

Reciprocal Relationships Between Parenting Behavior and Disruptive Psychopathology from Childhood Through Adolescence

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Abstract Theoretical models suggest that child behaviors influence parenting behaviors, and specifically that unpleasant child behaviors coerce parents to discontinue engaging in appropriate discipline. This study examined reciprocal relationships between parenting behaviors (supervision, communication, involvement, timid discipline and harsh punishment) and child disruptive disorder symptoms (ADHD, ODD and CD) in a clinic-referred sample of 177 boys. Annual measures, including structured clinical interviews, were obtained from the beginning of the study (when boys were between the ages of 7 to 12) to age 17. Specific reciprocal influence was observed; only timid discipline predicted worsening behavior, namely ODD symptoms, and ODD symptoms predicted increases in timid discipline. Greater influence from child behaviors to parenting practices was found: ODD also predicted poorer communication and decreased involvement, and CD predicted poorer supervision. ADHD was neither predictive of, nor predicted by, parenting behaviors. The results are specifically supportive of a coercive process between child behaviors and parenting behaviors, and generally suggestive of greater influence of child behaviors on parenting behaviors than of parenting behaviors on child behaviors

Keywords Disruptive behavior · Oppositional defiant disorder · Conduct disorder · Attention deficit hyperactivity · Disorder · Parenting behavior · Coercion

Parenting practices and children's disruptive behavior have been theorized to be reciprocally influential for over three decades (e.g. Patterson and Reid 1970), which has served to provide the underpinnings for models of developmental psychopathology and clinical interventions. Patterson and Reid (1970) described coercion as a process in which aversive stimuli control the behavior of one person and positive reinforcement maintains the behavior of the other. An example might involve a child responding to a parental directive with aversive behavior, leading to the explicit or implicit withdrawal of the directive by the parent. However, in contrast to the broad scope of the influence of this theory, relatively little empirical investigation has been conducted on reciprocal influences between parenting and child behavior over time, particularly in terms of clinical manifestations of disruptive behavior.

In the DSM-IV (APA 1994), the disruptive behavior disorders (DBD) consist of attention deficit hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and conduct disorder (CD). Although defined as separate disorders, ADHD is often comorbid with ODD and CD, and there has been discussion as to whether ODD and CD should be combined into one disorder. Factor analyses have repeatedly shown that ADHD, ODD and CD are distinct from one another (e.g. Burns et al. 1997a, b; Hartman et al. 2001; Pardini et al. 2006). Nevertheless, researchers have often treated these constructs uniformly, collapsing across ODD and CD, and occasionally ADHD as well. It has become increasingly evident that this practice has led to gaps in existing models of child psychopathology. For example, although ADHD had been thought to be a significant direct predictor of CD, recent research has indicated that ODD mediates the relationship between ADHD and CD (Burke et al. 2005; van Lier et al. 2007). A review of the literature suggests that a failure to account

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for ODD (Lahey et al. 2000), resulted in the perhaps illusory conclusion of a direct link between ADHD and CD, although the relationship may not entirely be accounted for by ODD among girls (van Lier et al. 2007).

Further, evidence has suggested important differences between ODD and CD. ODD may be much more involved than CD in comorbidity between the DBDs and other psychopathology (Burke et al. 2005; Maughan et al. 2004; Nock et al. 2007). Certain features of ODD, namely negative affect, may explain links to depression (Burke, submitted). Data from the Developmental Trends Study (DTS), a clinic referred sample of boys, suggested a model of development of psychopathology in which ADHD predicted ODD, ODD predicted not only CD but depression and anxiety as well, and CD was only predicted by ODD (Burke et al. 2005).

Considering the differences between ODD and CD in both the DSM-IV description of the disorders and in their manifest nature, it is reasonable to anticipate that parents may be differentially influenced by ODD versus CD. ODD is a pattern of “negativistic, defiant, disobedient and hostile behavior towards authority figures”, which is usually evident prior to 8 years of age (APA 1994). As such, it involves chronic, often intense, and highly emotionally charged conflict. On the other hand, CD is a repetitive and persistent pattern of rule- and norm-violating behavior that tends to involve acts the child commits in the community rather than in the home. Thus, the effect on parents of these behaviors is often indirect, through feedback from police, school personnel, neighbors or others in the community. It makes sense that ODD behaviors would be more salient (Teagle 2002) and burdensome (Bussing et al. 2003b) to parents than CD, despite the fact that CD behaviors are more severe in nature.

