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Parent–Child Interaction Therapy for Disruptive Behavior in Children with Mental Retardation: A Randomized Controlled Trial

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This article presents results of a randomized controlled trial examining the efficacy of Parent–Child Interaction Therapy (PCIT) for treating disruptive behaviors of young children (ages 3 to 6) with mental retardation (MR) and comorbid oppositional defiant disorder. Thirty families were randomly assigned to an immediate treatment (IT) or waitlist (WL) control group. Results indicated that IT mothers interacted more positively with their children after treatment than WL mothers, and their children were more compliant after treatment. On parent-report measures, IT mothers reported fewer disruptive behaviors at home and lower parenting stress related to difficult child behavior than WL mothers after treatment. Whether evidence-based treatments for disruptive behavior require modification before application to children with MR is discussed.

Disruptive behavior among preschool-age children is a growing concern because of its high prevalence and poor prognosis (Loeber, Burke, Lahey, Winters, & Zera, 2000). The prevalence of disruptive behavior disorders, including oppositional defiant disorder (ODD) and conduct disorder, is estimated at between 2% and 16% (American Psychiatric Association [APA], 2000), and even higher rates are reported among children with mental retardation (MR). Recent studies indicate that parents rate children with MR significantly higher on measures of disruptive behavior than typically developing children (Dekker, Koot, van der Ende, & Verhulst, 2002), with over half in the clinically significant range (Emerson, Robertson, & Wood, 2005). As in the general population, these behavior problems persist into adulthood (Tonge & Einfeld, 2003).

For many children with MR, treatment of ODD is imperative. Disruptive behavior often prevents these children from participating in important educational and community activities (Durand, 2001) as well as rehabilitation for associated disorders (e.g., speech therapy). Disruptive behavior also contributes to physical safety concerns, higher need for supervision, reduced opportunities for independent functioning, and disrupted interpersonal relationships (Benson & Aman, 1999). Individual behavioral interventions for challenging behaviors in children with mild MR were recently examined in a meta-analysis of single-case studies and found to be effective in reducing children's behavior problems (Didden, Korzilius, van Oorsouw, & Sturmey, 2006).

Parent-training interventions have also been implemented for children with MR, and studies suggest these programs may be superior to individual child treatments (Handen, 1998). Although parenting interventions with this population have historically focused on increasing children's self-help and adaptive behaviors (Shearer & Shearer, 1972), Baker (1996) described applications of both group and individual parent training for treating behavior problems in children with developmental delays (Baker & Brightman, 1984; Baker, Landen, & Kashima, 1991; Brightman, Baker, Clark, & Ambrose, 1982). One of these studies used random assignment to groups (with some exceptions) and found parent training superior to delayed training in reducing parent-reported behavior

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problems and observed parent teaching skills at the end of treatment, although changes were not maintained at 6-month follow-up (Brightman et al., 1982). These studies did not select children based on formal diagnoses of disruptive behavior or MR, and children with autism were not excluded. However, they clearly suggest the potential of parent training for efficacious treatment of disruptive behavior in children with comorbid MR and ODD.

More recently, Stepping Stones Triple P (SSTP), an adaptation for children with MR of the evidence-based Positive Parenting Program (Sanders, 1999), was examined with multiple measures in a randomized controlled trial (Roberts, Mazzucchelli, Studman, & Sanders, 2006). Children (ages 2 to 7) with either intellectual or adaptive functioning scores 2 standard deviations below the mean and parent-reported behavior problems were assigned to a waitlist control or 10-session, individually delivered SSTP. Parents in the treated group reported fewer child behavior problems after treatment than control parents, although results from behavioral observations were mixed. In target settings, treated children showed less oppositional behavior but not less noncompliant behavior than control children, whereas in generalization settings treated children showed less noncompliance but not less oppositional behavior after treatment. Observed child appropriate behaviors did not differ significantly between groups in either setting, and parenting stress also did not differ as a function of treatment. However, the positive changes in child behavior after treatment were maintained at 6-month follow-up.

Continued study of parenting interventions for disruptive behavior disorders in young children with MR using randomized group design studies is important for several reasons. First, randomized controlled trials permit greater confidence that obtained results are due to the intervention rather than confounding factors (e.g., time, therapist effects). Second, studies to date have not examined children with specific diagnoses based on clear criteria. When inclusion criteria are nonspecific, such as children with ''developmental delays'' or ''behavior problems,'' or do not exclude certain comorbid conditions, such as autism, treatment effects may be less reliable or replicable for the target condition. Finally, several evidence-based treatments for child disruptive behavior now exist (Eyberg, Nelson, & Boggs, in press) that seem promising for study in children with MR. Although children with MR have problem behaviors unique to their disorder, the significant comorbidity of MR and ODD suggests these children may benefit from evidence-based treatments for disruptive behavior. Further, it is important to test an established treatment in the new population before changing core elements to determine if modification is needed and to help understand negative results. Evidence-based treatments have flexibility to meet individual family needs that may be sufficient for families of children with MR (McDiarmid & Bagner, 2005).

