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ORIGINAL PAPER

The Effectiveness of Parent–Child Interaction Therapy for Families of Children on the Autism Spectrum

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Abstract We report the results of a pilot trial of an evidence-based treatment—Parent–Child Interaction Therapy (PCIT; Eyberg et al. *Psychopharmacology Bulletin, 31*(1), 83–91, 1995) for boys aged 5–12 with high functioning autism spectrum disorders and clinically significant behavioral problems. The study also included an investigation of the role of shared positive affect during the course of therapy on child and parent outcomes. The intervention group showed reductions in parent perceptions of child problem behaviors and child atypicality, as well as an increase in child adaptability. Shared positive affect in parent child dyads and parent positive affect increased between the initial and final phases of the therapy. Parent positive affect after the first phase was related to perceptions of improvement in problem behaviors and adaptive functioning.

Keywords Autism · Asperger Syndrome · PDDNOS · Intervention · Problem behaviors

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Autism spectrum disorders (ASDs), including high functioning autism (HFA), Asperger's Disorder (AS), and Pervasive Developmental Disorder not Otherwise Specified (PDDNOS) are neurodevelopmental disorders with a prevalence of 1 in 150 (CDC Morbidity and Mortality Weekly Report 2007). The precise prevalence of clinically significant behavioral problems in this population is not known since most empirical work has been conducted in clinically referred samples. However, empirical research and clinical observation suggest that a relatively large number of high functioning individuals with ASDs exhibit behavioral problems at some point during development (Brereton et al. 2006; Gadow et al. 2005). Finding effective interventions for these problems is an important clinical priority.

Behavioral problems manifest differently in individuals with ASDs depending on their age and cognitive level. Preschool age children in outpatient ASD settings show clinically significant Attention Deficit Hyperactivity Disorder (ADHD) symptoms including inattentiveness, overactivity and impulsivity and oppositional defiant disorder (ODD) symptoms—a pattern of hostile and defiant behavior directed towards adults—compared to children in special and regular education classrooms (Gadow et al. 2004). Clinically referred samples of school-aged children with HFA and Asperger Syndrome frequently display disruptive behaviors such as physical aggression, poor peer interaction, and/or strange behavior (Mandell et al. 2005; Tonge et al. 1999). There also are high rates of both ADHD and ODD in these children, and more severe conduct disorder (CD) symptoms in school-aged versus preschool children with ASDs (Gadow et al. 2005). One study found that children with Asperger Syndrome aged 11–19 exhibited comparable levels of irritability, temper tantrums, and defiance as children with CD (Green et al. 2000). Interestingly, two thirds of the children with CD

showed pragmatic language impairments comparable to those observed in individuals with ASDs (Gilmour et al. 2004). It is important to stress, however, that these samples were clinically ascertained, and that many children with ASDs do not exhibit behavior problems.

There is a well-developed empirical literature, with an emphasis on younger children, on interventions for problem behaviors in children with classical autism and developmental disabilities in general (see Horner et al. 2002; Dunlap and Fox 1996). Problem behaviors, which can include, physical aggression, property destruction, defiance, difficulty making transitions between activities and tantrums are major barriers to the attainment of children's educational and social goals. Once such behaviors are established, they are difficult to change. Most interventions for problem behaviors require careful assessment of environmental factors that precipitate and maintain them or "functional assessment" (Horner and Carr 1997). Important elements of interventions then include clear reinforcement for positive behaviors, and withholding of reinforcement for negative ones. Modifying the environment in order to prevent behavior problems also is an important strategy, as is ensuring that the "system" around the child including parents, caregivers, and teachers changes its own behavior in order to promote durable change in the child (Horner et al. 2002). A review of problem behavior interventions for 29–96-month-old children with autism between 1996 and 2000 found that tantrums and aggression were the most common symptoms; and that interventions combining avoidance of problematic situations with direct instruction about appropriate behaviors were the most common approaches. This type of strategy was highly successful, and resulted in an 85% decline in problem behaviors (Horner et al. 2002).