Patterson (1982) found some empirical support for coercive child–parent interaction. He also suggested specificity between parent and child behaviors. Specifically, he proposed that children who were “stealers” may have had parents who were less involved and less aware of the child’s behaviors in the community, in contrast to parents of “social aggressors,” who were likely to be emotionally involved in negative and hostile interactions with children. The differences between ODD and CD, and their differential relationship with parental behavior, are not inconsistent with these groupings.

Empirical evidence supports the suggestion of specificity between types of parenting practices and ADHD, ODD and CD. Stormshak et al. (2000) found that positive and negative parenting behaviors were relatively independent of one another, and that punitive discipline by parents was a common risk factor among oppositional, aggressive, hyperactive and internalizing behaviors in children. Furthermore, physically aggressive punishment was specifically linked

with child aggression, and low parental warmth or involvement was specifically linked with oppositionality (Stormshak et al. 2000).

There is also evidence to suggest specific influence from child behaviors to parenting practices. ODD, in particular, appears to have a greater impact than CD on parenting behaviors. A diagnosis of ODD, and not of CD, has been associated with greater caregiver strain (Bussing et al. 2003a, b). Likewise, ODD but not CD was associated with increased involvement in mental health treatment during the prior year (Bussing et al. 2003b). Further, parents have been found to be more perceptive of problems associated with ODD than CD (Teagle 2002).

In addition to the evidence for unidirectional influence between parent and child behavior, there has been some empirical support for reciprocal influences, depending upon the types of parenting and child behaviors examined. Delinquent behaviors and poor supervision have been found to show reciprocal influence (Laird et al. 2003). Stice and Barrera (1995) found support for reciprocity between low parental support and low control with adolescent substance use, but not with adolescent externalizing disorder. Rather, adolescent externalizing behaviors predicted low parental support and low control, but parenting behaviors were not predictive of externalizing disorders.

Huh et al. (2006) reviewed four prospective studies of reciprocal effects, and found that in 10 of 13 models tested, there was evidence of child to parent effects, whereas evidence for parent to child effects was found in only 6 of 13. In their own study of the perceptions of 496 adolescent girls recruited from public and private schools in the Southwestern USA, they found that externalizing problems predicted decreased perception of parental support and parental control one year later, but did not find support for the converse. They did find that adolescent substance use predicted decreased perceived parental control, and perceived parental control predicted increased substance use.

Although ADHD is associated with parental stress (Anastopoulos et al. 1992), studies that also include measures of ODD or CD have generally found conduct problems to be either more potent correlates of parenting problems than ADHD, or to render ADHD symptoms non-significant altogether. Conduct problems, more so than ADHD symptoms, have been associated with negative parent-child interactions (Gomez and Sanson 1994), parent-adolescent conflict (Edwards et al. 2001), or parental warmth, consistency and use of punitive discipline or spanking (Stormshak et al. 2000). Similarly, ODD has been found to be a stronger predictor of parental stress or strain than ADHD (Anastopoulos et al. 1992; Bussing et al. 2003a; Johnston 1996; Podolski and Nigg 2001). Parents’

sense of competence was associated with the strength of ODD symptoms, rather than ADHD (Johnston 1996). Finally, ODD has also been found to be a stronger predictor of involvement in mental health treatment than ADHD (Bussing et al. 2003b). When child conduct problems are taken into account, it appears that any influence of ADHD on parent factors is markedly reduced.

The typical developmental process of the DBD (e.g. Burke et al. 2005) allows for differing effects of parenting behaviors at different periods during a child's development. Given evidence that ADHD tends to emerge first, and to predict ODD symptoms alone (Burke et al. 2005), the model of Greene et al. (Greene and Doyle 2000; Greene et al. 2003) of the transactions between parenting and children's problems with dysregulation may be particularly relevant here, with certain types of parenting in response to ADHD eliciting further undesirable behavior early in development. As children mature, they develop additional skills and greater independence, requiring changes in parenting in response. For example, supervision of a young child has a very different meaning from that of an adolescent or teenager. Likewise, parental involvement becomes complicated by an early adolescent's need to demonstrate individuation and independence. Finally, it may be the case that over time, parents' and children's behavioral routines and expectations, good or bad, of one another may become more established and resistant to change.