The purpose of this study was to evaluate the efficacy of Parent-Child Interaction Therapy (PCIT), without modification, for treating the disruptive behaviors of children with comorbid ODD and MR. PCIT is an evidence-based parent-training program for disruptive behavior in young children (Eyberg et al., in press), but the efficacy of this treatment for children with MR has not previously been examined in a randomized controlled trial. We hypothesized that in comparison to families in a waitlist (WL) control group, families in the PCIT group would show after treatment (a) greater child compliance during observed parent–child interactions, (b) fewer child disruptive behaviors as rated by parents, (c) more positive and effective parenting behaviors during parent–child interactions, and (d) reductions in parenting stress.

Method

Participants

Participants were 30 female primary caregivers and their 3- to 6-year-old child. All adult caregivers living in the home were encouraged to participate in treatment because of research suggesting that father involvement leads to better maintenance of treatment gains (Bagner & Eyberg, 2003). However, although six fathers participated in treatment, data for this study were collected only from the primary caregiver, who in all cases was the mother. Most children (80%) were referred by pediatric health care professionals, 10% were referred by teachers, and 10% were self-referred. To be included in the study, children had to receive diagnoses of both ODD and either mild or moderate MR, and the primary caregiver had to obtain a standard score of 75 or higher on a cognitive screening measure. Children with major sensory impairments (e.g., deafness, blindness) or autism spectrum disorders were excluded, as were families suspected of child abuse. Children on medication to control their behavior were not excluded if they had been stabilized on the medication and dosage for at least 1 month at the time of the initial evaluation. Families screened out of the study ($n = 28$) were referred to appropriate services elsewhere.

Study children were mostly boys (77%), with a mean age of 54.13 months ($SD = 10.15$), and most (60%) met diagnostic criteria for mild MR

Table 1. *Demographic Characteristics of Immediate Treatment (IT) and Waitlist (WL) Control Groups*

	IT[a]		WL[b]				
Characteristic	***M***	***SD***	***M***	***SD***	***t*(28)**	**$\chi^2(1)$**	***p***
Child Age (Months)	52.40	8.81	55.87	11.38	0.93	—	.359
Child Sex (% Female)	20.00	—	26.67	—	—	0.19	.666
Child Ethnicity (% Minority)	26.67	—	40.00	—	—	0.60	.439
Child IQ	57.53	11.01	60.80	11.25	0.80	—	.428
Maternal Age	35.20	8.57	37.67	7.22	0.85	—	.401
Paternal Age[c]	38.50	11.05	38.33	9.64	0.04	—	.970
Maternal IQ	99.40	13.95	99.60	14.44	0.04	—	.969
Hollingshead	37.40	13.24	45.20	14.35	1.55	—	.133
Marital Status (% Two Parent)	66.67	—	80.00	—	—	0.68	.409
Distance (Miles)	32.64	22.98	36.01	21.72	0.41	—	.683

[a] $n = 15$.
[b] $n = 15$.
[c] Father $n = 22$, $df = 20$, in this group comparison.

(IQ between 55 and 75). Racial/ethnic composition was 67% Caucasian, 17% African American, 13% biracial, and 3% Hispanic, with a mean Hollingshead (1975) score of 41.30 ($SD = 14.14$). Families were randomly assigned to an immediate treatment (IT) group or WL control group. There were no significant demographic differences between groups (see Table 1).

Among the 15 IT families and 15 WL families enrolled in the study, there were 10 IT families and 12 WL families that completed the Time 2 assessment, conducted 4 months after study treatment enrollment. These 22 families were "study completers" (73%). At Time 2, there were 5 study dropouts (33%) and 3 waitlist dropouts (20%). However, among the 10 IT families that completed the Time 2 assessment, 4 had not yet completed treatment. Two of these families subsequently dropped out of treatment unilaterally before meeting treatment completion criteria and were therefore treatment dropouts, bringing the total treatment dropout rate to 47% for this study.

Screening Measures

Wechsler Preschool and Primary Scale of Intelligence–Third Edition (WPPSI–III; Wechsler, 2002). The WPPSI-III assesses cognitive ability in children ages 3 to 7. The WPPSI–III Performance IQ, Verbal IQ, and Full Scale IQ (FSIQ) have test–retest reliability ranging from .84 to .93, and the intersubtest correlations are all moderate to high (Wechsler, 2002). Children were administered the core subtests to derive a FSIQ score and were required to score below 75 as part of the MR diagnosis.

Adaptive Behavior Scale–School: Second Edition (ABS–S: 2; Lambert, Nihira, & Leland, 1993). The ABS–S: 2 measures adaptive behavior in individuals 3 to 21 years of age and assesses nine domains (e.g., independent functioning, language development). Internal consistency ranges from .82 to .98 for these domains, and 2-week test–retest reliability ranges from .42 to .79 (Lambert et al., 1993). An ABS–S: 2 standard score of 4 or below on at least two domains was also required for a diagnosis of MR.

The Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988). The CARS is a 15-item observational rating scale developed to identify children with autism and distinguish them from developmentally handicapped children without autism. Internal consistency of .94 and 1-year test–retest reliability of .88 have been reported (Schopler et al., 1988). A raw score of 30 or lower was required for study inclusion.

Wonderlic Personnel Test (WPT; Dodrill, 1981). The WPT is a screening measure of adult intellectual abilities. In a sample of 120 normal adults, the Wonderlic estimate of intelligence correlated .93 and was within 10 points of the Wechsler Adult Intelligence Scale FSIQ for 90% of participants (Dodrill, 1981). A standard score of 75 or higher was required for study inclusion.

Diagnostic Interview Schedule for Children–Fourth Edition–Parent Version (DISC–IV–P; Shaffer Fisher, Lucas, Dulcan, & Schwab-Stone, 2000). The DISC–IV–P, a structured diagnostic interview administered to parents, includes separate modules for all common child mental disorders included in the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed. [*DSM—IV*], APA, 2000). One-week test–retest reliability for administration

to parents of 9- to 17-year-old children has been reported at .54 for ODD (Shaffer et al., 2000). The DISC–IV–P was used, along with the CBCL Aggressive Behavior subscale, to screen children for inclusion based on the presence of ODD.

Measures of Child and Parent Functioning

Child Behavior Checklist for $1\frac{1}{2}$ to 5 Year Olds (CBCL; Achenbach & Rescorla, 2000). The CBCL is a 99-item parent-rating scale designed to measure the frequency of children's behavioral and emotional problems in the past 2 months. Because of their cognitive delay, the CBCL was used for all children in this study, as recommended by the test author (T. Achenbach, personal communication, June 10, 2003). The Aggressive Behavior, Externalizing, and Total scales of the CBCL yield interrater (mother–father) reliability coefficients of .66, .67, and .65 and 1-week test–retest reliability coefficients of .87, .87, and .90, respectively (Achenbach & Rescorla, 2000). Similarly high CBCL interrater (mother–father) reliability coefficients have been found in a sample of delayed children (Baker, Blacher, Crnic, & Edelbrock, 2002). A *T* score above 64 on the Aggressive Behavior subscale was required, along with the DISC–IV–P, for a diagnosis of ODD. The CBCL Externalizing and Total scales were used as child behavior outcome measures. In this sample, internal consistency estimates for the Externalizing and Total scales at the Time 1 assessment were .82 and .95, respectively.

Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999). The ECBI is a 36-item parent-rating scale of disruptive behavior. The ECBI Intensity Scale measures the frequency with which disruptive behavior occurs, and the Problem Scale measures how problematic the child's behavior is for the parent. The Intensity and Problem scales yield test–retest reliability coefficients of .80 and .85 across 12 weeks and .75 and .75 across 10 months, respectively (Funderburk, Eyberg, Rich, & Behar, 2003). Psychometric examination of the ECBI with children with MR referred for treatment of behavior problems found these children received lower scores on both scales than nondelayed children referred for treatment of behavior problems (Cone & Casper-Beliveau, 1997). Their scores were significantly above normative means, however, supporting the use of these scales for measuring outcome in this population. In our study, the ECBI was completed weekly by the primary caregiver to assess treatment progress and was used as a measure of treatment outcome. The Time 1 internal consistency estimates for the Intensity and Problem scales were .90 and .91, respectively.

Parenting Stress Index–Short Form (PSI–SF; Abidin, 1995). The PSI–SF is a 36-item parent self-report instrument containing three factor-analytically derived subscales: Parental Distress, Parent–Child Dysfunctional Interaction, and Difficult Child. Six-month test–retest reliability of subscales is .85, .68, and .78, respectively. Many studies have used the PSI to examine stress in parents of children with MR (e.g., Roach, Orsmond, & Barratt, 1999; Sarimski & Hoffmann, 1994). Baker et al. (2002) found that behavior problems in children with MR contributed more to parenting stress than the child's cognitive delay. The PSI–SF subscales were used in this study to assess the effects of PCIT on parenting stress. The Time 1 internal consistency estimates for the subscales in this study ranged from .73 to .89.

Dyadic Parent–Child Interaction Coding System (DPICS; Eyberg, Nelson, Duke, & Boggs, 2004). The DPICS is a behavioral observation coding system that measures the quality of parent–child social interaction during three 5-min standard situations that vary in the degree of parental control (i.e., child-led play, parent-led play, and clean-up). The convergent and discriminative validity of the DPICS categories have been extensively documented, and the psychometric data are summarized in the DPICS manual (Eyberg et al., 2004). Parent categories recorded for this study were behavior descriptions (statements describing the child's current actions), reflections (statements with the same meaning as a preceding child verbalization), praises (statements expressing positive evaluation of the child), criticisms (statements expressing disapproval to the child), questions, and commands (directions). Child compliance to parent commands giving opportunity to comply were also recorded.