To our knowledge, there have been no studies of interventions focused on problem behaviors in school-aged higher functioning children with ASDs. Studies of interventions for this population have been limited to those targeted at improving social skills (e.g. Bauminger 2002; Solomon et al. 2004). However, there are many "well established" and "probably efficacious" (Chambless and Hollon 1998) manualized evidence-based interventions for school-aged children without ASDs and with average or better cognitive and language abilities and disruptive behavior disorders (Brestan and Eyberg 1998). One such intervention, Parent-Child Interaction Therapy (PCIT; Eyberg et al. 1995; Hembree-Kigin and McNeil 1995), is an empirically-supported and manualized parent coaching intervention model developed for children, aged 2 to 7 years old, with behavioral disorders. PCIT is unique in that parents are coached, in real time, to reinforce their children's positive behaviors with verbal praise while ignoring, and thereby extinguishing, dysfunctional ones using a coach behind a one-way mirror who communicates with the parent using a "bug-in-the ear" microphone. While PCIT does not involve traditional functional assessment, it is highly structured and built on behavioral principles; involves direct instruction to parents, who then convey clear expectations to the child; includes coaching parents in how to modify the environment so as to minimize precipitants of behavioral problems; and focuses on achieving durable change by modifying the way parents interact with their children. In addition to reducing problem behaviors, PCIT has been shown to improve self-esteem (Eisenstadt et al. 1993), to stimulate speech and language development, and to teach awareness of emotions (McElreath and Eisenstadt 1994). These also are highly relevant goals for high functioning children on the autism spectrum.

There also are several successful parent support interventions relevant for children with ASDs and behavioral problems (Sofronoff and Farbotko 2002; Sofronoff et al. 2004; Tonge et al. 2006). These interventions also are important given that parents of children with ASDs report more parenting stress than parents of children with other developmental disorders (Eisenhower et al. 2005; Wolf et al. 1989). High parent stress in families of children with autism is related to increased child disruptive behaviors, which then contribute to increased parent stress (Baker et al. 2003). This cycle of negative emotions eventually can undermine parents' sense of self-efficacy and lead to increased risk of parent anxiety and depression in these families (Hastings and Brown 2002; Sofronoff and Farbotko 2002).

In contrast to negative parent child interactions, positive affect promotes child development in typically developing children (Maccoby and Martin 1983). Optimism in mothers relates to better coping with problem behaviors in children with developmental delay (Baker et al. 2005). Shared positive affect (SPA), or moments where both child and parent are engaged in happiness, laughter, smiling, or affectionate touch, has been related to increased child compliance, moral development, social skills, frustration tolerance, and kindergarten adjustment in typically developing children (Kochanska and Aksan 1995; Kochanska and Murray 2000; Laible and Thompson 2000). Consistent with these findings in typically developing children, higher levels of parent/child synchronization and attunement, a form of SPA, led to superior joint attention and language development 1, 10, and 16 years later in children with autism (Siller and Sigman 2002).

The goal of this pilot study was to assess the effectiveness of PCIT (Eyberg et al. 1995; Hembree-Kigin and McNeil 1995) an empirically supported and manualized parent coaching intervention model developed for children. PCIT was designed for children aged 2 to 7 years; however, we viewed mental age as more appropriate to use in this developmentally delayed population and recruited slightly

older subjects. Support for using PCIT with older children also comes from clinical observation in typically developing children that PCIT can be helpful for parent child relationship enhancement in adolescents. Given that PCIT is highly structured, relies on behavioral principles, and helps parents to change the way the child's system may inadvertently promote behavioral problems, our first hypothesis was that PCIT would lead to a reduction in child problem behaviors. Our second hypothesis was that PCIT would improve child adaptive and social functioning. Third, we predicted that participation in PCIT would lead to a reduction in parent stress. Fourth, we hypothesized that SPA would be increase over the course of therapy for the parent child dyads in the intervention group. Finally, we hypothesized that there would be a positive relationship between SPA and improvements in child and parent functioning.

Method

Study Design

The study was conducted using a waiting-list control group design. Subjects were qualified for the study based on their meeting criteria for autism, cognitive abilities, and behavioral symptoms as described below. Once qualified, they were matched with a subject of the same age, cognitive level, and level of behavioral symptoms, who served as their control. One subject from each pair then was randomly selected to receive intervention first. There were no statistically significant differences between the groups on age, IQ, or level of symptoms. Shared positive affect coding was completed for the first intervention group only. Pre-intervention measures were completed within 2 weeks of beginning therapy, and post-intervention measures were completed within 2 weeks of the conclusion of therapy.

