Journal of Consulting and Clinical Psychology
2005, Vol. 73, No. 3, 371–388

0022-006X/05/$12.00 DOI: 10.1037/0022-006X.73.3.371

Mediators, Moderators, and Predictors of 1-Year Outcomes Among Children Treated for Early-Onset Conduct Problems: A Latent Growth Curve Analysis

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Several child conduct problem interventions have been classified as either efficacious or well established. Nevertheless, much remains to be learned about predictors of treatment response and mechanisms of behavioral change. In this study, the authors combine data from 6 randomized clinical trials and 514 children, ages 3.0–8.5 years, to evaluate moderators, mediators, and predictors of outcome. Among other findings, latent growth curve models of mother-report and observational measures of child externalizing behaviors suggested that marital adjustment, maternal depression, paternal substance abuse, and child comorbid anxiety/depression each moderated treatment response. Moreover, critical, harsh, and ineffective parenting both predicted and mediated outcome, with the most favorable responses observed when parents scored relatively low on each construct at intake yet improved during treatment. Implications for treatment nonresponders are discussed.

Psychosocial treatments for child conduct problems are among the most thoroughly evaluated interventions in the clinical sciences literature. Research conducted over the past 3 decades has demonstrated that conduct problems can be treated successfully and that a number of therapeutic alternatives confer positive effects on participant children and families (Nock, 2003). Interventions with some empirical support include child-focused cognitive–behavioral approaches targeting anger control, coping, and problem-solving skills (e.g., Kazdin, Siegel, & Bass, 1992; Lochman & Wells, 1996; Webster-Stratton, Reid, & Hammond, 2001); teacher-focused educational approaches aimed at improving classroom management of problem behaviors (e.g., Reid, Webster-Stratton, & Hammond, 2003; Webster-Stratton, Reid, & Hammond, 2004); and parent-focused interventions designed to improve parent–child interaction quality and alter coercive operant contingencies within families (e.g., Eyberg et al., 2001; Patterson, Dishion, & Chamberlain, 1993; Webster-Stratton, 1984, 1994).

Among these approaches, parent training (PT) has emerged as the preferred treatment because two of its variants meet the stringent Chambless and Hollon (1998) criteria for well-established interventions (Brestan & Eyberg, 1998). There is also emerging evidence that combining PT with either child treatment (CT) or teacher training (TT) may result in larger treatment effects than those produced by any single mode of intervention (Kazdin, Esveldt-Dawson, French, & Unis, 1987; Webster-Stratton et al., 2004). Thus, considerable progress has been made toward developing effective treatments for early-onset conduct problems.

Identifying empirically supported treatments for any psychiatric disorder represents a milestone in the advancement of clinical science, particularly for a condition as stable and costly as early-onset conduct problems. Nevertheless, developing effective treatments is not the only objective of intervention research. Once the efficacy of a treatment is established, the mechanisms through which ameliorative effects are exerted must be elucidated, and factors that alter the efficiency of the intervention within different subsamples must be identified (Brestan & Eyberg, 1998; Nock, 2003; Owens et al., 2003). Here the objective is to move beyond basic questions of efficacy toward identifying those who are most likely to benefit from a given intervention under specific circumstances. The importance of pursuing these derivative research questions can hardly be overstated. Even the most successful interventions for conduct problems are effective for only about two thirds of participant children (see Webster-Stratton & Hammond, 1997). Identifying treatment nonresponders is therefore an important objective in formulating and testing new interventions that target children who do not benefit from current treatment approaches. As Brestan and Eyberg (1998) noted, we must begin to address the questions "For whom does this treatment work?" and "When is this treatment not enough?" These and similar questions have therefore been assigned high priority in recent years in child psychotherapy research (Owens et al., 2003).

In the context of intervention research, variables that specify for whom a treatment is effective or under what conditions a treatment is effective are either predictors or moderators of outcome (Hinshaw et al., 2000; Kraemer, Wilson, Fairburn, & Agras, 2002). Such variables can include parental attributes such as maternal depression or paternal substance abuse, child attributes such as

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Carolyn Webster-Stratton has disclosed a potential financial conflict of interest because she disseminates these treatments and stands to gain from favorable reports. Because of this, she has voluntarily agreed to distance herself from certain critical research activities, including recruitment, consenting, primary data handling, and data analysis. The University of Washington has approved these arrangements. Preparation of this article was supported in part by National Institute of Mental Health Grants MH63699 to Theodore P. Beauchaine and MH00988 to Carolyn Webster-Stratton.

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biological sex or comorbid anxiety, or broader contextual–environmental influences such as social class. Both predictors and moderators are variables present at baseline that alter treatment response (Kraemer et al., 2002). Predictors, however, do so regardless of treatment condition. If, for example, children with preexisting comorbid attention-deficit/hyperactivity disorder (ADHD) respond less favorably to all interventions for conduct problems, ADHD would qualify as a predictor of treatment outcome. In contrast, moderators differentially predict outcome across treatment groups, or across treatment and control groups. Thus, if children with comorbid ADHD respond more favorably to conduct problem interventions that include teacher training than to alternative interventions, ADHD would qualify as a moderator of treatment outcome.

Few studies have examined predictors of outcome for conduct problem interventions, and even fewer have examined treatment moderators (for reviews, see Brestan & Eyberg, 1998; Nock, 2003). Nevertheless, a number of candidate variables emerge. Likely child-specific predictors include comorbid symptoms of anxiety and/or depression, comorbid ADHD, and age, each of which has been linked either empirically or theoretically to treatment response. Children with comorbid anxiety/depression have fared better than their nondepressed counterparts in some short-term treatment outcome studies (e.g., Beauchaine, Gartner, & Hagen, 2000). In contrast, children with conduct problems and comorbid ADHD may suffer from a particularly refractory condition that is less responsive to intervention efforts (e.g., Lynam, 1996, 1998). Thus, both anxiety and impulsivity may predict treatment outcome, with opposite directions of effect. Finally, several authors have noted that interventions for conduct disorder (CD) are of limited effect when offered in adolescence, after delinquent and aggressive behaviors have persisted across many years and secondary risk factors such as academic failure, school dropout, and deviant peer group formation have developed (e.g., Dishion & Patterson, 1992; Ruma, Burke, & Thompson, 1996). Thus, the age at which an intervention is initiated may also predict treatment outcome.

A number of parent- and family-specific variables also emerge as possible treatment predictors or moderators. Parental psychopathology exerts strong influences on children's behavior and may therefore impact treatment response. Maternal depression, for example, affects many aspects of children's adjustment (Downey & Coyne, 1990) and has predicted child outcomes in some intervention studies (e.g., Baydar, Reid, & Webster-Stratton, 2003; Webster-Stratton, 1990b). Moreover, parental relationship satisfaction (Harrist & Ainslie, 1998; Webster-Stratton & Hammond, 1999), life stress (Pinderhughes, Dodge, Bates, Pettit, & Zelli, 2000), and substance abuse (Baydar et al., 2003; Fuller et al., 2003) all have been linked to either treatment response or stability in child externalizing behaviors in previous research. One objective of the present study was to evaluate these and other potential predictors–moderators of outcome among 514 children treated at the University of Washington Parenting Clinic with empirically supported interventions for conduct problems (Webster-Stratton, 1982, 1984, 1994; Webster-Stratton & Hammond, 1997; Webster-Stratton, Hollinsworth, & Kolpacoff, 1989; Webster-Stratton & Reid, 1999).

In contrast to predictors and moderators, *mediators* identify mechanisms of action through which an intervention exerts its effects. In other words, mediators are influences that accrue during an intervention and account for variability in treatment response (Kraemer et al., 2002). In treatment outcome studies of externalizing behavior disorders, parenting practices have consistently accounted for variance in children's behavioral changes following multimodal interventions (e.g., Hinshaw et al., 2000; Reid, Webster-Stratton, & Baydar, 2004). Thus, better child externalizing outcomes are observed when parents become less coercive, less critical, and more effective in their discipline practices. A second objective of the present study was to perform focused mediational analyses of the impact of changes in specific parenting practices on child outcomes.

In addition, we sought to extend previous findings in two ways. First, we wanted to model reciprocal effects of parenting on child behavior, and of child behavior on parenting. We know that parenting practices affect child behavior, as outlined above. However, child behavior also affects parenting (e.g., Beauchaine, Strassberg, Kees, & Drabick, 2002; Smith, Calkins, Keane, Anastopoulos, & Shelton, 2004), yet these mutual dyadic influences cannot be modeled with traditional mediational tests that use a static posttreatment mediator. Thus, we used growth curve modeling to examine the reciprocal effects of parenting and child behavior on one another across pretreatment, posttreatment, and 1-year follow-up assessments.

Second, we sought to model more dynamic intervening variable effects of parenting on children's externalizing behavior. In theory, variables can serve as both predictors–moderators and mediators of outcome (Judd, Kenny, & McClelland, 2001). This would be the case, for example, if both baseline parenting and changes in parenting made independent contributions to treatment response among children.[1] As noted above, changes in parenting have been shown to mediate externalizing outcomes. Moreover, initial levels of critical parenting have predicted treatment outcome in our prevention work with Head Start samples (Reid et al., 2004). However, we are aware of no studies that have assessed the concurrent predictive and mediating roles of parenting on treatment response for children with early-onset conduct problems. Doing so is important because initial scores in longitudinal research are often the most robust predictors of outcome. Failure to account for the predictive effects of baseline parenting could therefore lead to the mistaken inference that treatment effects are mediated by parenting change, when in fact they are driven by pretreatment differences in parenting behavior. Modeling both predictive and mediating effects addresses this potential confound.