To examine changes in parent–child interactions, we created a composite category of "Do Skills" (behavior descriptions, reflections, and praises) reflecting behaviors parents are taught to use, and a composite category of "Don't Skills" (questions, commands, and criticisms) reflecting behaviors parents are taught not to use during child-led play. Child compliance was measured during the parent-led play and clean-up situations. Undergraduate student coders were trained to 80% agreement with a criterion tape before coding the mother–child interactions and were uninformed as to group status (IT or WL). Reliability (percent agreement and Cohen's kappa) was calculated for one-third of the observations from each family at each assessment point. Percent agreement ranged from 58% (noncomply) to 91%

Table 2. *Interobserver Reliability of Individual DPICS Categories Comprising Composite Parenting Skill and Child Compliance Categories*

Categories	Percent Agreement[a]	Kappa
Behavior Descriptions	68	.63
Unlabeled Praises	89	.84
Labeled Praises	89	.89
Reflective Statements	67	.66
Descriptive/Reflective Questions	86	.80
Information Questions	91	.89
Criticisms	72	.66
Indirect Commands	67	.65
Direct Commands	90	.83
Commands With No Opportunity for Compliance	71	.62
Child Compliance to Commands With Opportunity for Compliance	73	.69

Note: Interobserver reliability was calculated for 51 of the 153 5-min Dyadic Parent–Child Interaction Coding System (DPICS) situations observed at the two assessment points.
[a] Percent agreement calculated by summing agreements across participants (and assessment points) and dividing by agreements plus disagreements across participants.

(information question), and kappa ranged from .55 (noncomply) to .89 (labeled praise and information question) in this study (see Table 2).

Consumer Satisfaction Measure

Therapy Attitude Inventory (TAI; Eyberg, 1993). The TAI is a 10-item consumer satisfaction measure addressing the impact of parent training on such areas as confidence in discipline skills, quality of the parent–child interaction, the child's behavior, and overall family adjustment. Parents are asked to rate each item on a 5-point scale from 1 (*dissatisfaction with treatment or worsening of problems*) to 5 (*maximum satisfaction with treatment or improvement of problems*). For example, one item stem is "Regarding my confidence in my ability to discipline my child, I feel," with response options ranging from "(1) *much less confident*" to "(5) *much more confident*." Cronbach's alpha was .91, and 4-month test–retest reliability was .85 in an earlier study (Brestan, Jacobs, Rayfield, & Eyberg, 1999). Convergent validity with rating scale and observational measures of treatment change, and discriminative validity between alternative treatments have been demonstrated (Brestan et al., 1999; Eisenstadt, Eyberg, McNeil, Newcomb, & Funderburk, 1993). Internal consistency in this study was .53 for the 10 IT families that completed the Time 2 evaluation.

Study Design and Procedure

The study was approved by the University of Florida Health Sciences Center Institutional Review Board and the Alachua County School Board. Children were recruited through teachers and health care professionals. Teachers of special education preschool and kindergarten classrooms were given information packets to distribute to families that might be eligible and interested in the study. Packets included a cover letter describing the study, demographic questionnaire, CBCL, informed consent form, and stamped return envelope. Children rated within the clinical range on the Aggressive Behavior Scale of the CBCL were scheduled for a screening evaluation. Families of children rated within normal limits were sent information on other resources in the community. Health care professionals were given information flyers to distribute to families in their practice. Families responding to the flyers or referred directly were scheduled for a screening evaluation and completed the informed consent, demographic questionnaire, and CBCL at that visit.

The screening evaluation included administration of the WPPSI–III, ABS–S: 2, DISC–IV–P, WPT, and CARS. Children had to receive a diagnosis of ODD according to the Jensen et al. (1996) criteria for optimal caseness, which involved both categorical evidence based on the DISC–IV–P diagnosis and dimensional evidence based on the CBCL Aggressive Behavior Scale (T score > 64). Children had to receive a diagnosis of mild or moderate MR as defined in the *DSM–IV* (APA, 2000), which required a standard score between 40 and 75 on the WPPSI–III and significant deficits in at least two areas of adaptive behavior according to the mother's report on the ABS–S: 2. The CARS was completed based on observations during the evaluation. Families not meeting study criteria were given feedback and appropriate recommendations or referrals. Families meeting study criteria then completed the ECBI, PSI–SF,

and DPICS observations, which were videotaped and later coded by trained research assistants. Families received $10 for participation in this Time 1 assessment.

Two computer-generated random numbers lists, one for boys and one for girls, were maintained by the second author, who was uninvolved in recruitment or assessment. The second author consulted the appropriate list each time a child was enrolled in the study; if the next number was odd, the child was assigned to the IT group, and if even, the child was assigned to the WL group. Families assigned to the IT group were scheduled for the first session within 1 week. Families in the WL group were reminded they would begin treatment in 4 months, following a second assessment.