Participants

Nineteen male subjects aged 5–12 with an ASD participated in this study. Participants were recruited from local psychiatrists, neurologists, general practitioners, psychologists, speech and language pathologists, occupational therapists, advocacy groups, regional centers (state agencies that serve individuals with developmental disabilities), and the M.I.N.D. Institute's Subject Tracking System database.

All participants met criteria for Autistic Disorder, AS or PDDNOS according to DSM-IV-TR (American Psychiatric Association 2000); ASD or autism according to ADOS-G (Lord et al. 2000); and autistic disorder according to the Autism Diagnostic Interview-Revised (ADI-R; Lord et al. 1994). Children were excluded if they had a Full Scale IQ score of <70 on the Wechsler Abbreviated Scales of Intelligence for Children (WASI; Wechsler 1999) and did not possess enough receptive and expressive language to participate in this language-intensive intervention. All participants also had to either demonstrate clinically significant externalizing behavior measured by the Behavior Assessment System for Children (BASC) Externalizing Problem Scale (Reynolds and Kamphaus 1992) or exceed the cut-off on the Intensity Scale of the Eyberg Child Behavior Inventory (ECBI, Eyberg 1998) (Table 1).

The study was approved by the Institutional Review Board of the University of California, Davis. Appropriate assent was obtained from the participants. Written consent was obtained from their parents.

Measures

Child

The Eyberg Child Behavior Inventory (ECBI; Eyberg 1992, 1998) The ECBI is a 36-tem parent-report measure of the

Table 1 Characteristics of participants

	Intervention ($n = 10$)			Control ($n = 9$)		
	M	*SD*	Range	*M*	*SD*	Range
Age (years)	8.2	1.7	6.0–10.8	8.1	2.2	5.3–12.1
FSIQ[a]	100.11	19.2	83–135	93.4	16.8	79–125
VIQ	97.7	18.4	73–138	90.4	20.3	75–133
PIQ	102.2	21.6	82–138	94.7	9.3	84–110
ADOS	13.1	4.3	8–22	11.3	3.6	7–19
ECBI intensity	67.0	5.6	59–79	65.7	8.8	50–79
ECBI problem	62.9	6.3	56–73	66.8	8.5	56–78
BASC externalizing problem	71.1	8.2	57–86	76.6	14.9	52–105
	Note: 6 Asperger's, 4 high-functioning autism			*Note*: 2 Asperger's, 4 high-functioning autism, 3 PDD-NOS		

[a] Full scale IQ scores were not available for two children who were too young for the WASI

In these cases, PPVT scores were used

child's conduct problem that has demonstrated acceptable levels of reliability and validity (Eyberg 1992, 1998). It commonly is used to assess the severity of problem behaviors and parent perceptions of problem behavior in PCIT, and was thus chosen for this study. The Intensity Scale indicates the frequency of each conduct problem occurrence and the Problem Scale assesses the degree to which the child's behavior is perceived as problematic by the parent. The Intensity Scale is rated on a seven Likert scale, and the Problem Scale is rated using a Yes-No format. Both scales have been shown to be stable over time and sensitive to the effects of intervention (Eyberg 1992, 1998). The ECBI is appropriate for children ages 2–16 years. *T*-scores at or above 60 on the Intensity and Problem Scales are considered clinically significant.

The Behavior Assessment System for Children Parent Rating Scales (BASC; Reynolds and Kamphaus 1992) The BASC is a 138-item parent-report measure of behavior and emotion that has established reliability and validity, and is appropriate for children ages 2.5–18 years old (Doyle et al. 1997; Reynolds and Kamphaus 1992). Each item contains a description of a behavior that the parent rates on a four-point scale of frequency. Scales used to assess problem behaviors in this study include Aggression, Hyperactivity, Attention Problems, and Conduct Problems. Scales used to assess adaptive social behaviors and child well-being were Adaptability, Social Skills, Leadership, Depression, Anxiety, and Atypicality. On the BASC, *T*-scores at or above 70 are considered to be clinically significant.

Parent

The Parenting Stress Index-Short Form (PSI-SF; Loyd and Abidin 1985; Sheras and Abidin 1995) The PSI-SF is a 36-item self-report measure of stress in the parent–child dyad (Loyd and Abidin 1985; Sheras and Abidin 1995). It has four subscales: Parental Distress (PD), Parent-Child Dysfunctional Interaction (P-CDI), Difficult Child (DC), and Defensive Responding (DR) and Total Stress. The PSI-SF is appropriate for parents with a child between the ages of 1 month and 12 years. Scores at or above 90th percentile indicate the parent is experiencing clinically significant parenting stress. The Total Stress Score was used.

