a
Advanced degree	9 (25.0)	14 (25.5)	
College Degree	14 (38.9)	23 (41.8)	
Some College	10 (27.8)	16 (29.1)	
High School or Less	3 (8.3)	2 (3.6)	
Mother's Age (N=90) ^b , mean (SD)	36.0 (7.2)	35.9 (5.3)	0.930
Income			0.447
< 20k	3 (8.3)	4 (7.3)	
20k – <40k	9 (25.0)	8 (14.6)	
40k – <60k	5 (13.9)	14 (25.5)	
60k – 90k	10 (27.8)	11 (20.0)	
> 90k	9 (25.0)	18 (32.7)	

Characteristic N (%) Unless otherwise noted	PEP-R: Positive Response to PEP (N = 36)	PEP-NR: No Response to PEP (N = 55)	P-value
Two-Parent Household	31 (86.1)	50 (90.9)	0.509 ^a
Baseline Clinical Scores: Child			
CGI Severity			0.769
Moderately ill	12 (33.3)	20 (36.4)	
Markedly ill	19 (52.8)	30 (54.6)	
Severely ill	5 (13.9)	5 (9.1)	
Aberrant Behavior Checklist, mean (SD)			
Irritability	25.2 (6.9)	23.0 (5.5)	0.157
Social Withdrawal	12.6 (8.5)	12.6 (7.7)	0.970
Stereotypy	5.4 (4.8)	7.3 (5.2)	0.071
Hyperactivity	31.5 (8.1)	31.3 (9.1)	0.896
Inappropriate Speech	5.7 (3.2)	6.3 (3.1)	0.402
HSQ-ASD, mean(SD)	3.69 (1.57)	3.81 (1.48)	0.719
ECI Subscales(N=88) ^g , mean(SD)			
Anxiety	12.3 (6.2)	10.6 (6.3)	0.225
ADHD	33.1 (8.9)	32.8 (7.6)	0.870
PDD	19.7 (6.8)	20.5 (6.8)	0.614
ODD	11.9 (6.3)	11.0 (5.0)	0.500
Vineland, mean(SD)			
Communication Score (N=90) ^e	80.5 (12.9)	83.3 (17.1)	0.390
Daily Living Score	80.1 (13.3)	79.1 (15.1)	0.751
Socialization Score	73.0 (8.9)	73.9 (11.4)	0.669
Adaptive Behavior Score (N=88) ^f	76.6 (10.1)	76.7 (12.8)	0.995
Baseline Parent Self-Report Scores			
PSI (N=87) ^d , mean (SD)	102.0 (19.0)	104.5 (17.3)	0.549
Parent Distress	31.1 (8.1)	33.8 (9.2)	0.163
Parent-Child Difficult Interaction	28.6 (7.6)	28.6 (7.9)	0.994
Difficult Child	42.4 (7.7)	42.1 (6.0)	0.859
Caregiver Strain, mean (SD)	2.76 (0.63)	2.85 (0.51)	0.442
Parent Health Questionnaire ^h	4.51 (2.73)	4.51 (3.15)	0.995
Parenting Sense of Competence Total ⁱ	63.9 (10.3)	63.2 (10.9)	0.748
PSOC Satisfaction ⁱ	37.3 (5.2)	36.3 (7.3)	0.491
PSOC Efficacy ⁱ	26.6 (6.2)	26.9 (5.8)	0.854

^a – P-value based on an exact test.

^b – Mother's age missing for one participant in PEP-R.

^c – IQ is missing for one child in PEP-R and one child in PEP-NR.

^d – PSI scores are missing for two children in PEP-R and two children in PEP-NR.

^e – Vineland Communication standard score is missing for one child in PEP-R.

^f – Vineland Adaptive Behavior score is missing in three children from PEP-R.

^g – ECI scores are missing for two children in PEP-R and one child in PEP-R.

^h – PHQ scores are missing for one parent in PEP-R and four parents in PEP-NR.

ⁱ – PSOC scores are missing for two children in PEP-R and one child in the PEP-NR.

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Change from Baseline to Week 24 on Parent Self-Reports by Treatment Response to PEP (N = 91)

Table 2.

Outcome	PEP-R: Positive Response to PEP (N = 36)		PEP-NR: No Response to PEP (N=55)		Adjusted Mean Difference (SE) ^b	95% CI for Adjusted Mean Difference (Lower, Upper)	P-value ^c (effect size) ^d
	Baseline	Week 24	Baseline	Week 24			
PSI Total Score	102.02 ± 19.09	88.56 ± 18.83	104.4 ± 17.33	98.9 ± 19.43	-8.55 (3.24)	(-15.01, -2.09)	0.010 (0.48)
PSI Parent Distress	31.13 ± 8.14	27.89 ± 8.98	33.65 ± 9.23	30.19 ± 10.31	-0.45 (1.63)	(-3.69, 2.79)	0.782 (0.05)
PSI Parent-Child Dysfunctional Interaction	27.73 ± 7.61	23.88 ± 6.26	28.77 ± 7.89	27.38 ± 7.26	-3.37 (1.25)	(-5.85, -0.88)	0.009 (0.44)
PSI Difficult Child	42.14 ± 7.70	36.32 ± 9.03	42.04 ± 6.07	41.31 ± 6.46	-5.11 (1.33)	(-7.77, -2.45)	<0.001 (0.77)
Caregiver Strain	2.74 ± 0.63	2.27 ± 0.62	2.85 ± 0.51	2.77 ± 0.58	-0.43 (0.08)	(-0.61, -0.24)	<0.001 (0.78)
Parent Health Questionnaire	4.54 ± 2.74	2.39 ± 2.27	4.53 ± 3.17	4.00 ± 3.05	-1.58 (0.56)	(-2.69, -0.47)	0.006 (0.53)
PSOC Total	63.68 ± 10.40	71.30 ± 11.43	63.41 ± 10.97	66.94 ± 12.74	4.24 (1.89)	(0.47, 8.00)	0.028 (0.40)
PSOC Satisfaction	37.24 ± 5.22	41.03 ± 6.75	36.43 ± 7.36	38.25 ± 7.98	2.29 (1.32)	(-0.33, 4.92)	0.086 (0.35)
PSOC Efficacy	26.47 ± 6.23	30.25 ± 6.14	26.99 ± 5.83	28.59 ± 6.21	2.05 (1.00)	(0.07, 4.04)	0.043 (0.35)

CI = confidence interval; PT = Parent Training; PEP = Parent Education; SE= standard error

^a – Data are Least Squares Means (SD) from the mixed model conditioned on baseline.^b – Adjusted Mean Difference = difference of Least Squares Means from Mixed model conditioned on baseline score.^c – P-value from Mixed model conditioned on baseline score, P < 0.05 is statistically significant.^d – Effect size calculated from the absolute value of the adjusted mean difference divided by pooled standard deviation at baseline