Four months after the Time 1 assessment, all families were seen for the Time 2 assessment. This was the posttreatment assessment for IT families (although 4 [40%] families had not yet completed treatment at that point) and the pretreatment assessment for WL families. The Time 2 assessment included the same measures of parent and child functioning completed at Time 1 (CBCL, ECBI, PSI–SF, and DPICS). Families in the IT group also completed the TAI at Time 2. All questionnaires were identified by participant number only and administered by an independent assessor who was not the family's therapist, except in two cases. All families received $15 for completion of the Time 2 assessment.

Treatment

PCIT sessions were conducted once a week and lasted approximately 1 hr. The treatment manual (Eyberg & Child Study Lab, 1999), which provided session outlines in checklist form, was followed to help ensure treatment fidelity. Each family was seen individually by two therapists. Lead therapists included the first author (two cases) and eight other graduate students in clinical child psychology with prior training and experience as a PCIT therapist. The cotherapists were graduate students and interns in clinical psychology who had read the treatment manual and observed a prior case. All therapists attended weekly group supervision with the authors.

In PCIT, parents are taught skills to establish a nurturing and secure relationship with their child while increasing their child's prosocial behavior and decreasing negative behavior. Treatment progresses through two phases. The Child-Directed Interaction (CDI) phase focuses on enhancing the parent–child relationship, increasing positive parenting, and improving child social skills. The Parent-Directed Interaction (PDI) phase focuses on improving parents' ability to set limits and follow through consistently to reduce child noncompliance and disruptive behavior. In both phases of treatment, therapists actively coach parents toward mastery of the interaction skills as assessed during a 5-min parent–child observation at the start of each session. For this study, CDI was limited to five coaching sessions before beginning the PDI phase of treatment. However, CDI continues to be assessed and coached along with PDI skills in the PDI phase of treatment.

Throughout treatment, parents are asked to practice the skills in 5- to 10-min sessions, with PDI sessions gradually replaced with use of PDI only at those times when a command is necessary. In the last few sessions, parents learn variations of the PDI procedure to deal with aggressive behavior and public misbehavior. Treatment continues until parents demonstrate mastery of the CDI and PDI skills and their child's behavior is within .5 standard deviation of the normative mean on the ECBI Intensity Scale. Therapists work actively to keep families in treatment until completion criteria are met. The average length of treatment for the IT treatment completers ($n = 8$) was 12 sessions ($SD = 1.77$), which is similar to other PCIT outcome studies (Eisenstadt et al., 1993; Schuhmann, Foote, Eyberg, Boggs, & Algina, 1998).

Treatment Integrity

All therapy sessions were videotaped, and 50% of the session tapes from each family were randomly selected and checked for integrity using the treatment manual checklists. Fifty percent of the checked tapes were again randomly selected and checked independently by a second coder to provide an interobserver reliability estimate. Accuracy was 97% with the treatment protocol, and percent agreement interrater reliability was 97% (range = 79–100%).

Results

Analyses of covariance (ANCOVA), with pretreatment scores as covariates, were used to determine treatment effects. ANCOVA is recommended for randomized controlled trials because it is a more statistically powerful analytic method than repeated measures analysis of variance (Rausch, Maxwell, & Kelley, 2003). Individual scores for all variables at Time 1 were within 3 standard deviations of the sample mean. At the Time 2 assessment, differences between the IT and WL groups were examined for the following outcome

Table 3. *Mean Scores for Observational Measures of Parenting Skill and Child Compliance at Time 1 and Time 2 Assessments*

			Time 1		Time 2					
Measure	**Group**	n^a	***M***	***SD***	***M***	M^b	***SD***	***F*(1, 18)**	***p***	d^c
CDI Do Skills[d]	IT	10	5.60	2.63	18.10	17.94	8.90	20.09	$<.001$	2.06
	WL	11	4.91	2.66	3.64	3.78	4.86			
CDI Don't Skills[d]	IT	10	43.90	14.45	10.00	9.84	9.94	9.67	.006	1.32
	WL	11	43.18	16.78	28.36	28.51	18.29			
% Child Compliance[e]	IT	10	63.88	19.22	85.20	85.90	9.44	9.68	.006	1.53
	WL	11	68.89	19.71	59.72	59.10	25.68			

Note: CDI = Child-Directed Interaction; IT = immediate treatment; WL = waitlist control.
[a] One WL family completed the Time 2 assessment by phone and was unable to come in for the observation due to lack of transportation, resulting in a sample size of 21 mother–child dyads for analyses of observational data.
[b] Adjusted Time 2 scores based on analyses of covariance.
[c] Cohen's d = effect size between IT and WL groups at Time 2 based on adjusted mean scores.
[d] CDI skills were coded during the child-led play situation of the Dyadic Parent–Child Interaction Coding System.
[e] Child compliance was coded during the parent-led play and clean-up situations of the Dyadic Parent–Child Interaction Coding System.