Behavioral Coding

Shared Positive Affect Coding Adapted from Kochanska and Aksan (1995) (SPA; Ono et al. 2005) Parent–child shared affect was assessed using a 5-min segment of free play known as the dyadic parent child interaction coding (DPICs) portion of the therapy session. In this portion of the session, the parent and child were seated at a table were asked to select a toy from three choices. Play materials included art supplies, toy animals and dinosaurs, play food and dishes and building toys including Legos, Kinex, and a marble track. Coding was completed using a global system adapted from Kochanska and Aksan (1995). There were two trained coders, (a graduate student and a research assistant with experience working with children with autism) blind to the treatment status of the children. Parents and children were coded individually for positive, neutral, and negative affect and aloofness. Facial expressions, tone of voice, and body language formed the basis for judgment. Coding was implemented using Noldus: The Observer Video-Pro 5.0 software. See Appendix 1 for a description of the codes.

For each participant, 3 5-min DPICS segments (pre-, mid-, and post-intervention) were coded in 15-s increments, resulting in a total of 60 segments per participant. The sample included nine mothers and one father. DPICS segments were coded in random order. Intervals where both the parent and child engaged in positive affect were considered instances of SPA. Double coding was completed on 50% of the segments to establish inter-rater reliability based on Intraclass Correlation (ICC; Shrout 1998), which has been shown to be an acceptable method for this type of data. ICC assesses rating reliability by comparing the variability of different ratings of the same subject to the total variation across all ratings and subjects. Disagreement on the neutral code was high, thus Aloofness, Neutral, and Negative affect codes were collapsed into one: Not Positive. ICC for the two codes, Positive versus Not Positive, for the parents was 77%. ICC for the two codes, Positive versus Not Positive, for the children was 78%. Relatively low ICCs likely were due to the quality of the tapes used for the codings, which made it difficult to fully view the facial expressions of both parties in the dyad, and to the fact that the coding system was new.

Parent–Child Interaction Therapy

There were two phases to treatment, each lasting six sessions. Each phase began with the therapist meeting alone with the parent(s) to provide instruction in how to coach the child during the ensuing sessions. The first phase of PCIT is child directed interaction (CDI). During CDI, parents are taught to be attuned to their children by giving positive attention and praise, by ignoring negative behavior, and by not criticizing, disciplining, making requests, giving commands, and asking questions. Initially, the clinician led the parent through the session by telling them exactly what to say to the child. Once the parent began to take the lead, the clinician mainly reinforced the parent's verbalizations and behaviors. When the parent became proficient at describing, reflecting, praising, and ignoring inappropriate behaviors, the clinician helped the parent to highlight and reinforce

child behaviors that would be useful in daily life. Parents were coached until they reached mastery criteria (25 descriptions, 15 praises, and a maximum of three questions). Mastery was assessed during a 5-min unstructured play period occurring at the beginning of every PCIT session. This occurred within eight sessions for all participants.

The second phase of treatment—Parent directed interaction (PDI) was introduced once mastery criteria had been achieved. In PDI, parents were coached to give clear, direct, concise, age appropriate, and simple commands, and to consistently reinforce child compliance. During PDI treatment sessions, parents were taught to use the time out chair when children did not comply with parent requests (Hembree-Kigin and McNeil 1995). All parents completed this part of the therapy within six sessions. One family relocated in the middle of CDI. All other subjects completed both phases of treatment. Mean length of total treatment for these families was 12.7 sessions.

PCIT was modified slightly to work with children with ASDs. For children who talked excessively about their intense and focused (circumscribed) interests, mention of these topics was prohibited. Second, the child-centered approach of CDI encouraged some children with ASDs to play in isolation and/or be inappropriately controlling. In these cases, parents were coached to redirect the interaction (i.e., adapt a more directive stance, characteristic of PDI) instead of following the child's lead. In addition, when children did initiate interactions, parents were coached to give an abundance of praises to reinforce adaptive social behavior.