Method

Participants

The sample included 514 families who have participated in our treatment outcome research studies on oppositional defiant disorder (ODD) and CD

[1] Claims that the same variable can moderate and mediate outcome have been the source of some controversy in the literature. As Kraemer et al. (2002) note, when the distinction is made between moderators and mediators as existing prior to and occurring during treatment, respectively, a single variable cannot moderate and mediate outcome. However, related but distinct variables such as pretreatment parenting behavior and parenting change during the course of treatment can.

over the past 20 years. This included 21 separate cohorts of children enrolled in six different treatment outcome studies. Entry criteria for all cohorts were as follows: (a) The child was between 3 and 8 years of age; (b) the child had no debilitating physical impairment, intellectual impairment, or history of psychosis and was not already receiving psychological treatment; (c) the primary referral reason was for conduct problems such as noncompliance, aggression, and oppositional behavior that continued for more than 6 months; (d) parent-report symptoms were clinically significant (i.e., more than two standard deviations above the normed mean) on the Eyberg Child Behavior Inventory (ECBI; Robinson, Eyberg, & Ross, 1980); and (e) the child met criteria for ODD and/or CD according to either the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition—Revised* (*DSM–III–R*; American Psychiatric Association, 1987) or the *DSM–IV* (American Psychiatric Association, 1994), depending on their date of entry into the study.

A telephone screen was used to identify children in the clinical range on the ECBI. These families were eligible for a 2- to 3-hr structured intake interview developed by our staff, after which a diagnosis was rendered according to *DSM–III–R* or *DSM–IV* criteria. Highly trained therapists conducted the interviews, which were videotaped for review. Random and regular review of approximately 15% of interviews indicated 100% reliability for ODD and CD diagnoses. The final sample consisted of 402 boys and 112 girls between the ages of 3.0 and 8.5 years at intake ($M = 5.4$, $SD = 1.3$). The racial/ethnic composition of the sample was 4.8% African American, 88.5% Caucasian, 3.9% Latino, and 2.8% other ethnic identities (e.g., Asian American, Native American). These figures reflect the racial/ethnic distribution of metropolitan Seattle.

Intervention

After baseline assessments were completed, families were randomly assigned to either a wait-list condition or to one or more combinations of PT, CT, and/or TT. Most wait-listed participants were offered treatment after each randomized clinical trial (RCT) was conducted and are therefore included in all analyses. Detailed descriptions of each treatment have appeared elsewhere (e.g., Webster-Stratton & Hancock, 1998). However, we provide brief outlines of each component below.

The parent program. All PT conditions included the basic content of the Incredible Years Parent Training Program. This program teaches parents child-directed play skills, effective parenting skills, communication and problem-solving skills, strategies for coping with stress, and ways to strengthen children's prosocial behaviors and social skills. This program has been repeatedly shown to improve parenting and to reduce noncompliant and aggressive behaviors in children. Variations in program delivery (e.g., number of sessions, basic vs. advanced content) have been reported in separate treatment outcome studies (e.g., Webster-Stratton, 1984; 1990a, 1994; Webster-Stratton & Hammond, 1997; Webster-Stratton, Kolpacoff, & Hollinsworth, 1988; Webster-Stratton et al., 2004).

The child program. The child program consisted of Dinosaur School, a social skills and problem-solving curriculum developed by Carolyn Webster-Stratton. Children receive social skills training in a 2-hr afterschool program for 18–22 weeks. Groups are led by two therapists and include six to seven children. Program content includes units on following school rules, doing one's best in school, coping with feelings, problem solving, anger management, making friends, and engaging in teamwork. The program is illustrated with videotaped vignettes that children watch and then discuss under the direction of their group leaders. Child-size puppets are used to rehearse and role-play program content with children. Children are also engaged in group activities, which are enhanced with cue cards, role-plays, and games. A token economy is instituted, with children earning chips for appropriate behaviors, active participation, and prosocial engagement. Workbooks are given to children to take home for completion with their parents, and suggestions to help families are sent to teachers and parents in regular newsletters.

The teacher program. The teacher program, which is similar in content to the parent program, is taught in four daylong sessions that are spaced throughout the fall and winter of the academic year. Teachers of enrolled children are invited to participate in the program, which consists of topics including building positive relationships with students, strategies to promote parent–teacher collaboration, the importance of positive attention and praise, proactive strategies for preventing problem behaviors, using tangible reinforcement contingencies, limit-setting, time-out, classroom management strategies, and methods for increasing prosocial behavior among students. Teacher's salaries are paid for each day, which has resulted in a 90% acceptance rate. The organizing approach is one of collaboration between group leaders and teachers, who are viewed as experts and are encouraged to contribute to discussions and to offer suggestions to one another. Videotaped vignettes are used as springboards for role-playing alternative behavioral management techniques. Group leaders consult with teachers in developing behavioral management plans for specific children, and they observe classrooms on nontraining days to offer suggested refinements. Group leaders also facilitate parent–teacher conferences to formulate home–school behavior plans.

In total, 317 participant families received PT only, 60 received CT only, 38 received PT and CT, 24 received PT and TT, 23 received CT and TT, and 25 received all three treatment components. In addition, 27 participant families were assigned to a wait-list control condition and received PT after their postassessment.

Child Outcome Measures

Because we wanted to include all families who have received treatment in our clinic over the past 20 years, measures were restricted to those used across all of our treatment outcome studies. This precluded the use of both father-report and teacher-report data, each of which was available for only about half of the sample. Nevertheless, a number of mother-report and observational measures were available for most participants.

Child Behavior Checklist (CBCL). The CBCL (Achenbach, 1991) is a 113-item informant-report measure that yields two broadband factors, Internalizing and Externalizing, and a number of more specific subscales (e.g., Attention Problems, Anxious/Depressed). Behavioral descriptors (e.g., does not seem to feel guilty after misbehaving) are rated by parents across three anchors (0 = *not true*, 1 = *somewhat true*, 2 = *very true*), which are summed for each factor-analytically derived subscale. These scores are then indexed to national norms. For the present study, we used maternal reports of the broadband Externalizing factor as a measure of behavioral outcomes among children. This factor includes the broadest range of problematic behaviors that are targeted by our intervention. In addition, we used the Attention Problems subscale as an index of comorbid hyperactivity–impulsivity, and the Anxious/Depressed subscale as an index of comorbid emotional adjustment. Psychometric properties of the CBCL are well established (see Achenbach, 1991).

ECBI. The ECBI (Robinson et al., 1980) is a 36-item informant-report measure of conduct problems for children ages 2–16 years. Scores from the ECBI correlate well with independent behavioral observations and differentiate between clinic-referred and control children. For the present study, we used mother reports of the Total Behavior Problems score, which is characterized by good internal consistency ($\alpha = .98$) and test–retest reliability ($r = .86$).

Parenting Stress Index (PSI). The PSI (Abidin, 1983; Loyd & Abidin, 1985) is a 101-item parent-report measure of child behavior problems and parental adjustment. Included among the six child subscales is a 5-item Demandingness factor, which assesses behavioral difficulty and oppositionality. This factor was used as an additional index of externalizing behavior. Reliability for the Demandingness factor is adequate ($\alpha = .62$).

Dyadic Parent–Child Interactive Coding System—Revised (DPICS–R). The DPICS–R (Robinson & Eyberg, 1981; Webster-Stratton, 1985) is a well-researched observational measure for evaluating the behaviors of

children with conduct problems and their parents while at home. The measure includes 39 behavioral categories for parents and 8 behavioral categories for children. Previous research has indicated that child behaviors extracted from the DPICS–R correlate adequately with informant-report indices of conduct problems and are sensitive to behavior changes brought about through preventive and interventive efforts (e.g., Reid, Webster-Stratton, & Beauchaine, 2001; Webster-Stratton et al., 1989).

All mothers and children were observed at pretreatment, posttreatment (on average 6 months after their initial assessment), and 1-year follow-up while interacting with one another during (a) two 30-min home visits in which families were instructed to engage in normal activities, (b) a 10-min laboratory free-play session, and (c) a 10-min lab clean-up task. Within each of these conditions, a Total Child Deviance score was extracted from the DPICS–R. This variable was the sum of frequencies of whining, yelling, crying, physical negativity, "smart" talk, aggression, and noncompliance (see Webster-Stratton & Hammond, 1997; Webster-Stratton et al., 2001). Data were averaged for the two home visits before scores for each behavior were standardized and combined to form the Total Child Deviance construct for each condition. Cronbach's αs were .63 for the lab task, .55 for the cleanup task, and .66 for the home visit, averaged across the pretreatment, posttreatment, and 1-year follow-up assessments.

Behavioral observations made with the DPICS–R were conducted by eight trained coders per study. Typically, new coders become reliable compared with experienced coders after 4–6 months of formal training. Reliability data were collected on 20–30% of observations, depending on the study. The average intraclass correlation across studies was .79 (range = .71–.89).

Measures of Putative Predictors–Moderators

PSI. The PSI includes both parent domain and child domain scores, which are summed to yield a total stress score that assesses the overall magnitude of life stress a parent is experiencing. These scores were included because parenting stress has been linked to both child aggression and harsh discipline practices (e.g., Pinderhughes et al., 2000), either of which could affect treatment outcome.

Dyadic Adjustment Scale (DAS). The DAS (Spanier, 1976) is a widely used 32-item self-report measure of marital adjustment and satisfaction. It is reliable across time and setting, and it discriminates between couples who are and are not distressed in their marriages. The Overall Adjustment score was used in this study. This scale was characterized by high internal consistency in the validation sample (α = .96).

Beck Depression Inventory (BDI). The BDI (Beck, 1979) is a thoroughly researched, 21-item self-report inventory of depressive symptoms. The measure is internally consistent, with a split-half reliability of .93. All participating mothers completed the BDI at each assessment point. The BDI was included because of the strong relation between maternal depression and children's adjustment (e.g., Downey & Coyne, 1990).

Parental substance abuse. Both maternal and paternal substance abuse were assessed with two questions, one pertaining to a history of alcohol abuse, and the other to a history of illegal drug abuse. Both questions were coded dichotomously (0 = *no*, 1 = *yes*). These scores were added to form a history of substance abuse index for each parent. Current use was not assessed.

Additional familial predictors. Several additional potential moderators that have been shown to be related to treatment outcome were assessed. These included maternal education level (< Grade 7 through graduate degree), maternal age, maternal relationship status (partnered vs. single), social class (Hollingshead two-factor index; Hollingshead & Redlich, 1958), and family size.