variables: (a) mothers' CDI Do Skills observed during child-led play interactions, (b) mothers' CDI Don't Skills during child-led play interactions, (c) child compliance observed during parent-led play and clean-up interactions, (d) child disruptive behaviors rated by mothers, and (e) mothers' report of parenting stress. Levene's Test of Equality of Variances was significant only for the CDI Don't Skills variable, $F(1, 19) = 4.70$, $p = .043$. To examine whether nonhomogeneity of variance affected findings for this variable, we conducted a regression to residualize out the covariates and conducted a t test on the residualized posttreatment scores, $t(19) = 3.19$, $p = .005$. The significant result suggested that nonhomogeneity of variance did not affect results for the CDI Don't Skills. We also examined the mediational role of parenting changes in accounting for changes in child behavior to strengthen conclusions about the effects of PCIT in this population. For all analyses, alpha was set at .05, but exact alpha levels for all outcome variables were reported to permit examination of potential experimentwise error rate.

Observed Parent–Child Interaction

Mean scores for the IT and WL groups on observational measures from parent–child interactions at Time 1 and Time 2 assessments are shown in Table 3. Mothers in the IT group used significantly more CDI Do Skills and fewer CDI Don't Skills at the Time 2 assessment than mothers in the WL group. The large effect sizes for IT mothers' behaviors reflected their success in mastering the PCIT skills, and a large effect size was also seen for children's behavior at Time 2. After treatment, children's compliance to maternal commands was significantly higher in the IT than WL group.

Parent Report

Table 4 shows the Time 1 and Time 2 mean scores for study completers in the IT and WL groups on parent report measures. On both the CBCL Externalizing Scale and Total Scale, mothers in the IT group reported significantly fewer child behavior problems at Time 2 than mothers in the WL group. Mothers also reported fewer disruptive behaviors on the ECBI Intensity Scale. Group differences were not significant on the ECBI Problem Scale, suggesting that treatment did not affect maternal distress about their child's behavior. Similar results were found on the PSI–SF Parental Distress and Parent–Child Dysfunctional Interaction subscales, with no significant between-group differences after treatment. However, on the Difficult Child subscale, IT mothers again reported significantly fewer child behavior problems than WL mothers.

Mediational Role of Changes in Parenting Behavior on Child Behavior Outcome

To examine whether pre–post changes in maternal parenting skills mediated child behavior change, we repeated the ANCOVA reported in Table 4 for the CBCL Externalizing Scale twice – once entering the change score for mothers' Do Skills as the second covariate and once entering the change score for mothers' Don't Skills as the second covariate. Both analyses were nonsignificant, indicating that changes in both positive parenting behaviors, $F(1, 17) = 1.30$, $p = .27$, $d = .64$,

Table 4. *Mean Scores for Mothers on Parent-Report Measures at Time 1 and Time 2 Assessments*

			Time 1		Time 2					
Scale	**Group**	***n***	***M***	***SD***	**Unadjusted *M***	**Adjusted *M***	***SD***	***F*(1, 19)**	***p***	***d*[a]**
Child Behavior Checklist										
Externalizing	IT	10	34.60	7.73	19.60	20.28	10.72	8.56	.009	1.08
	WL	12	36.25	6.25	31.25	30.69	8.56			
Total	IT	10	89.70	29.45	51.90	58.83	27.87	11.62	.003	.97
	WL	12	95.17	16.41	83.83	82.23	20.44			
Eyberg Child Behavior Inventory										
Intensity	IT	10	156.40	34.30	94.60	100.63	26.22	13.00	.002	1.50
	WL	12	170.92	19.47	148.17	143.14	30.33			
Problem	IT	10	21.40	6.11	10.10	9.31	9.42	2.68	.118	.66
	WL	12	18.67	7.98	14.67	15.33	8.74			
Parenting Stress Index-Short Form										
Parental Distress	IT	10	30.60	4.70	30.00	29.18	5.72	.19	.671	.02
	WL	12	30.17	7.80	28.67	29.35	8.47			
Parent–Child DI	IT	10	31.10	10.10	26.20	25.51	8.93	2.59	.124	.52
	WL	12	29.33	6.75	29.58	30.16	8.82			
Difficult Child	IT	10	42.60	8.40	32.60	33.97	8.87	4.80	.041	.59
	WL	12	43.67	7.79	38.98	38.61	6.80			

Note: Raw scores are reported. Time 1 scores do not differ between groups (all $ps > .20$). IT = immediate treatment; WL = waitlist control; DI = Dysfunctional Interaction.
[a] Cohen's d = effect size between IT and WL groups at the Time 2 assessment based on adjusted mean scores.

and negative parenting behaviors, $F(1, 17) = 3.02$, $p = .10$, $d = .77$, contributed to child behavior change during treatment.