Five therapists worked on the study. Three (including M.S. and B.G. who saw 12 total cases) received PCIT training from master PCIT trainers at U.C. Davis Children's Hospital's CAARE Diagnostic & Treatment Center. This training consisted of shadowing and practicing with master trainers for a period of at least 6 months. The other two therapists were trained in the team by working on at least three cases with trained therapists. Fidelity to the treatment model was maintained through regular team coding meetings during the course of the study. During these meetings, we reviewed tapes of treatment sessions and discussed both coaching and behavioral coding issues. However, no formal measure of treatment fidelity was used. DPICs segments used in analyses were double coded live during each session and discrepancies were resolved via consensus.

Results

Behavioral Problems

All analyses were conducted using SPSS 12.0. To investigate changes in child behavior and adaptive behavior changes, we conducted a series 2 × 2 analyses of covariance (ANCOVAs) with group (intervention, waiting-list control) as the between subjects factor and scale scores on the measures of problem behaviors as the within subjects factors. In order to control for patients' original levels of symptomatology, pre-test scores were used as a covariate in all analyses. This generally is viewed as the most powerful statistical approach to use to account for pre-treatment status (Frison and Pocock 1992).

On the ECBI, on the Problem Scale, there was a main effect of time ($F(1, 16) = 6.30$, $p = .023$), and the group by time interaction was significant ($F(1, 16) = 9.41$, $p = .007$). Subsequent analyses revealed that Problem Scale scores for the intervention group declined significantly ($t(9) = 3.0$, $p = .015$). This suggests that parents of children receiving the intervention, experienced their children's behaviors as less problematic after completing PCIT. Mean scores on both the intervention and the waiting-list control groups showed a main effect of Intensity Scale score over time ($F(1, 16) = 5.61$, $p = .031$). There was no significant group by score interaction, meaning that parent's in both groups reported declines in child problem behaviors after enrolling in the study. Although not statistically significant, intervention group scores on both ECBI Scales declined from the clinical to the normal range.

On the BASC, Hyperactivity Scale scores declined for the intervention group, but not for the control group. There was a main effect of time ($F(1,16) = 8.06$, $p = .012$), and the group by time interaction approached significance ($F(1,16) = 4.29$, $p = .055$). On the Attention Problems scale, the main effect of time was not significant, the interaction between group and time approached significance ($F(1,16) = 4.01$, $p = .062$). Finally, on the Conduct Problems Scale, there was again a main effect of time ($F(1,16) = 6.61$, $p = .021$), and the interaction between group and time approached significance ($F(1,16) = 4.14$, $p = .059$). For the Aggression Scale, the main effect of time approached significance ($F(1, 16) = 3.15$, $p = .095$), with both groups reporting trend level reductions. The interaction between group and time was not significant.

Adaptive Behavior and Emotional Well-Being

On the Adaptability scale, the main effect of time was not significant. However, the interaction of group and time was significant ($F(1,16) = 5.31$, $p = .035$), indicating that increased adaptability depended on group membership, with the intervention group increasing significantly ($t(9) = -4.32$, $p = .002$) from pre to post treatment, while the control group declined slightly. Main effects of time, but no significant group by time interactions, were observed for the Leadership (main effect of time: $F(1,16) = 6.11$, $p = .025$), and the Social Skills (main

Table 2 Problem and social behaviors pre- and post-intervention by group

	Intervention group ($n = 10$)		Control group ($n = 9$)		Group × Time interaction	
	Pre-group Mean (*SD*)	Post-group Mean (*SD*)	Pre-group Mean (*SD*)	Post-group Mean (*SD*)	*F*	*p*-value
ECBI						
Intensity	67.00 (5.64)	59.70 (4.95)	65.67 (8.80)	62.22 (9.77)	.75	.462
Problem	62.90 (6.30)	52.00 (6.52)	66.78 (8.51)	63.00 (7.31)	9.41	.007
BASC-problem						
Aggression	63.90 (10.58)	59.00 (6.25)	70.33 (14.21)	67.78 (14.60)	.44	.516
Hyperactivity	74.30 (8.29)	68.70 (11.68)	80.56 (13.95)	80.56 (8.31)	4.29	.055
Attention	72.80 (6.13)	65.80 (8.77)	70.89 (10.46)	70.67 (10.92)	4.01	.062
Conduct	67.40 (8.63)	59.90 (8.01)	67.00 (14.03)	66.00 (10.44)	4.14	.059
BASC-social						
Adaptability	23.90 (7.91)	32.40 (10.23)	28.44 (6.48)	27.33 (10.38)	5.31	.035
Social skills	30.20 (3.77)	37.40 (5.80)	35.00 (10.52)	37.33 (6.91)	2.15	.160
Leadership	36.20 (4.02)	38.10 (6.15)	33.89 (6.07)	37.56 (4.72)	.08	.790
Depression	60.00 (9.57)	53.60 (7.25)	72.33 (15.68)	65.11 (13.91)	3.28	.089
Atypicality	75.50 (14.25)	69.10 (20.51)	72.33 (21.09)	78.33 (17.11)	4.59	.048