Comorbid child psychopathology. Symptoms of comorbid psychopathology among participant children were assessed with the CBCL. We included the broadband Internalizing score, as well as the Anxiety/Depression and Attention Problems subscales.

Additional child predictors. Finally, children's age and sex were assessed as possible moderators of outcome. As noted above, older children generally fare worse in treatment for conduct problems than younger children (e.g., Dishion & Patterson, 1992; Ruma et al., 1996). Although less is known about sex effects in treatment of conduct problems (Brestan & Eyberg, 1998), higher rates of psychiatric comorbidity have been observed in long-term follow-ups of girls with CD compared with boys (Dalsgaard, Mortensen, Frydenberg, & Thomsen, 2002).

Measures of Putative Mediators

Parenting. Parenting was assessed from both behavioral observations and parent reports. Observational data were collected by means of the DPICS–R during the 30-min home observations. The DPICS–R contains 39 codes for a wide range of parenting behaviors. These categories were reduced by subjecting posttreatment scores to exploratory factor analysis (EFA) with Varimax orthogonal rotation. We chose to perform the EFA on parenting at posttreatment rather than at baseline because a large portion of the intervention addressed parenting skills for most families. Given our previous research demonstrating significant improvements in parenting following treatment (e.g., Webster-Stratton et al., 2004), posttreatment scores should reflect a wider range of parenting behaviors, including more positive strategies than might be found at pretreatment. The EFA suggested three primary factors, which accounted for 20%, 17%, and 12% of the variance in parenting behavior. Items with loadings of .40 or higher were retained to form three parenting behavior scales, one corresponding to each factor. These scales included (a) six items related to verbal criticism (e.g., critical statements, negative commands), (b) six items related to supportive parenting (e.g., labeled praise, reflective statements), and (c) seven items related to ineffective parenting (e.g., warnings with no opportunity to comply, lack of follow-through with consequences).[2] Cronbach's αs were .86, .77, and .60, respectively, suggesting adequate reliability.

In addition to the home observations, we used the Daily Discipline Inventory (DDI; Webster-Stratton & Spitzer, 1991) to interview mothers twice by phone about their parenting strategies at each assessment point. The DDI consists of a list of 19 negative and 19 prosocial behaviors commonly exhibited by children. At baseline, mothers selected those behaviors that they perceived as problems for their child. These individually tailored checklists were then used as the basis for phone calls conducted twice at baseline, twice immediately postintervention, and twice at 1-year follow-up. During the phone calls, mothers were asked to report on the occurrence or nonoccurrence of the target behaviors for the previous 24 hr. If the behavior occurred, then the mother was asked how she handled the problem. These discipline responses were then coded into 1 of 75 categories. To reduce the DDI data, we conducted a second EFA, which yielded three dominant factors, two of which corresponded closely with factors obtained from the DPICS–R. Items with loadings above .40 were again retained, producing a six-item Verbal Criticism factor (e.g., disapprove, criticize, humiliate) and a seven-item Supportive Parenting factor (e.g., reason, discuss, verbal responses to feelings). The third factor consisted of six items related to Harsh Parenting (e.g., slap, spank, hit, restrain; see Footnote 2). These factors accounted for 14%, 12%, and 13% of the variance in DDI scores, respectively. Cronbach's αs were .62, .59, and .59.

Dosage. A second variable that was expected to mediate outcome was treatment "dosage." To the extent that a treatment is effective, children in families receiving more should experience the most behavior change. We assessed dosage in two ways. One was to count the number of parent training sessions attended by each mother. Although attendance rates were

[2] The complete set of items composing each factor is available from the authors upon request.

quite high for the sample (90%), the number of sessions offered across studies ranged from 0 for the CT- and TT-only conditions to 25 for some of the enhanced PT conditions. Even within PT conditions, the number of sessions offered ranged from 10 to 25. Consequently, there was adequate variability in the number of sessions attended to index dosage. Second, we examined whether the number of treatment components received by a family mediated outcome. As noted above, all families received either PT and/or CT, and some families also received TT. Thus, depending on the study, families received either one, two, or three components. We therefore constructed an additive vector in which a value of 1 was assigned for each component received, on the basis of our research demonstrating that each treatment is effective in isolation (Webster-Stratton et al., 2004).

Results

Missing Data

Data for at least one child outcome variable were missing for 30 families at pretreatment (5.8%), 53 families at posttreatment (9.7%), and 147 families at 1-year follow-up (28.6%). To accommodate this without dropping cases, we used full information maximum likelihood estimation. Under most conditions, this approach produces less biased parameter estimates than alternatives in the presence of missing data (Schafer, 1997). Nevertheless, analyses were also conducted in which all families with missing data were dropped. The pattern of results from the latent growth models, presented below, remained unchanged.

Latent Growth Curve Models (LGMs) of Child Behavior

We assessed treatment response among children by constructing LGMs of externalizing behavior using AMOS 4.0 (Arbuckle & Wothke, 1999). Separate models were constructed for the mother-report and behavior observational data, both of which were collected at pretreatment, posttreatment (6 months from pretreatment, on average), and 1-year follow-up. Growth curve models offer several advantages over traditional methods of assessing change. First, by including all available measurement points in outcome assessments, growth functions offer enhanced reliability over simple pre–post assessment designs (Rogosa, Brandt, & Zimowski, 1982). This in turn yields increased sensitivity for detecting behavioral change (Speer & Greenbaum, 1995). Moreover, growth curves avoid the inflation of Type I error associated with repeated measures analysis of variance (Hertzog & Rovine, 1985; Vasey & Thayer, 1987). Finally, LGMs allow multiple outcome measures to be combined in a single analysis.

The choice to model mother-report and observational data in separate LGMs was based on accumulating evidence that diverse sources of information provide unique yet valid inferences about children's behavior across different contexts (see Keiley, Lofthouse, Bates, Dodge, & Pettit, 2003; Youngstrom, Findling, & Calabrese, 2003). In an LGM combining mother reports and observational measures, such unique variance would be assigned to prediction error, given the core assumption in structural modeling that all measured indicators mark the same latent construct. Thus, we elected to model mother-report and observational data separately, each with multiple measures (see below).

Mother report. Scores from the CBCL Externalizing factor, the ECBI Total Behavior Problems scale, and the PSI Demandingness factor were combined to form a latent conduct problem construct based on mother reports (see Figure 1). In this curve-of-factors LGM, loadings of each measured index on latent constructs were constrained to be equal at each assessment point, as indicated by the path labels. The path from CBCL scores to the latent externalizing construct, for example, was constrained as equal across time points, thereby meeting the factor loading invariance requirement of the LGM model (see Duncan, Duncan, Strycker, Li, & Alpert, 1999). As also indicated in Figure 1, intercepts and slopes were extracted from the externalizing constructs across pretreatment, posttreatment, and 1-year follow-up. These were used as estimates of (a) baseline functioning and (b) improvement or decline in symptom severity across the 12-month period. As is typical in longitudinal structural models, correlated error terms across time points were allowed for each measure (see Hoyle & Smith, 1994). However, error terms were not allowed to correlate across measures. The LGM curve-of-factors model of mother-report externalizing symptoms provided an adequate fit, $\chi^2(20, N = 514) = 20.1$, $p = .45$, comparative fit index = 1.00, RMSEA = .011, minimum discrepancy function/degrees of freedom (CMIN/DF) = 1.06, and all factor loadings were significant (all ts > 15.2, all ps $< .001$). The correlation between the externalizing intercept and slope was not significant at $-.02$. Although baseline symptoms are often predictive of outcome, all participants in the present study were selected for elevated externalizing symptoms. Thus, there was a restricted range of intake symptoms for growth trajectories to map onto. A significant variance term for the latent slope parameter suggested that a multilevel random coefficients model was appropriate for evaluating change in maternal reports of child behavior.

Behavior observations. Child negative behaviors exhibited during (a) the lab free-play session, (b) the lab clean-up task, and (c) the two home visits were used as indicators of a latent externalizing construct based on DPICS–R observational data. In each setting, five measures of negative behavior from the DPICS–R were combined. These included negative physical actions (e.g., hit); destructive behaviors (e.g., break or throw object); yelling, crying, and whining; "smart" talk; and overall behavioral valence, rated on a 5-point scale. For this last category, observers paused every 5 min to code parental valence on a scale ranging from *exuberant affect* (1) to *unrestrained negative affect* (5). Scores for each behavior were standardized before being combined. Cronbach's αs, averaged across pretreatment, posttreatment, and 1-year follow-up assessments, were .63 for the lab task, .55 for the cleanup task, and .66 for the home visits.

The LGM model of DPICS–R observations of externalizing behaviors was parallel in structure to the model presented in Figure 1 for the mother-report data. Once again, loadings of each behavioral index on latent constructs were constrained to be equal at each assessment point, and correlated error terms were allowed within, but not across, measures. The curve-of-factors model provided an adequate fit, $\chi^2(20, N = 514) = 24.1$, $p = .26$, comparative fit index = .998, RMSEA = .023, CMIN/DF = 1.27, and all factor loadings were significant (all ts > 5.1, all ps $< .001$). As with the mother-report model, the correlation between the externalizing intercept and slope was not significant at .22. A significant variance term for the latent slope parameter suggested that a random coefficients approach was appropriate for