From a clinical standpoint, the issue of bidirectional influence in parent behavior and child psychopathology is critical. Interventions have been designed to modify parenting behaviors more so than directly targeting children's behaviors, and little evidence is available to support interventions that do not include a parent component (see Burke et al. 2002). The most successful interventions do tend to include both parent- and child-directed intervention components (see Pardini 2008). The success of such interventions suggests that it is possible to achieve change in children's behavior by changing parenting behaviors. However, if child behavior also influences parenting behavior, interventions could either be more effective if they address both child and parent behaviors, or could be undermined by the continuing negative effect of child behaviors on parents as parents begin to initiate changes.

Studies of parenting and children's antisocial behavior have examined a wide array of parenting practices, child behavior, and correlates of both. Parenting practices such as degree of involvement, parent-child conflict management, monitoring and harsh and inconsistent discipline have been correlated with children's disruptive or delinquent behavior (Frick et al. 1992; Wasserman et al. 1996). In the DTS, from which the data for the present paper were obtained, Frick et al. (1992) found that poor supervision and inconsistent

discipline, but not involvement or poor communication, distinguished ODD and CD groups from those with other psychopathology. Also using this data set, Wakschlag et al. (1997) found that poor supervision and harsh discipline measured in year 1 predicted the child's CD status aggregated across the following 5 years. Two other studies from the DTS found evidence that links between parenting behaviors and CD were accounted for by ODD (Loeber et al. 1995, Loeber et al. 2000a). Only one study from the DTS (Burke et al. 2005) examined parenting as a predictor of ODD, finding that among aspects of parenting, only the parent's rating of the quality of the relationship shared by the parent and child predicted ODD symptoms. However, that construct was not descriptive of parenting behaviors, but more of global positive ratings of the child and the parent's relationship with the child. No study from the DTS has examined parenting behaviors as an outcome.

CD is a disorder notable for its heterogeneity, and for the broad array of factors that has been identified as predictors or correlates (for reviews, see Burke et al. 2002; Loeber et al. 2000a). Because many of these factors are also associated with parents or parenting behavior, they must be taken into account in considering how parent and child behaviors may influence one another. For example, socioeconomic and demographic factors have been found to have a complex relationship with both parenting behaviors and children's behavioral problems (Brody et al. 2003, McLoyd 1998). Children of young mothers are more likely to demonstrate CD in adolescence (Wakschlag et al. 2000). A parental history of psychopathology or of antisocial behaviors, including APD (Lahey et al. 1995) or criminality (Farrington et al. 2001) has been found to predict child antisocial behaviors. Parental substance use has also been linked to later CD (Loeber et al. 1995; Wakschlag et al. 1997).

The present analyses were conducted to examine the influence of parenting behaviors on changes in clinical measures of child behaviors through adolescence (specifically ADHD, ODD and CD symptoms), and to examine the influence of those child behaviors on changes in parenting during the same time period. We made the following specific hypotheses: (1) Reciprocal influence would be found between parenting practices and ODD and CD symptoms, but not ADHD symptoms; (2) Based on prior evidence from the DTS (Burke et al. 2005; Frick et al. 1992; Loeber et al. 1995, 2000a, b; Wakschlag et al. 1997, 2000), CD symptoms will specifically be involved in reciprocal relationships with lower supervision and harsh punishment, and ODD symptoms with involvement, poor communication and timid discipline; (3) Relationships between parenting behaviors and child behaviors will remain significant even after accounting for significant covariates.

Methods

Participants and Procedures

Participants in this sample were 177 boys recruited in 1987 from clinics in Pittsburgh, Pennsylvania and in Athens and Atlanta, Georgia. Records of those involved in services at these facilities during the 1987–1988 academic year were reviewed. Boys were required to be living with at least one biological parent. Those with mental retardation or psychosis, those who had received inpatient psychiatric treatment within the last six months, and those who were taking psychotropic medication that could not be discontinued for two days prior to their scheduled assessment were excluded from the study. Further details regarding participant recruitment can be found in Loeber et al. (2000b).

The participants were 7 to 12 years of age at the beginning of the study, and were followed up with parent and child assessments until the age of 17. Interviews were conducted on an annual basis, except in year 5, due to a funding cut. Annual retention rates ranged from a high of 100% in year 2 to 87.1% in year 10, with an average across all years of 93.4%. The sample was composed of Caucasian (70%) and African-American boys (30%), with families ranging across all five levels of the four-factor index of socioeconomic status (Hollingshead 1975). Consent was obtained from parents and assent from children at initial enrollment and at multiple occasions through the course of the study. The Institutional Review Boards of the University of Pittsburgh and the University of Georgia approved and monitored the research protocol of the study.