effect of time: $F(1, 16) = 16.45, p < .001$) scales. We next examined BASC Depression, Anxiety, and Atypicality Scales. On the Atypicality Scale, there was no significant main effect of time, however, the interaction of group and time was significant ($F(1, 16) = 4.59, p = .048$), with the parents of children in the intervention group reporting that their children appeared significantly less atypical after PCIT. On the Depression Scale, there was a main effect of time ($F(1, 16) = 6.19, p = .024$). The interaction between Depression and group approached significance ($F(1, 16) = 3.28, p = .089$). There were no significant main effects or interactions on the Anxiety Scale (Table 2).

Parent Stress

On the PSI Total Score, there were no significant main effects of time ($F(1,16) = .568, p =$ ns), and no group by time interaction ($F(1,16) = 1.88, p =$ ns), suggesting no change in self-reported parent stress as a result of enrolling in the study or receiving therapy. Total Parent Stress in both groups also was above the clinical cutoffs at both before and after therapy.

Shared Positive Affect

Here, we tested the hypothesis that SPA and parent positive affect would increase over the course of therapy in the ten families in the intervention group. We also examined the pattern of change. First, we investigated if there were differences in SPA at the three time points (baseline, midpoint, and post-PCIT). There were statistically significant increases in SPA scores between baseline and midpoint ($t = -2.61, p < .05$) and between baseline and post-PCIT ($t = -2.71, p < .05$). Parent positive affect between baseline and midpoint ($t = -5.13, p < .01$) and baseline and post-PCIT ($t = -3.49, p < .01$) improved significantly (See Table 3). Child positive affect also increased between the three time points, although the change was not statistically significant. Next we used Noldus lag sequential analysis and examined how often child positive affect followed parent positive affect. The mean number of times child positive affect followed parent positive affect was 1.2 at baseline, 3.8 at midpoint, and 4.7 post-PCIT. The *t*-test results for the lag sequential analysis showed there was significant improvement from the baseline to the post-PCIT ($t = -2.60, p < .05$). The comparison from baseline to midpoint exhibited a slight improvement ($t = -2.19, p < .10$).

We hypothesized improvements in the parent-child relationship after the CDI phase of therapy, and therefore increased positive affect in the dyad at the midpoint of therapy (when CDI was completed), should be related to reductions in child problem behaviors and to increases in adaptive behavior and well-being, and to decreased parent stress. Pearson correlations (two-tailed tests) were calculated to examine the relationship between midpoint SPA and child behaviors at the conclusion of therapy. There were no significant findings. We also examined the relationship between midpoint parent positive affect scores and child behaviors after therapy. For problem behaviors, there were significant negative correlations between parent positive affect at the therapy midpoint and the BASC Hyperactivity ($r = -.68, p < .05$) and the ECBI Problem Scales ($r = -.65, p < .05$) post-intervention. For adaptive behaviors, there

Table 3 Means (standard deviations) and *t*-tests for DPICS affect codes and lag sequential analysis

	Pre-intervention	Range	Mid-intervention	Range	Post-intervention	Range	Between pre & mid *t* (*df*)	Between pre & post *t* (*df*)
SPA score	1.5 (1.8)	0–5	4.0 (2.8)	1–8	5.3 (5.2)	0–15	−2.61 (9)**	−2.71 (9)**
Parent positive affect	4.2 (2.5)	1–9	10.4 (3.2)	6–15	10.4 (5.7)	3–18	−5.13 (9)***	−3.49 (9)***
Child positive affect	4.8 (4.2)	0–12	6.3 (4.5)	2–14	7.3 (6.3)	0–18	−0.76 (9)	−1.97 (9)*
Lag sequential	1.2 (1.6)	0–4	3.8 (3.1)	0–8	4.7 (4.9)	0–15	−2.19 (9)*	−2.60 (9)**

Note: * $p < .1$, ** $p < .05$, *** $p < .01$, SPA = shared positive affect

were significant correlations between parent positive affect at therapy midpoint and the BASC Adaptability ($r = .70$, $p < .05$) and Social Skills Scales ($r = .74$, $p < .05$) post-intervention. These findings suggest that parent positive affect, as assessed by outside observers, is negatively related to parent reports of problem behaviors, and positively related to parent reports of adaptive behaviors at the conclusion of therapy (See Table 4).