Consumer Satisfaction

The TAI was administered to the 10 IT study completers at the Time 2 assessment. Their TAI ranged from 42 to 50 ($M = 46.40$, $SD = 2.88$). These findings suggest that families were highly satisfied with PCIT.

Intent-to-Treat Analyses

In addition to comparisons between families that completed the Time 2 assessment, we conducted an intent-to-treat analysis with all families that enrolled in the study. The ECBI Intensity Scale was completed weekly by mothers in treatment to assess progress. Thus, for families that dropped out of treatment, their last ECBI intensity score before dropping out was used as their posttreatment score because it is the best estimate of child disruptive behavior outcome for families not completing the Time 2 assessment. For the two IT families that dropped out of the study before beginning treatment and the three WL families that did not return for the Time 2 assessment, the Time 1 ECBI intensity score was used as the Time 2 score. The analysis of between-group differences was significant, $F(1, 29) = 5.79$, $p = .023$, $d = .67$, indicating that when all study families were included in the ANCOVA, disruptive behavior remained lower for children assigned to the IT group.

Clinical Significance

To determine whether the changes in children's disruptive behavior were clinically significant, we applied the Jacobson, Roberts, Berns, and McGlinchey (1999) criteria to children's scores on the measures with established cutoff scores. These criteria require that (a) the magnitude of change from pre- to posttreatment is statistically reliable and (b) the child's posttreatment score falls within the normal range. We used the reliable change index (RCI; Jacobson, Follette, & Revenstorf, 1984) to determine whether the magnitude of change exceeded the margin of measurement error. The RCI is calculated by dividing the magnitude of change between Time 1 and Time 2 scores by the standard error of the difference score. RCIs greater than 1.96 are considered sufficient in magnitude (Jacobson et al., 1999). For the second criterion, we required the child's score to be at or above the published cutoff value for the measure at the Time 1 assessment and below the cutoff value at the Time 2 assessment. As shown in Table 5, a relatively high percentage of mothers in the IT group reported clinically significant child behavior change.

Table 5. *Number of Families Showing Clinically Significant Child Behavior Change in the Immediate Treatment (IT) and Waitlist (WL) Control Groups*

			Reliable Change[a]		Clinically Significant Change[b]	
Measure	**Group**	***n***	**No.**	**%**	**No.**	**%**
CBCL Externalizing	IT	10	9	90	7	70
	WL	12	7	58	2	17
ECBI Intensity	IT	10	10	100	5	50
	WL	12	6	50	1	8

Note: CBCL = Child Behavior Checklist; ECBI = Eyberg Child Behavior Inventory.
[a] The reliable change index (RCI) was used to determine whether the magnitude of change exceeded the margin of measurement error. The RCI was calculated by dividing the magnitude of change between Time 1 and Time 2 scores for each child by the standard error of the sample difference scores. RCIs greater than 1.96 were considered sufficient in magnitude.
[b] A child was determined to have made a clinically significant change if the child's score was in the clinically significant range at pretreatment and the normal range at posttreatment, and the change in the child's score from pre- to posttreatment was statistically reliable as defined using the RCI.

Discussion

This study provides initial empirical support for the use of PCIT with young children with comorbid MR and ODD. After treatment, mothers interacted more positively with their children than untreated mothers and reported significant improvements in their children's disruptive behavior. The treated children also showed significantly greater compliance than untreated children, comparable to behavioral changes of nondelayed children in PCIT (e.g., Eisenstadt et al., 1993; Schuhmann et al., 1998). In addition to statistical analysis of study findings, we examined clinical significance to provide information about individual child behavior change within groups. Although a larger percentage of treated than untreated mothers reported reliable changes in their children's behavior, the greatest difference between groups was the clinical level of children's behavior at Time 2, where the percentage of mothers reporting child behavior in the normal range was much greater in the treated group.

Mediational analyses indicated that changes in child behavior could be accounted for by the increases in positive parenting behaviors and decreases in negative parenting behaviors during mother–child interactions. Specifically, the mothers learned to implement a child-directed interaction that involved giving positive attention to their child's adaptive behaviors and actively ignoring maladaptive behaviors. Mothers also learned to implement a parent-directed interaction when needed, by using effective commands with consistent follow-through for compliance and noncompliance. The findings of this study suggest that for treating disruptive behaviors in children with MR, an evidence-based treatment for disruptive behavior can be successful without requiring protocol modification. The disruptive behavior of children with MR appears to respond to treatment in the same way as the disruptive behavior of nondelayed children. Further, behavioral interventions that teach authoritative parenting practices and target positive and negative interactions generally appear to have sufficient flexibility to affect a broad array of problem behaviors efficiently across a number of populations (Bagner, Fernandez, & Eyberg, 2004; Eyberg, 2005).