Participants at all sites were assessed using identical procedures. The parent informant at year 1 was the mother of the participant in 173 of the 177 cases, and was the child's father in the remaining four cases. A structured diagnostic interview with a teacher, and teacher rating scales regarding the participant, were collected by telephone and mail (Loeber et al. 2000b).

Measures

DBD Symptoms A modified version of the Diagnostic Interview Schedule for Children (DISC; Costello et al. 1987) was developed in collaboration between A. J. Costello and the principal investigators of this study, in order to include DSM III-R criteria (see Lahey et al. 1990 and Loeber et al. 1989 for further discussion). Parallel versions for parents, children, and teachers were used at each assessment. These included symptoms of, among other disorders, CD, ODD, and ADHD. We did not assess impairment, so diagnoses derived from these measures are based on whether or not the criterion number of symptoms was endorsed for a given disorder. Using all informants

(parent, teacher, child) at phase A, 148 boys (83.6%) met criteria for ODD, 121 (68.4%) for CD, and 122 (68.9%) for ADHD.

For the present analyses, we used symptom counts rather than categorical diagnoses. We did so in order to be able to examine potentially more subtle changes in children's behavior from year to year than discrete diagnoses would allow. After year 2, children were no longer asked about symptoms of ADHD and ODD, and after Year 4 no further teacher interviews with the DISC were conducted, so in the present analyses, for consistency across all waves ADHD and ODD include parental report alone. Year 1 internal consistency for these constructs was 0.60 for CD, 0.76 for ODD and 0.83 for ADHD.

Interviewers typically had a master's level social science education, and were provided with training on the specific measures used in the interview. For the purpose of assessing reliability, a second interviewer observed and scored one quarter of the interviews. Over years 1 through 4, agreement, as measured by Cohen's kappa (Cohen 1960) for CD was 0.92, for ODD was 0.90, and for ADHD was 0.95. Over years 6 through 11, Cohen's kappas were 0.91 for CD, 0.95 for ODD, and 0.94 for ADHD.

Treatment To measure participation in treatment, from year 2 onward, parents were also asked how often their child had gone to a counselor, psychologist, therapist or mental health center for emotional or behavioral problems in the past year. Mean behavioral treatment ranged from a high of 13.6 (SD=25.62) in year 2 to a low of 1.5 (SD=4.6) in year 10.

Parental Psychopathology and Substance Use To assess the DSM-III-R diagnoses of antisocial personality disorder (APD), alcohol abuse, and drug abuse of parents at year 1, a structured diagnostic interview, the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott and Spitzer 1978), was used. To assess parental psychopathology, the interviewed parent completed measures regarding both him- or herself as well as the other parent. Maternal and paternal substance use was coded as present if use of alcohol or drugs by either parent was reported. Maternal and paternal constructs were combined into Parental constructs using an either/or method. Also, Parental Depression was coded based on the SADS interview. Reliability checks for DIS diagnoses were conducted for 31% of the assessments. Kappas ranged from 0.57 for recurrent paternal unipolar depression to 0.78 for paternal APD, with a median kappa across diagnoses of 0.72.

Maternal prenatal smoking was also assessed via retrospective report in year 1. Parents were asked to rate

maternal prenatal smoking during the mother's pregnancy with the study child using three categories: never or occasionally; less than half a pack per day; or greater than half a pack per day. The construct was dichotomized to contrast "never or occasionally" with any greater level of use.

Parenting Practices Questions assessing parent–child communication, quality of the parent child relationship, monitoring of the child's behavior, and the use of physical punishment, were asked of parents at each assessment (Loeber et al. 1998). Apart from timid parenting, these constructs have been used in numerous previous publications from the DTS (e.g. Frick et al. 1992; Loeber et al. 2000b; Burke et al. 2005); excepting that for these analyses we removed any items from each construct that clearly reflected the child's behavior rather than that of the parent. Each parenting construct used separate items from the questionnaire; there was no overlap among items between constructs.

Timid Discipline Seven items from the parenting questionnaire (Loeber et al. 1998) were used to assess timid discipline, or parental resistance or reluctance to engage in disciplinary practices because of concerns that the child will respond with hostile or undesirable behavior (e.g. "Do you hesitate to enforce the rules with your son because you fear he might harm someone in the household?") Responses to these items were measured using a three-point rating scale ("almost never", "sometimes", "almost always"). All items were summed so that higher ratings indicated increased levels of timid discipline. This scale showed good internal consistency, with a mean alpha of 0.80 across the ten waves of data.