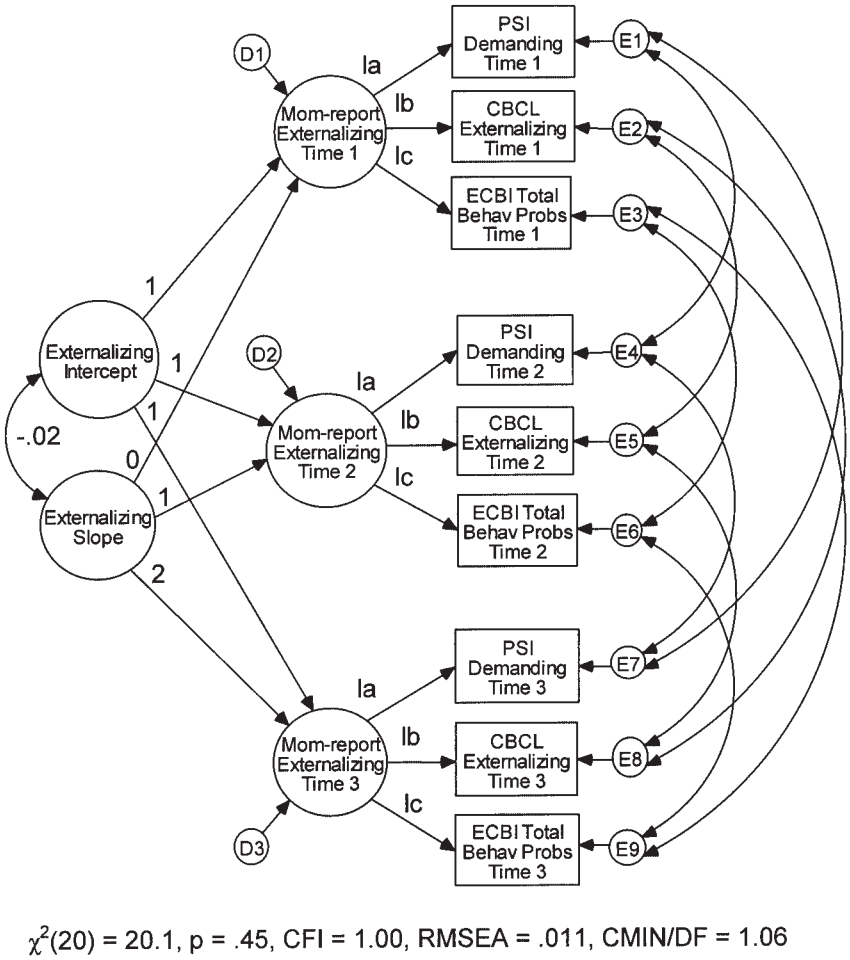

Figure 1. Latent growth model for maternal reports of externalizing behaviors. Matching labels mark path coefficients that were constrained to be equal across assessment points. PSI = Parenting Stress Index; Demanding = Demandingness; CBCL = Child Behavior Checklist; ECBI = Eyberg Child Behavior Inventory; Behav Probs = behavior problems; D = disturbance; E = error.

modeling change in observational measures of child externalizing behavior.

Effect Sizes and Intercorrelations Among Variables

Because interpreting latent slope and intercept parameters is not straightforward, we report pretreatment, posttreatment, and 1-year follow-up scores for (a) all manifest indicators in the LGM models, and (b) each parenting factor in Table 1. Effect sizes in behavior change from baseline to 1-year follow-up are also included, which ranged from $d = .33$ for observations of child behavior during free play to $d = 1.59$ for mother-reported behavior problems on the ECBI. Thus, 1-year effect sizes for the child and parent variables were medium to large by Cohen's (1988) standards.

Intercorrelations among the child externalizing variables included in the LGMs appear in Table 2. In general, correlations were significant ($p \leq .01$) within, but not across, mother-report and observational measures. In addition, correlations within the mother-report measures tended to be higher than correlations within the observational measures.

Intervening Variable Analyses

Predictive effects of pretreatment parent and child characteristics. We tested predictive effects of child outcomes by including each putative predictor in the LGMs, one at a time, and observing their concurrent strength of association with the latent intercept and slope parameters. This process allowed us to assess the impact of each variable on treatment response (slopes) while controlling for baseline symptom levels (intercepts). A significant path from a variable to the latent slope parameter confirms a predictive relation to treatment outcome.

Results are presented with descriptive statistics for each variable in Table 3. Because of the large number of path coefficients tested, only findings at or below the $p = .01$ level of significance are interpreted. For the mother-report data, no significant positive associations between the putative predictors and externalizing slopes were found. Rather, significant negative relations were observed between growth in externalizing symptoms and maternal age, paternal substance use history, and CBCL Anxiety/Depression. Because negative slopes suggest improvement, higher

Table 1
Means (and Standard Deviations) of Baseline, Posttreatment, and 1-Year Follow-Up Scores for Selected Child and Parent Variables

	Baseline	Posttreatment	1-year follow-up	1-year effect size (*d*)	*t* ratio	*p*
LGM child variable (mother report)						
CBCL Externalizing *T*	68.14 (7.89)	61.09 (9.52)	58.79 (10.25)	1.03	20.12	<.001
PSI Demandingness	28.63 (5.25)	25.24 (5.78)	24.24 (5.95)	0.78	15.80	<.001
ECBI Total Behavior Problems	21.43 (5.80)	13.48 (7.17)	11.07 (7.22)	1.59	26.66	<.001
LGM child variable (observation)						
Negative behaviors during free play	5.88 (9.97)	3.84 (5.35)	3.25 (5.79)	0.33	4.03	<.001
Negative behaviors during clean-up	1.85 (2.50)	1.30 (2.26)	0.96 (1.87)	0.41	5.28	<.001
Negative behaviors during home visit	18.35 (18.46)	13.21 (11.56)	10.79 (8.85)	0.55	7.70	<.001
Parenting factor (lab visit)						
Verbal Criticism	54.31 (39.66)	38.80 (27.81)	35.55 (25.00)	0.58	10.21	<.001
Supportive Parenting	37.62 (23.55)	48.30 (31.71)	50.55 (30.92)	0.47	9.47	<.001
Ineffective Parenting	2.21 (2.43)	1.52 (1.75)	1.32 (1.79)	0.42	6.43	<.001
Parenting factor (self-report)						
Verbal Criticism	5.52 (4.88)	3.21 (3.49)	3.05 (3.45)	0.59	8.82	<.001
Supportive Parenting	3.44 (3.36)	4.17 (3.75)	5.52 (4.20)	0.59	8.90	<.001
Harsh Parenting	4.51 (3.50)	3.37 (3.31)	2.55 (2.62)	0.64	9.12	<.001

Note. LGM = latent growth curve model; CBCL = Child Behavior Checklist; PSI = Parenting Stress Index; ECBI = Eyberg Child Behavior Inventory.

scores on each of these predictors were associated with larger treatment responses. It is noteworthy that children of a father with a history of substance abuse and children with comorbid internalizing symptoms responded better to treatment.

For the observational measures, only two significant predictive relations were found: a negative association between externalizing slopes and CBCL anxiety/depression, replicating the mother-report data, and a positive association between externalizing slopes and a history of maternal substance abuse. This latter finding suggested that children of mothers with substance abuse histories responded better to treatment than children of mothers with no such history. This mirrored a similar finding from the mother-report data of paternal substance abuse and replicates data from our prevention work with Head Start samples (Reid et al., 2004). These effects are depicted with other selected predictor–treatment outcome relations in Figure 2.

Moderating effects of pretreatment parent and child characteristics. We tested moderating effects by examining the interaction between treatment condition and each putative moderator in predicting externalizing slopes. Treatment status was indicated by means of weighted contrast codes to control for differences in the sizes of intervention groups (see Pedhazur, 1982; Serlin & Levin, 1985). Three such contrasts were coded, including (a) whether treatment included parent training (PT, PT + CT, PT + TT, PT + CT + TT vs. all other groups), (b) whether treatment included child training (CT, CT + PT, CT + TT, CT + PT + TT vs. all other groups), and (c) whether treatment included teacher training (TT + PT, TT + CT, TT + PT + CT vs. all other groups). These vectors were then multiplied by each putative moderator to form an interaction term (see West, Aiken, & Krull, 1996). Next, the interaction terms were inserted into the LGMs, one at a time, and their strength of association with the latent externalizing slope parameter was assessed. In this context, a significant path indicates that the moderator–externalizing slope relationship differs across contrasted groups. Intercepts were not included in these models because participants were randomly assigned to conditions. Thus, systemic relations between the putative moderators and treatment condition were not expected. It should be noted that the three contrasts were not independent. Rather, each compared interventions including one particular form of treatment (PT, CT, or TT) to interventions without that form of treatment. This approach was chosen because it offered meaningful contrasts while preserving adequate power for testing moderating effects. Comparing all 21 cohorts against one another would have resulted in both underpowered contrasts and a prohibitively large number of pairwise comparisons.

Results of the moderational analyses are reported in Table 4. Once again, only path coefficients that were significant at $p \leq .01$ are interpreted. According to the mother-report LGMs, significant moderational effects were found for marital satisfaction. As illustrated in Figure 3, differential treatment responses were observed across conditions for children of mothers who reported DAS scores below, versus above, the sample median. Although all groups improved at similar rates from pre- to posttreatment, interventions including PT resulted in better 1-year outcomes than interventions without PT for children of mothers reporting low marital satisfaction. The mother-report LGMs also indicated a significant moderational effect for children's comorbid anxiety/depression. Interventions including PT resulted in the better 1-year outcomes than interventions without PT for children scoring below the sample median of $T = 56$ on the CBCL Anxious/Depressed subscale (see Figure 3). In contrast, similar outcomes were observed regardless of treatment approach for children scoring above the median.