Pearson's correlations coefficients were calculated to examine the relationship between midpoint SPA and parent stress. Correlations between the SPA score at the midpoint, and the Total PSI score ($r = -.60$, $p < .10$) approached significance.

Discussion

Our first hypothesis, that there would be a statistically significant reduction in parent reports of child problem behaviors in the treatment group, was not confirmed although child problem behaviors were no longer in the clinically significant range after PCIT. While no significant reduction in actual behaviors was reported, there was a statistically significant group by time interaction for ECBI Problem Scale scores. This demonstrated that, even if PCIT did not lead to a reduction in the reported intensity of actual behaviors, parents no longer perceived the behavior problems as so distressing.

Table 4 Correlations between SPA, parent positive affect, BASC, ECBI, and PSI scales at post-testing ($n = 10$)

Subscale	Parent PA mid	SPA mid
Child scales		
BASC hyperactivity	−.68**	.10
BASC atypicality	−.47	−.48
BASC attention problems	−.54	−.28
BASC adaptability	.70**	−.31
BASC social Skills	.74**	.36
BASC leadership[a]	.10	.01
ECBI intensity	−.54	−.03
ECBI problem	−.65**	−.26
Parent scales		
PSI defensive responding	−.29	−.62*
PSI parental distress	−.17	−.58*
PSI total stress	−.39	−.60*

Note: [a] $n = 9$. * $p < .1$, ** $p < .05$, PA = positive affect, SPA = shared positive affect

Results of this study provided support for our second hypothesis that PCIT would improve child adaptive functioning. The interaction of group and time for the Adaptability Scale indicated that participation in PCIT lead to improvements in parent perceptions of child flexibility (i.e., increased willingness to share, to shift between activities without problems, to adjust to new situations and people, and to try new things) that is assessed by this scale. The interaction between group and time also was significant for the Atypicality Scale, which assesses repeating things over and over, talking to oneself, rocking, daydreaming, and having strange ideas, suggesting that children receiving PCIT appeared more "typical" to their parents after participation in the therapy.

Our third hypothesis was not confirmed. Despite increases in observed parent positive affect during treatment, parents did not report declines in their stress levels, which remained at clinical levels. This result provides evidence that parent reports of improvements in child behavior and functioning are not simply results of the "placebo effect" of being enrolled in treatment. It points to the continued need to develop interventions to help the parents of children with ASDs. It also is possible that there is a lag between parent positive affect and reduction in parent stress, which we were unable to capture in the current study.

Consistent with our fourth hypothesis, PCIT led to improvements in the level of both parent positive affect and shared parent child positive affect or SPA. For the intervention group, the SPA score more than doubled between the baseline and midpoint assessments. Despite the fact that the second phase of intervention involved training for behavioral compliance, SPA continued to increase. Parent positive affect increased significant, and the number of times parent positive affect was directly followed by child positive affect also showed a four-fold increase from baseline to the conclusion of therapy.

Finally, our fifth hypothesis received mixed support. SPA at midpoint was not related to improvements in child behavior or parent symptoms. Parent positive affect at the midpoint, proved to have a more robust relationship with outcomes. Parent positive affect at midpoint was negatively correlated with BASC Hyperactivity and the ECBI Problem Scale. It was positively correlated with the BASC Adaptability and Social Skills scale at post-testing, suggesting that parent positive affect after the CDI phase of therapy was related to improvement in parent's perception of the child's adaptive social behavior by the end of therapy. The precise nature of this relationship remains unclear, and clearly merits further investigation through the use of observer-based measures, and a larger sample which would make more sophisticated statistical analysis, such as structural equation modeling, possible.

There were several of trend level findings related to behavior and social adaptive functioning which bear mention due to the small size of this study. On the BASC Scales assessing Hyperactivity, Attention Problems, and Conduct Problems, parents reported improvements during the 14-week period after enrollment, and interactions of these scales and group approached significance. The interaction between group and time also approached significance for the Depression Scale.