The parenting stress of mothers in this sample was relatively low at pretreatment compared to mothers of nondelayed children with ODD (Ross, Blanc, McNeil, Eyberg, & Hembree-Kigin, 1998) and differed depending on the source of stress. Stress due to difficult child behavior was the only clinically elevated PSI scale and the only scale to show significant group differences after treatment. The absence of significant posttreatment differences in parenting stress related to dysfunctional parent–child interactions might have been due to small sample size in view of the moderate between-group effect size on this variable. However, because mothers did not report significant stress on either this or the Parent Distress scale before treatment, change on these scales may not be clinically important.

The relatively low level of overall parenting stress among mothers of children with comorbid MR and ODD was unexpected but is similar to the relatively low level of general stress found by Roberts et al. (2006) among parents of children with MR and behavior problems. Possibly the presence of MR serves to buffer the stress of parenting a child with ODD. However, parents of children with MR may

have unique stressors associated with their child's condition, such as financial burden (Baker et al., 2002), that would be better detected by measures designed specifically for this population. Still, our finding that maternal stress related to difficult child behavior was reduced to within normal limits for treated mothers is important and further strengthens conclusions about changes in child behavior with treatment.

One limitation of this study is the absence of follow-up data, which does not allow us to evaluate whether treatment effects in this population will last once treatment ends. In the Roberts et al. (2006) study, the effects of SSTP were maintained for the families of delayed children at a 6-month follow-up, and previous PCIT research with nondelayed children has found durable treatment effects lasting at least 2 years (Boggs et al., 2004). These studies together suggest that the treatment gains seen in this study may show at least short-term maintenance. After treatment, mothers reported being highly satisfied with the parenting skills they had learned, which may be important for continued use of the skills. However, these parents often have competing demands for their time in rehabilitative services, which could interfere with continued use of PCIT skills once treatment ends. It will be important to examine the long-term effectiveness of PCIT with children who present comorbid disruptive behavior and MR in future research.

A second limitation is differential attrition. Although not statistically significant, attrition at the Time 2 assessment was higher for families in the IT group (33%) than the WL group (20%). We conducted an intent-to-treat analysis to determine whether findings at Time 2 would be similar if all families enrolled in the study were assessed. Results suggested that significant between-group differences were likely not due to differential attrition. Still, attrition is a substantial problem in child therapy generally (Kazdin, 1996), and there may be unique reasons for dropout in this population. Additional time demands of caregiving, for example, could influence attrition. Further examination of parent training attrition in this population is warranted.

Third, the generalizability of our findings is limited to mothers. Of the 10 IT families with fathers in the home, only six fathers participated in treatment, providing insufficient data for analysis. Roberts et al. (2006) found significant changes in fathers' self-reported parenting behaviors but no change in their reports of child problems after treatment. Thus, the role of fathers in behavioral parenting programs for children with MR is not clear and also requires further study.

Finally, our use of a WL control group did not control for nonspecific therapy effects. However, we believe it is important to examine the efficacy of new applications of PCIT against no-treatment conditions prior to launching larger scale and more costly studies of treatment effectiveness. The results of this study provide useful information on feasibility and power for future study of PCIT with children evidencing comorbid MR and ODD.

Implications for Future Research, Policy, and Practice

A unique strength of this study is its careful identification of participant children according to *DSM–IV* criteria, which clearly specify the population to whom the results apply. Additional strengths are the randomized, controlled group design and multiple methods of measuring child behavior outcomes, which lend validity to the findings. The findings suggest that PCIT is sufficiently flexible to address many concerns common among families of children with MR, such as self-injurious behaviors or speech and language problems (Harden & Sahl, 1997), while adhering to the treatment manual. For example, when teaching parents to follow their child's play in CDI, therapists would encourage short sentences that repeat concepts the child is ready to learn, such as "You picked a *red* crayon. You're coloring the balloon *red*. I like your *big red* balloon!" Therapists also use developmentally appropriate examples when modeling how to lead the child's play in PDI and would demonstrate gestural cues along with verbal directions to aid comprehension. For example, when using a command such as "Give me this red block," a parent might learn to touch the block during the command and then hold out their hand for it. When coaching parents in session to use commands for behaviors incompatible with problem behaviors, therapists focus on problem behaviors as they occur. Thus, if a child began slapping his own face, the command might be, "Put your hands in your lap," followed by praise for obeying and enthusiastic use of CDI skills to provide both distraction from the trigger for slapping and stimulation from the game. These examples illustrate one way in which evidence-based treatments meet individual needs and emphasize developmental issues that may arise for families of young children with MR.

In sum, this study supports further research on PCIT for children with comorbid MR and ODD and contributes to emerging evidence that comorbidity may not lessen the efficacy of evidence-based interventions (Brown, Anthony, & Barlow, 1995; Kendall et al., 1997). For children with MR, specifically, our results suggest that

evidence-based treatments may not require significant modification to achieve results similar to those found with typically developing children.

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