Several moderational effects were also found in the LGMs of behavior observations. Although not pictured to conserve space, children of mothers scoring above the sample median of 8 on the BDI fared better in conditions that included PT or CT than in conditions that did not include PT or CT. A parallel pattern was observed for children of fathers with a history of substance abuse. Furthermore, a significant PT coefficient for marital status indicated that children of unpartnered mothers fared better when PT was included in their treatment than when it was not. This effect is depicted in Figure 3. Both CBCL Attention Problems and social

Table 2
Intercorrelations Among Manifest Indicators of Child Behavior Included in the Latent Growth Curve Models

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Mother report																		
1. CBCL Externalizing Time 1	—	.62**	.56**	.48**	.33**	.32**	.39**	.27**	.26**	.04	.04	.02	−.03	.01	.03	.07	.01	.03
2. CBCL Externalizing Time 2		—	.59**	.35**	.56**	.37**	.26**	.56**	.37**	−.04	−.02	.03	−.07	.05	.04	−.04	.08	.05
3. CBCL Externalizing Time 3			—	.35**	.37**	.58**	.23**	.34**	.58**	.09	.02	.02	.01	.08	.11**	.03	.06	.06
4. PSI Demandingness 1				—	.58**	.53**	.35**	.27**	.28**	.01	.02	.00	.00	−.01	.03	.07	−.04	.08
5. PSI Demandingness 2					—	.57**	.25**	.56**	.40**	−.05	.00	−.01	−.04	.07	.04	.02	.04	.06
6. PSI Demandingness 3						—	.25**	.36**	.61**	.05	.01	−.02	.00	.06	.09	.01	.02	.11**
7. ECBI Total Behavior Problems 1							—	.39**	.33**	.03	.02	−.04	.07	−.09	−.01	.10	.02	.07
8. ECBI Total Behavior Problems 2								—	.51**	−.06	.00	.04	−.01	.07	.02	.01	.10	.10
9. ECBI Total Behavior Problems 3									—	.06	.03	.05	.02	.05	.06	.03	.05	.06
Behavior observation																		
10. Negative behaviors: Free Play 1										—	.32**	.26**	.34**	.17**	.09	.12**	.20**	.18**
11. Negative behaviors: Free Play 2											—	.13**	.20**	.39**	.12**	.11**	.13**	.09
12. Negative behaviors: Free Play 3												—	.17**	.06	.30**	.02	.09	.21**
13. Negative behaviors: Clean-Up 1													—	.20**	.23**	.12**	.15	.11**
14. Negative behaviors: Clean-Up 2														—	.08	.11**	.09	.06
15. Negative behaviors: Clean-Up 3															—	.02	.07	.12**
16. Negative behaviors: Home Visit 1																—	.22**	.23**
17. Negative behaviors: Home Visit 2																	—	.28**
18. Negative behaviors: Home Visit 3																		—

Note. CBCL = Child Behavior Checklist; PSI = Parenting Stress Index; ECBI = Eyberg Child Behavior Inventory.
** $p \leq .01$.

Table 3
Predictive Effects of Pretreatment Family and Child Risk Factors on Latent Growth Trajectories in Maternal Reports and Observational Measures of Externalizing Behavior

Independent variable	Mean (*SD*)	Standardized parameter estimate in LGM predicting slopes of externalizing behavior	
		Mother report	Behavior observations
Family predictors			
Parenting Stress Index Life Stress	282.6 (38.7)	−.090	−.019
Dyadic Adjustment Scale	105.6 (49.7)	−.151	−.034
Beck Depression Inventory	8.8 (6.8)	.011	−.068
Maternal substance use	0.3 (0.6)	−.011	−.172**
Maternal education[a]	2.7 (1.0)	−.169	.029
Maternal age in years	35.2 (6.0)	−.210**	−.110
Number of children in household	2.0 (0.9)	−.033	.013
Social class (Hollingshead score)	32.7 (16.3)	−.150	−.112
Paternal substance use	0.5 (0.8)	−.466***	.106
Marital status[b]		.012	.110
Child predictors			
CBCL Anxiety/Depression	59.2 (9.0)	−.326***	−.171**
CBCL Attention Problems	61.5 (7.9)	−.113	.066
Age in months	64.7 (15.5)	−.062	.067
Sex[c]		−.021	.132

Note. LGM = latent growth curve model; CBCL = Child Behavior Checklist.
[a] Average education of high school graduate. [b] 0 = single, 1 = partnered; 164 mothers were single at study entry. [c] 0 = female, 1 = male.
** $p < .01$. *** $p < .001$.

class also moderated outcomes in the observational LGMs. In the former case, children scoring above the sample median of $T = 61$ on CBCL Attention Problems achieved better long-term outcomes when TT was included in their treatment (see Figure 3). In the case of social class, children from semiskilled and unskilled families who received an intervention including PT or CT responded better than children who received an intervention that did not include these components.

Mediating effects of treatment dosage. Mediating effects of treatment dosage on child outcomes were assessed in two ways. We evaluated the effect of the number of treatment components on outcome by testing its strength of association with externalizing slopes in both the mother-report and observational LGMs. This strategy is depicted in Figure 4 (Panel 1). Note that intercepts were not included as predictors of dosage in these models because the number of treatment components received was not dependent on baseline symptom levels. This is because participants were assigned randomly to groups and recruited by means of identical procedures. Furthermore, externalizing intercepts were unrelated to externalizing slopes in the original LGMs (see above). For these reasons, the direct path from the number of treatment components to externalizing slopes provided an unbiased estimate of the impact on treatment response. As expected, the mother-report data suggested that more treatment components were related to better child outcomes, as indexed by a path coefficient of −.132 ($z = 2.36$, $p < .01$). Thus, participation in more treatment components resulted in greater improvement for children, reflected in greater reductions in externalizing behavior. No such relation was found for the observational data, for which the analogous path coefficient was −.050 ($z = 0.39$, *ns*).

Testing the effects of maternal attendance required the inclusion of externalizing intercepts in the mediational models. This is because higher initial rates of externalizing behavior could elicit greater parental attendance. Left uncontrolled, such an effect could lead to the erroneous conclusion that maternal attendance predicts worse outcome. For this reason, we used the modeling strategy depicted in the lower left panel of Figure 4 to test the mediational effect of maternal attendance on externalizing slopes. Once again, the direct effect of externalizing intercepts on externalizing slopes was omitted because it was not significant in the original LGMs. Maternal attendance was unrelated to both externalizing intercepts and externalizing slopes across both self-report and observational analyses. This may reflect a ceiling effect because maternal attendance was quite high for the sample as a whole (90% of sessions were attended). We return to this possibility later.

Predictive and mediating effects of parenting. In contrast to the dosage variables, parenting behaviors were measured at all three assessment points, providing an opportunity to model more dynamic intervening variable effects. Thus, we constructed models in which both the moderating effect of intercepts in parenting behavior and the mediating effect of slopes in parenting behavior on children's externalizing outcomes were assessed. In these models, we sought to control for confounding sources of influence on slopes in both parent and child outcomes, including (a) baseline parenting on parenting slopes, (b) baseline externalizing symptoms on baseline parenting, and (c) cross-lag influences of externalizing symptoms on parenting slopes. Once again, direct paths from externalizing intercepts to externalizing slopes were not included because they were nonsignificant in the original LGMs. This analytic framework is depicted in Figure 4 (Panel 3). Note that these models assess the independent predictive and mediating effects of parenting at intake (Path *b*) and changes in parenting during the course of treatment (Path *a*), respectively, on children's externalizing behaviors.

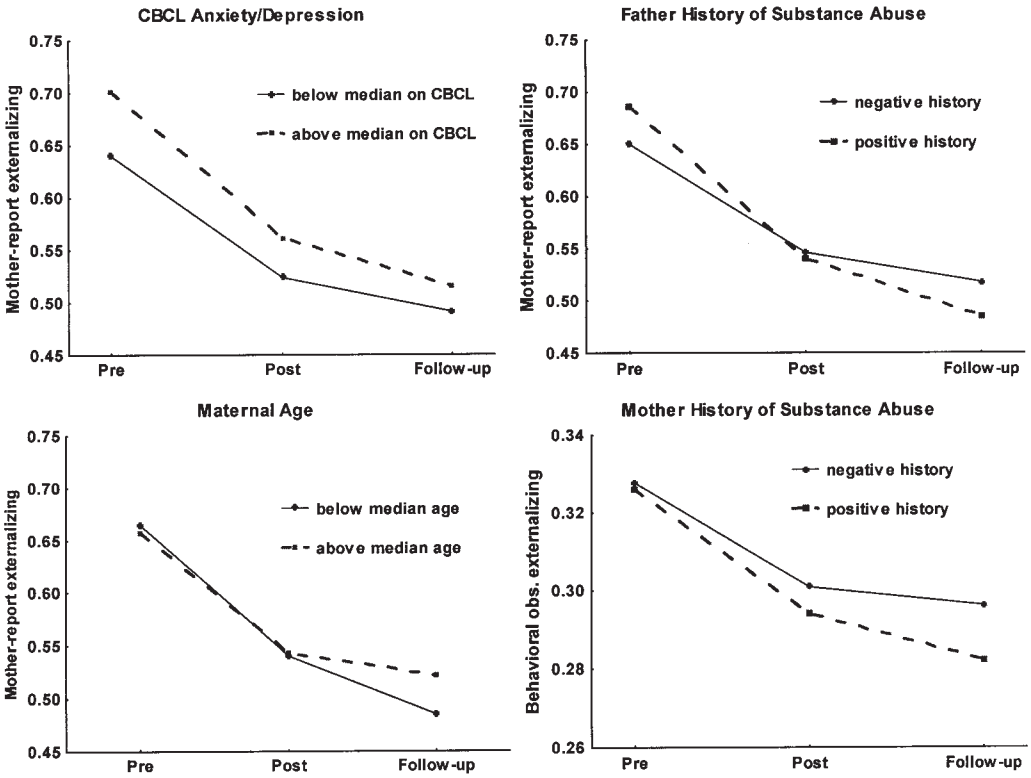

Figure 2. Selected predictors of treatment response. Top left: One-year outcomes in mother-report externalizing behavior for children above and below the median Child Behavior Checklist (CBCL) Anxiety/Depression score of $T = 58$. Top right: One-year outcomes in mother-report externalizing behavior for children of fathers with and without a history of substance abuse. Bottom left: One-year outcomes in mother-report externalizing behavior for children of mothers above and below the median sample age of 35 years. Bottom right: One-year outcomes in observations (obs.) of externalizing behavior for children of mothers with and without a history of substance abuse. Externalizing symptoms at each assessment point were indexed by the proportion of observed scores for each child to the maximum score on each measure, averaged across the Parenting Stress Index, CBCL, and Eyberg Child Behavior Inventory for mother reports, and across the home visit, lab free-play task, and lab clean-up task for the behavioral observations. Pre = pretreatment; Post = posttreatment.