In sum, in this pilot study we showed it was feasible to implement PCIT in children aged 4–12 with ASDs, and that measures traditionally used to assess the effectiveness of PCIT were useful. We also demonstrated that there was a "signal," in the form of reports of parent perceptions and trend level findings, that PCIT is effective in reducing parent perceptions of the severity of child problem behaviors, and in improving their perceptions of child adaptive functioning. In addition to this, we provided empirical evidence that SPA and parent positive affect increased during therapy in a subset of parent child dyads, and that this related to parent perceptions of child behaviors.

Decreasing child problem behaviors clearly is an important goal for children, who experience reduced learning and socialization opportunities when aggression and tantrums are present, and for parents, who experience greater stress related to problem behaviors than to autism symptom severity (Baker et al. 2003). However, promoting less tangible outcomes such as parent child attunement, parent positive affect, and positive parent perceptions of children with autism may be at least equally important due to their relationship with a wider range of positive outcomes including language development and social growth (Siller and Sigman 2002). An additional benefit of these less tangible outcomes for children with autism may be an increase in adaptive skills and growth of moral conscience as has been demonstrated for children with typical development (Kochanska 2002).

This study had several limitations. First, assessments of problem behaviors were all parent reports. This limits the range of interpretations that can be drawn from this work to those related to parent perceptions. Second, our sample was relatively small. This limited statistical power of analyses, and made it impossible to systematically examine diagnostic subgroups. This is an important topic to address in future studies because some suggest that individuals with Asperger's Syndrome exhibit more and even a different form oppositional behavior than those with HFA or PDD-NOS (Gadow et al. 2005, 2004; Tonge et al. 1999). Studies of PDDNOS also suggest there may be unique behavioral problems related to affect regulation and/or psychotic thought processes associated with this diagnosis (Towbin et al. 1993). Third, we did not include a formal measure of treatment fidelity. Finally, it clearly would have been preferable to include a control group in our SPA analysis, and to improve the reliability of the SPA measure.

Future studies should include observer-based measures, as well as ecologically valid measures of the child's social functioning, and measures of autism-related social and other problem behaviors. During the course of the study, we heard multiple anecdotal reports of improvements in friendships of the target children. We did not systematically capture this important information, and empirical measures of the development of friendships in these children should be included in future studies. Inclusion of a more formal measure of treatment fidelity also would improve the design of future studies. Consistent with criteria for empirically based interventions, future studies also should include collection of longitudinal data, and data in the home and school contexts.

In conclusion, several clinical observations, and recommendations for future studies bear mention. When special interest related topics were excluded from play, we observed an increased range of interests and decreased fixation. In our view, this suggests that clinical advice to use children's interests as reinforcements, should be applied judiciously, and that increasing the range of a child's interest areas is a potentially malleable and important target for intervention in this population. We also observed that PCIT was very useful for parent/child dyads previously enrolled in certain applied behavior analysis (ABA) treatments, because it enhanced parents' awareness of how their relationship with their child also could act as a potent reinforcer of desired behavior, resulting in an increased the level of positive affect in the dyad. This points to the continuing need to better understand the complex relationships between parent and child affect, and behavior.

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Appendix

Appendix 1 Affect coding manual

Positive affect (PA)	Positive affect occurs when there is laughing, joking playfully, singing happily, jumping with joy, smiling, saying "I love you," or an affectionate touch (i.e., placing hand on back, arm, or head; kissing; or hugging) from the Parent/Child to the Child/Parent. There is a general sense of happiness. Consider facial expressions, tone of voice, and body language when deciding if there is positive affect. The affect does not need to be expressed directly to each other except for saying "I love you" or the affectionate touch.
Neutral (NN)	Neutral affect occurs when there are no obvious signs of positive or negative affect; however the parent/child is still engaged in the task. Consider facial expressions, tone of voice, and body language when deciding if the affect is neutral.
Negative affect (NA)	Negative affect occurs when there is a display of distress, anger, fear, sadness, frustration, or irritation. Consider facial expressions, tone of voice, and body language when deciding if there is negative affect. The affect does not need to be expressed directly to each other.
Aloofness (AA)	Aloofness occurs when the Parent/Child is tuned out of the situation or focused only on what he/she is doing. There is no interaction with the other person. The Parent/Child appears to be bored, actively in his/her own world or not wanting to interact with partner. There is a general impression that Parent/Child would rather be somewhere else or playing alone with the activity.

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