Results are reported in Table 5. Before interpreting the effects of parenting on externalizing outcomes, we should note that parenting slopes were highly dependent on baseline parenting scores (*y* paths), with the largest improvements observed in parents who were the most symptomatic at intake. This is a common finding in treatment outcome research. Not surprisingly, children's externalizing scores at intake were also predictive of baseline parenting in several of the models (Path *z*). In other words, children with more symptoms had mothers with more problematic parenting. Furthermore, children's baseline externalizing behavior affected parenting slopes on several variables (*x* paths). Here the direction of effects suggested that higher externalizing intercepts were associated with positive slopes in parenting, or a less favorable response to treatment. The one exception was for mother reports of supportive parenting, where high externalizing scores at baseline predicted a better treatment response. Thus, as expected, parenting behavior was affected by child behavior. Nevertheless, baseline parenting and slopes in parenting were significant predictors of child outcome in two of the mother-report and two of the observational models. For the mother-report data, both intercepts and slopes in DDI Verbal Criticism and DDI Harsh Parenting accounted for significant variance in externalizing slopes. For the observational data, similar relations were found for both the DPICS–R Verbal Criticism and the DPICS–R Ineffective Parenting constructs. Each of these parenting variables therefore served as both a predictor and a mediator of treatment outcome. Because it is difficult to conceptualize concurrent trivariate relations among variables, we plotted the least-squares regression planes for each of the significant effects. Examples appear in Figure 5. In each case, the largest reductions in children's externalizing behavior were observed for participant dyads with mothers who scored relatively low on the problematic parenting constructs at baseline and improved during the course of treatment. Thus, neither low baseline scores nor improvement in parenting were sufficient to produce maximum change in children's externalizing behaviors; both were required.

Discussion

There were two primary objectives of this study. The first was to assess predictive and moderating effects of family and child

Table 4
Moderating Effects of Pretreatment Family and Child Risk Factors on Latent Growth Trajectories in Maternal Reports and Observational Measures of Externalizing Behavior

	Standardized parameter estimate in LGM predicting slopes of externalizing behavior					
	Mother report			Behavior observations		
Independent variable	PT	CT	TT	PT	CT	TT
Family moderators						
Parenting Stress Index Life Stress	−.109	−.101	.044	−.011	−.042	−.035
Dyadic Adjustment Scale	−.215***	−.214***	−.219***	−.106	−.048	−.074
Beck Depression Inventory	−.054	−.056	.044	−.070	.138	.218**
Maternal substance use	−.031	−.060	−.023	.102	.039	.103
Maternal education[a]	−.139	−.108	−.072	.001	.018	.026
Maternal age in years	−.099	−.110	−.040	−.011	.025	.028
Number of children in household	−.063	−.074	−.068	−.032	.168	.014
Social class (Hollingshead score)	−.128	−.097	−.071	.029	−.108	−.204**
Paternal substance use	−.026	−.039	−.069	.081	.136	.182**
Marital status[b]	−.044	.153	.103	−.191**	−.159	−.184**
Child moderators						
CBCL Anxiety/Depression	−.238***	−.083	−.055	.020	−.129	.055
CBCL Attention Problems	−.128	−.097	−.052	.055	.015	−.190**
Age in months	−.135	−.102	−.065	−.023	.010	−.008
Sex[c]	−.109	−.068	−.012	.030	.064	.054

Note. LGM = latent growth curve model; CBCL = Child Behavior Checklist; PT = parent training; CT = child training; TT = teacher training.
[a] Average education of high school graduate. [b] 0 = single, 1 = partnered; 164 mothers were single at study entry. [c] 0 = female, 1 = male.
** $p < .01$. *** $p < .001$.

characteristics on 1-year outcomes for a large sample of children treated with empirically supported interventions for conduct problems. Several significant predictive relations were found. In the mother-report models, more positive treatment responses were observed, as indexed by steeper externalizing slopes, in children of younger mothers, children of fathers with substance abuse histories, and children with comorbid symptoms of anxiety/depression. Comorbid anxiety/depression was also a significant predictor of outcome in the behavior observation models, as was a history of maternal substance abuse, which was associated with better treatment response.

Better long-term outcomes in children of younger mothers were not expected given well-established relations between early motherhood, compromised parenting, and externalizing behaviors. However, most research addressing links between maternal age and child behavior problems has focused on teen mothers, whereas the median age of mothers in our sample was 35. Others have observed less maternal sensitivity and greater difficulties with parenting among older, as opposed to younger, mothers following intervention (Summers, 2002). One possible explanation is that older mothers have more children and therefore less patience to cope with disruptive behaviors. However, there was no significant relation between maternal age and family size in the present sample ($r = -.07$, $p = .12$). An alternative possibility is that the behavioral repertoires of younger mothers are more malleable, resulting in improved parenting and greater reductions in child conduct problems. If this is the causal mechanism through which the maternal age effect was expressed, additional services might be offered to older mothers, including booster sessions and more opportunities to practice newly acquired parenting skills. Maternal age was positively and significantly correlated with slopes in both harsh ($r = .14$, $p < .01$) and critical ($r = .14$, $p = .01$) parenting, suggesting less improvement in parenting following intervention for older mothers.

Relations between parental substance abuse and more favorable child outcomes also ran counter to expectation. Although we are aware of no studies that have examined parental substance use histories as predictors of treatment response among children with conduct problems, conventional wisdom suggests that substance-abusing mothers and fathers might be less supportive of changes in family functioning brought about by CT, and more resistant to implementing skills taught through PT. Any such resistance should reduce the effectiveness of the intervention (e.g., Patterson & Chamberlain, 1994). On the other hand, parents who once abused substances but no longer do may have considerable opportunity to improve their parenting. Exploratory analyses examining relations between parental substance use histories and the six parenting factors indicated only one significant correlation, with paternal substance use predicting reductions in maternal reports of critical parenting ($r = -.13$, $p = .02$). Although this suggests parenting change as a possible mechanism for behavioral improvement among children of fathers with substance abuse histories, the effect was not large. Identification of additional mechanisms will require more detailed assessment of parental substance use in future studies.

The finding that elevated CBCL Anxious/Depressed scores predicted greater response to treatment came as less of a surprise. Although anxious/depressed children were more symptomatic on indices of externalizing behavior at baseline, they improved more rapidly than children with nonelevated Anxious/Depressed scores, with no significant difference in outcome at 1-year follow up. This is consistent with reports that some children with comorbid conduct problems and depression are more responsive to treatment than children with conduct problems alone (e.g., Beauchaine et al.,

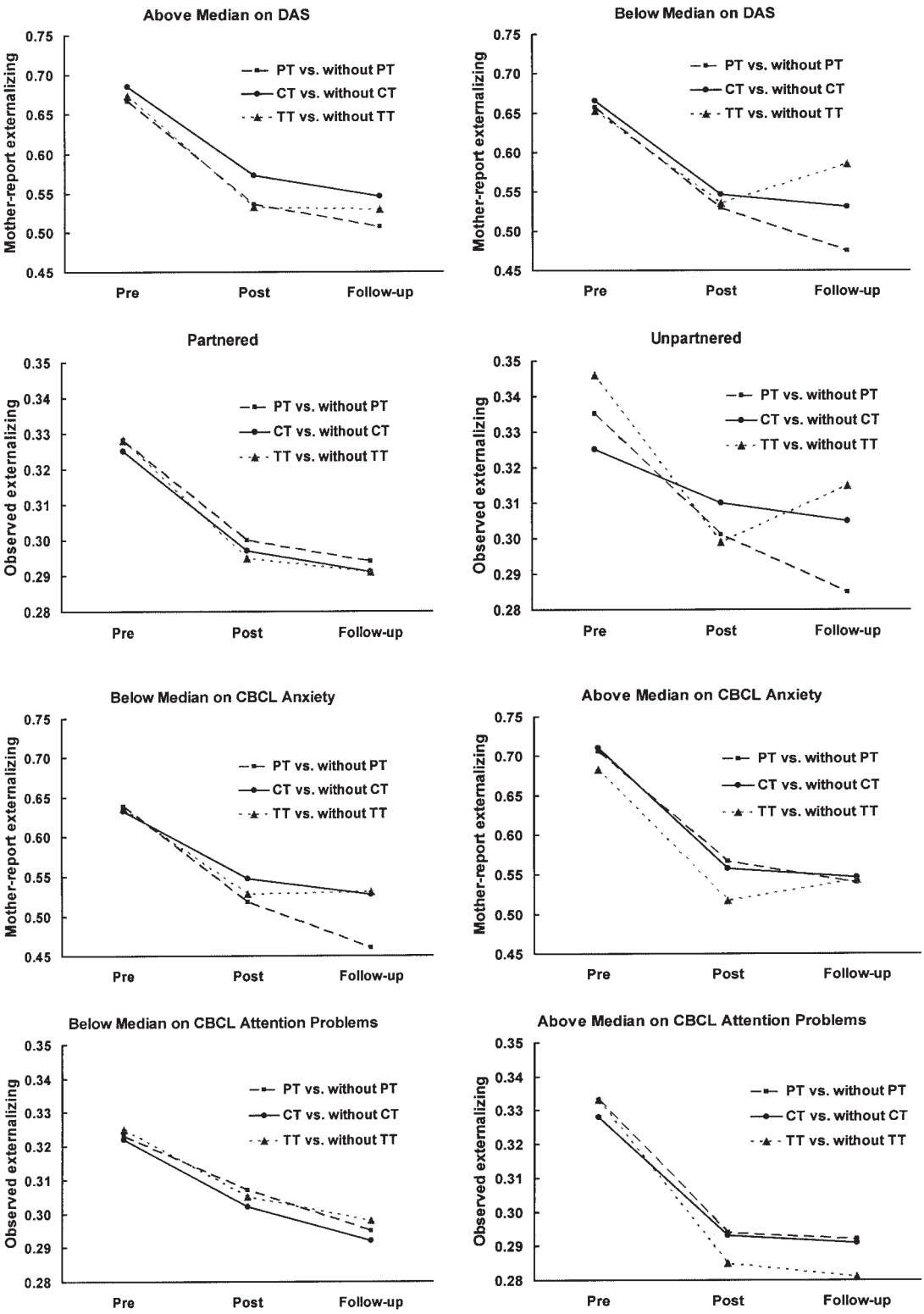

Figure 3. Selected moderators of treatment response. Row 1: One-year outcomes for children of mothers scoring above and below the sample median on marital adjustment. DAS = Dyadic Adjustment Scale. Row 2: One-year outcomes of children of partnered and unpartnered mothers. Row 3: One-year outcomes of children scoring below and above the sample median on the Child Behavior Checklist (CBCL) Anxious/Depressed subscale. Row 4: One-year outcomes of children scoring below and above the sample median on the CBCL

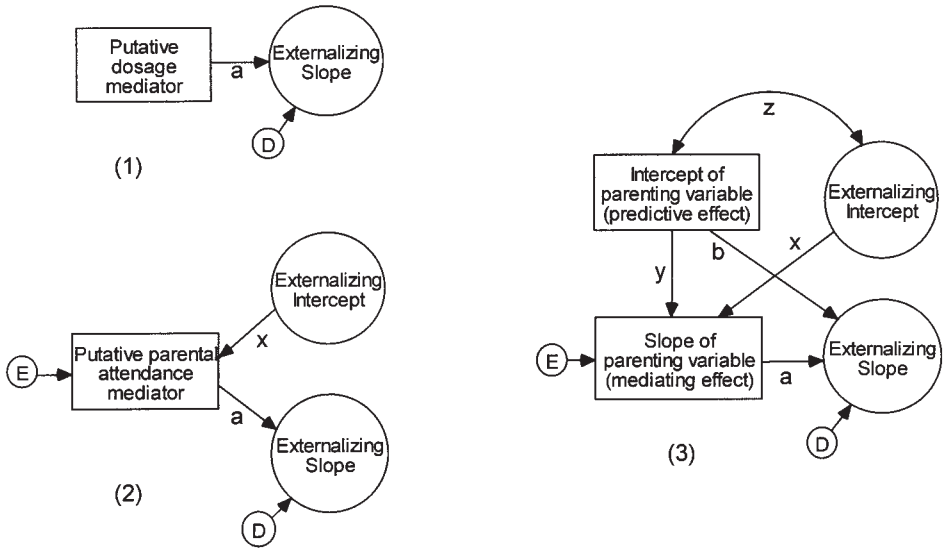

Figure 4. Framework for testing dosage effects (Panel 1), parental attendance effects (Panel 2), and parenting slopes (Panel 3) as mediators of externalizing outcomes among participant children. Path *a* represents the mediational relation and is analogous across models. Path *x* (Panel 2) was included to control for baseline child behavior on maternal attendance. Path *b* (Panel 3) was included to assess the predictive effect of baseline parenting on externalizing slopes. Paths *y* and *z* were included to control for the potential confounding effects of baseline parenting on parenting slopes and baseline child externalizing behavior on baseline parenting. D = disturbance; E = error.

2000). Findings such as these are encouraging given the generally poor long-term outcomes associated with comorbid CD and depression (Capaldi, 1991). Early intervention may hold considerable promise in preventing such trajectories.

Several moderational relations were also found. In the mother-report models, low marital adjustment was associated with better 1-year outcomes for families who received an intervention including PT. Although group differences were not apparent at the posttreatment assessment point, children of mothers reporting low marital adjustment who received PT improved more at 1-year follow-up than children who received an intervention without PT. This suggests that PT should be included in interventions for conduct problems when marital satisfaction is low. Moreover, evidence suggests that targeting marital satisfaction directly enhances the effects of PT. Ireland, Sanders, and Markie-Dadds (2003) reported concurrent positive effects on marital satisfaction and child behavior problems when sessions addressing interparental communication, support, and problem solving were added to standard PT.

Symptoms of comorbid anxiety/depression also moderated treatment outcome in the mother-report models. Interventions including PT were the most effective for children who scored below the median on the CBCL Anxious/Depressed subscale, whereas all intervention combinations were equally effective for children with elevated Anxious/Depressed scores. Some authors have argued that therapeutic leverage is difficult to establish in children with conduct problems who are low on trait anxiety, and that inability to experience emotional distress predicts particularly poor outcomes (Pardini, Lochman, & Frick, 2003). For children higher on trait anxiety, social rewards and reprisals such as those used by CT therapists and teachers may be sufficient to bring about behavioral change. In contrast, low-anxiety children may be optimally responsive to interventions that focus on altering instrumental operant contingencies within the home. Although speculative, this could explain the better treatment response observed among children low on anxiety/depression who received PT.

In the behavior observation models, maternal depression, social class, paternal substance abuse, marital status, and comorbid attention problems each moderated treatment response. For maternal depression, optimal 1-year outcomes were observed among children who received PT or CT when their mothers scored above the sample median on the BDI. This suggests that PT and/or CT should be included when intervening with children of mothers who are even moderately depressed. By its very nature, TT provides less in terms of coping skills for managing and improving parent–child relationship quality than either PT or CT. Moreover, mater-

Attention Problems subscale. Externalizing symptoms at each assessment point were indexed by the proportion of observed scores for each child to the maximum score on each measure, averaged across the Parenting Stress Index, CBCL, and Eyberg Child Behavior Inventory for mother reports, and across the home visit, lab free-play task, and lab clean-up task for the behavioral observations. PT = parent training; CT = child training; TT = teacher training.

Table 5
Effects of Baseline Parenting and Changes in Parenting on Latent Growth Trajectories in Externalizing Behavior

	Mediational path coefficient	Predictive path coefficient	Control path coefficients		
Variable	*a*	*b*	*x*	*y*	*z*
Mother-report models					
DDI Supportive Parenting	−.122	−.028	.248**	−.775***	−.327**
DPICS–R Supportive Parenting	−.133	−.055	.007	−.207***	−.089
DDI Verbal Criticism	.337**	−.300**	.197***	−.795***	.424**
DPICS–R Verbal Criticism	−.045	−.084	−.043	−.680***	−.002
DDI Harsh Parenting	.481***	−.371**	.159**	−.833***	.404**
DPICS Ineffective Parenting	−.020	−.036	−.018	−.695***	.018
Observational models					
DDI Supportive Parenting	.017	.050	.060	−.705***	.164
DPICS–R Supportive Parenting	.106	.041	.070	−.210***	.038
DDI Verbal Criticism	−.109	−.113	−.051	−.713***	−.026
DPICS–R Verbal Criticism	.249**	−.226**	.257***	−.747***	.264
DDI Harsh Parenting	−.007	−.008	.013	−.772***	.151
DPICS–R Ineffective Parenting	.460***	−.361**	.248***	−.761***	.266

Notes. DDI = Daily Discipline Interview; DPICS–R = Dyadic Parent–Child Interactive Coding System—Revised.
** $p < .01$. *** $p < .001$.

nal depression has been associated with disruptions in mother–child interaction patterns that could not be addressed with TT (McFarland & Sanders, 2003). In this respect, the observed moderating effect is not surprising. At first glance, however, these results might appear to conflict with our previous findings suggesting no relation between growth in externalizing symptoms and maternal depression in a subset of the current sample (Hartman, Stage, & Webster-Stratton, 2003). Yet that study assessed the predictive effect of maternal depression among participants in PT and did not examine treatment moderators. The present findings therefore extend, rather than oppose, our previous work.

Children who (a) were below the sample median on social class, (b) had fathers with a history of substance abuse, or (c) were parented by single mothers each fared best when PT or CT was included in their treatment. Although it would be easy to attribute this to a pattern of attenuated effectiveness of TT when family-specific risk factors are present, our previous work has shown TT to be most effective in reducing disruptive behaviors in the classroom. Because classroom behaviors were not assessed in the current study, TT may have been at a selective disadvantage in comparisons to interventions without TT. Unfortunately, we did not have sufficient teacher-report data on the entire sample to construct an LGM of classroom behavior.

The one condition under which interventions with TT were more effective than those without TT was when children scored above the sample median on CBCL Attention Problems. Thus, providing teachers with strategies for coping with disruptive behaviors conferred beneficial effects on more impulsive children, which generalized to dyadic interactions with their mothers. This finding is potentially important because it suggests that comorbid conduct problems and hyperactivity–impulsivity are responsive to intervention efforts that include TT, and may therefore mark a less recalcitrant condition than some authors have suggested (e.g., Lynam, 1996, 1998). Previously, we showed PT to be equally effective for disruptive boys with and without comorbid attention problems (Hartman et al., 2003). The current findings suggest that including TT in interventions may enhance treatment efficacy for hyperactive boys.

It should also be noted that among the seven significant moderating variables found across the mother-report and observational models, interventions with PT were never less effective than interventions without PT. This suggests that PT should remain the standard of care for children with early-onset conduct problems. At present, PT is the only well-established conduct problem intervention (Brestan & Eyberg, 1998; Nock, 2003). Although CT and TT are both classified as probably efficacious, the results reported here suggest that PT exerts the most consistent effects across different moderating variables. Thus, CT and TT should probably be offered in addition to, rather than in place of, PT.

It is interesting that children's age did not predict or moderate outcome. This occurred despite a large sample size and reports of reduced treatment response among older children, as articulated by others (e.g., Dishion & Patterson, 1992; Ruma et al., 1996). In all likelihood, failure to uncover age effects was the result of relatively early intervention, even for the oldest children in the sample, who were 8. Interventions delivered before adolescence are clearly more effective than those delivered later (e.g., Dishion & Patterson, 1992; Ruma et al., 1996). The lack of an age effect in the present study, in which all children were either in preschool or early elementary school, does not refute these findings.

Similarly, no sex effects were uncovered. This is potentially significant because almost nothing is known about differential treatment response to conduct problem interventions for boys and girls (Brestan & Eyberg, 1998). Most RCTs are underpowered for examining sex effects because boys presenting for treatment substantially outnumber girls. By combining data from multiple studies, we were able to assess sex effects in a sample that included

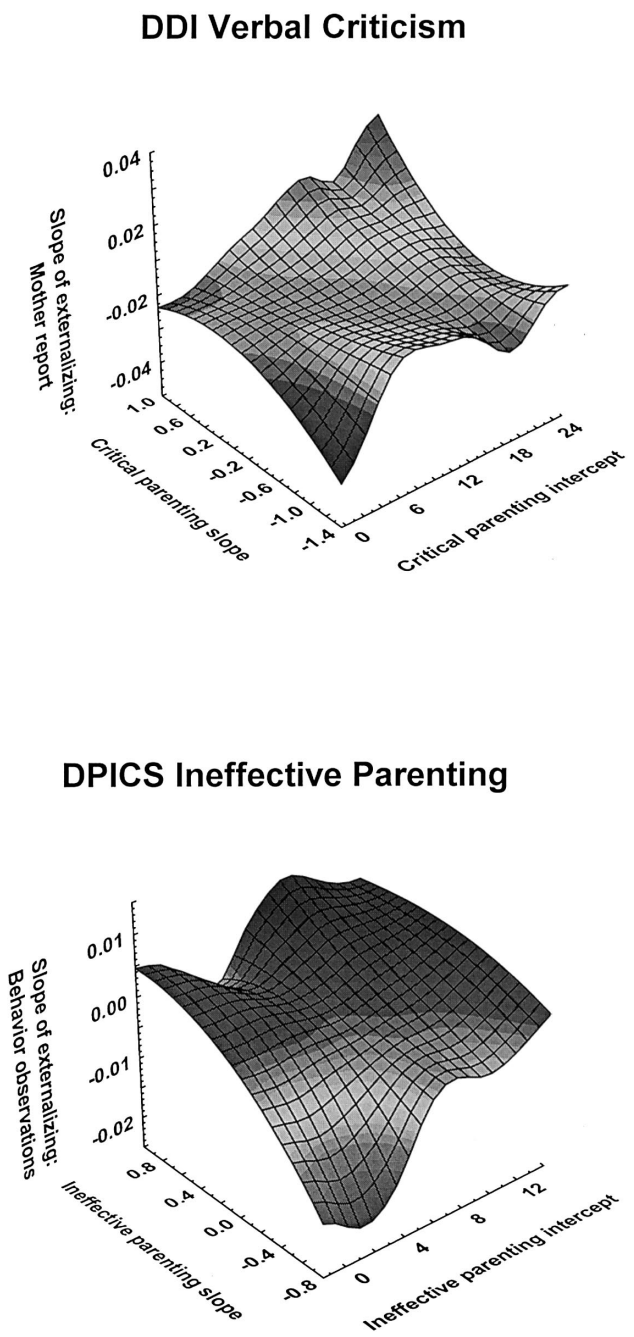

Figure 5. Three-dimensional least-squares regression planes describing relations between baseline parenting, parenting change, and child externalizing behavior. In the top figure, mother-report externalizing slopes are plotted against Daily Discipline Inventory (DDI) Critical Parenting scores at baseline and DDI critical parenting slopes. In the bottom figure, observational externalizing slopes are plotted against Dyadic Parent–Child Interactive Coding System (DPICS) Ineffective Parenting scores at baseline and DPICS ineffective parenting slopes. In both cases, the best child outcomes are observed when parents scored relatively low on the parenting construct at baseline *and* improved during treatment.

112 girls, yet no differences in treatment response were found. Thus, empirically supported interventions for conduct problems appear to be equally effective for both sexes.

Our second objective was to examine mediators of outcome, or mechanisms of behavioral change among participant children. Potential mediators included both dosage variables and parenting practices, the latter of which were examined in LGMs assessing the effects of changes in parenting behavior on changes in child behavior, controlling for the predictive effects of baseline parenting on child outcomes and baseline child behavior on parenting outcomes.

Results assessing the mediating effects of dosage variables were mixed. In the mother-report models, better child outcomes were observed when more treatment components (i.e., PT, CT, TT) were delivered to participant families. We have reported elsewhere on the efficacy of all three treatment programs, both alone and in combination (Webster-Stratton et al., 2004). Results from the mother-report model replicate our previous findings in a larger sample. Nevertheless, this finding should be juxtaposed with the analyses presented above suggesting that PT conferred the most consistent effects across the seven moderating variables. As noted previously, this pattern of findings suggests that PT should be the front-line treatment for conduct problems, with additional treatment components added when indicated. For example, the finding that hyperactive–impulsive children responded best to interventions including TT suggests that a teacher component should be added to PT for such children.

The number of treatment components received did not mediate externalizing outcomes in the behavior observation models. It is unclear whether the behavior observations were less sensitive to changes in children's functioning across the 1-year interval or whether there truly was no additive effect of treatment components in this context. Behavior observations are less sensitive for detecting low base-rate aggressive behaviors that are nevertheless important for prognosis.

Maternal attendance at PT sessions was also unrelated to children's externalizing outcomes. This was not completely unexpected because attendance rates were quite high (90%) across the six RCTs. In comparison, attendance rates in many treatment outcome studies of conduct problems are considerably lower (e.g., Barkley et al., 2000). The higher attendance rates in our studies are probably the result of several factors, including group support for parents, the collaborative parent–therapist learning process, and various active engagement methods such as weekly phone calls, "buddy" calls among parents, and direct and specific feedback on homework. Thus, the null finding with respect to attendance may represent a ceiling effect given the low attrition rate across studies.

Analyses of the mediating effects of parenting on trajectories in externalizing behavior uncovered several significant relations. For the mother-report models, both DDI Verbal Criticism and DDI Harsh Parenting predicted *and* mediated outcome. In other words, the best treatment responses, as indexed by negative externalizing slopes, were observed among children of parents who scored relatively low on Verbal Criticism and Harsh Parenting at baseline but nevertheless improved during treatment. Similar relations were found in the observational models of DPICS–R Verbal Criticism and DPICS–R Ineffective Parenting. Three-dimensional regression planes for each of these effects revealed that it is not enough to either begin treatment with relatively few parenting mistakes or to improve parenting during treatment; both had to occur for maximum reductions in children's externalizing behavior. These findings suggest that treatment providers should assess individual

differences in parenting practices at intake and target parents who are particularly harsh, critical, and/or ineffective with additional resources (e.g., a greater number of sessions, additional modes of intervention). Possible measures to be used for this purpose include the DDI and the Parenting Scale (Arnold, O'Leary, Wolff, & Acker, 1993). These findings may also suggest that specific parenting goals be established before PT is discontinued. Finally, it may be important to attend closely to parental resistance among those with especially poor parenting practices at intake. Parental resistance is directly related to therapeutic effectiveness yet is amenable to change when properly addressed (Patterson & Chamberlain, 1994).

Results from the LGMs assessing the predictive and mediating effects of parenting also demonstrated the importance of accounting for the influence of child behavior on parenting. In each of the mediational models outlined above, baseline levels of externalizing behavior (intercepts) significantly predicted both baseline parenting behavior and slopes in parenting behavior across the 1-year assessment interval. This underscores the importance of modeling reciprocal effects of parenting on child behavior and child behavior on parenting. If this is not done, estimates of the effects of parenting on child behavior are likely to be inflated.

As with all multiinformant research, it is also unclear what to attribute the lack of concordance between mother-report findings and behavior observational findings to. Why, for example, did the mother-report models yield a completely different set of moderators than the behavior observation models? Although lack of agreement across informants is nothing new in treatment outcome research, there is increasing recognition that diverse sources provide unique yet important pieces of information about children's functioning across contexts (e.g., Keiley et al., 2003; Youngstrom et al., 2003). Thus, we chose to construct separate models for mother-report and observational data. Each data source has associated strengths and weaknesses. Behavior observations are more objective but may be less sensitive to detection of low base-rate externalizing behaviors that are nevertheless important for prognosis, as noted above. In contrast, mothers are likely to be aware of and report low base-rate behaviors yet are more likely to be influenced by response biases, halo effects, demand characteristics, and so forth.

Finally, it should be reemphasized that the contrasts conducted in the moderational analyses of PT, CT, and TT were not independent. Rather, each contrast compared interventions that included one particular form of treatment (PT, CT, or TT) to interventions without that form of treatment. Because there were many combinations of treatments included across different cells of the RCTs, these contrasts do not compare one treatment directly against the others. We have reported such comparisons elsewhere (Webster-Stratton et al., 2004). The advantage of the current approach is that it assesses the relative impact of each intervention across all combinations of treatment in a large sample. For example, the finding that children scoring high on Attention Problems fared better when TT was included in treatment suggests that regardless of the other treatment components included in the intervention, training teachers in behavioral management strategies conferred positive effects on children.

Several authors have called for further specification of variables predictive of treatment response and for clarification of mechanisms of behavioral change in conduct problem interventions (Brestan & Eyberg, 1998; Nock, 2003; Owens et al., 2003). These calls address two related questions. The first concerns identification of children for whom current interventions are inadequate. As stated in the introduction of this article, interventions for conduct problems are effective only for about two thirds of participant children (Webster-Stratton & Hammond, 1997). Prospective identification of treatment nonresponders is the first step toward developing new interventions that are effective for children who are not helped by current approaches. Our findings identified a number of predictive relations that were related to outcome, including maternal age and baseline parenting. The pretest standing of families on these variables could be used to identify children at risk for treatment nonresponse.

The second question concerns matching children to appropriate interventions. Some authors have suggested that a flexible approach to case conceptualization and treatment be applied to conduct problems, with different intervention strategies based on evaluation of child- and family-specific factors that encourage and maintain problem behaviors (e.g., Frick, 2001). Although we endorse this notion in principle, findings from the present study suggest due caution. Where moderators of treatment response were found, interventions with PT were generally more effective than interventions without PT. Indeed, PT exerted the most consistent effects across different moderating variables, and there were no instances in which interventions without PT were more effective than interventions with PT. As noted above, this suggests that PT should remain the standard of care for preadolescent children with conduct problems. Nevertheless, the addition of TT may be important for impulsive children. Finally, despite these moderating effects, more treatment components were associated with steeper reductions in mother-reported externalizing slopes. This suggests that, all things being equal, more treatment is better than less.

Much remains to be learned about predictors, moderators, and mediators of treatment response among children with conduct problems. This study offers some insights into the questions "For whom does this treatment work?" and "When is this treatment not enough?" We look forward to additional research in the coming years that adds to and extends these findings.

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Received October 28, 2003
Revision received April 15, 2004
Accepted April 26, 2004 ■