Parental Involvement Parental involvement was measured using six parenting items assessing how often parents typically engaged in activities with their son (e.g., "Do you and your son do things together at home?"). Responses were based on a three-point scale ("hardly ever", "sometimes", "and often"). These items were summed so that higher scores indicate more positive parent involvement. This scale showed modest internal consistency, with a mean alpha of 0.71 across the ten waves of data.

Poor Communication This construct used 18 items to indicate low levels of satisfactory communication between parent and child (e.g. "Are you very satisfied with how you and your son talk together?"). Responses were based on a three-point scale ("almost never", "sometimes", "almost always"). Items were reverse scored as necessary and summed so that higher scores indicated less desirable communication styles. This scale showed good internal

consistency, with a mean alpha of 0.83 across the ten waves of data.

Poor Supervision Poor supervision was measured using a 17 items assessing the parent's awareness of their child's activities, the child's involvement in family activities, and time spent in activities with the son. Scores were summed such that higher scores indicated poorer parental supervision. This scale showed good internal consistency, with a mean alpha of 0.84 across the ten waves of data.

Harsh Discipline This construct was defined by a single item ("If your son does something that he is not allowed to do or that you don't like, do you slap or spank him, or hit him with something?"). Parents responded on a three point scale. Because of low endorsement of "often" (<5%) at each assessment, this item was dichotomized to contrast the response of "never" with the combination of the responses "sometimes" or "often."

Other Covariates

Parents were asked demographic questions regarding their ethnicity, educational and occupational background and income level, marital status, the age at which the participant's mother first gave birth, and the number of siblings of the study participant living in the household. Parental history of contact with the police was obtained via self-report at year 1. Teacher report of poor school work and of not being liked by other students was obtained as items on the Teacher Report Form (TRF) of the Child Behavior Checklist (Edelbrock and Achenbach 1984), which was completed annually by a teacher. In the DTS, the form was extended to include 23 additional items pertaining to antisocial behavior (Loeber et al. 1998), but the two specific items used for this study were from the items of the TRF. The Pubertal Development Scale (Petersen et al. 1988), a five-item index of physical maturation, was administered annually to the parent.

Analyses

Since we were particularly interested in the influence of child behaviors on parent behaviors, we included only those assessments completed by the same caretaker over time. A total of 51 observations (3.8%) were excluded because the informant was not the primary informant over the course of the assessments. As a check of the effect of excluding these observations, we reran the final models using reports from all parental informants, and found no meaningful differences in the results.

Generalized estimating equation (GEE) transitional regression models were conducted, using STATA software (StataCorp 2001). These analyses account for correlated data when repeated measurements on the same individual are used in a regression model. Although follow-up of the participants occurred over an 11 year period, assessments did not occur during year 5 due to funding cuts. GEE models are robust to unbalanced designs, in which some participants provide more data points or varied timing of responses (Diggle et al. 1994). To further ensure that children from the younger cohorts, who provided more observations for the analyses were not disproportionately influencing the outcomes of the models, we checked models for interactions involving cohort; no significant interactions were found.

In each model, we lagged predictors so that we could examine the relationship between predictors at time T and the outcome variable at the next (time $T+1$). In each model, we included the value of the outcome from time T as well, so that the prediction controlled for the existing level of the response variable, and thus represented change in the outcome from time T to time $T+1$. Since we were explicitly modeling the relationship of the outcome variable over two time points in the regression equation, we specified an independent correlation structure. In all models, a robust estimator of variance was used to provide the most conservative estimation of variance within the model. Age was included as a covariate in all analyses. Analyses included variables measured only at baseline, such as parental psychopathology and other demographic factors, and also time varying variables of interest and covariates.

For models predicting symptom counts of ADHD, ODD and CD, we specified negative binomial distributions, which are appropriate for count data with overdispersion. We tested the prediction to parenting behaviors in five separate sets of models, with each of our parenting behaviors as a dependent variable. The distributions of each variable required that we give consideration to the distributions specified for each. We used Poisson models for timid discipline and involvement. The parameter estimates of the negative binomial and Poisson models were exponentiated to provide the incidence rate ratio statistic, which can be interpreted as the percent increase in the rate of the count outcome for each unit increase in the predictor when the other independent variables in the model are at their mean value.

The distributions of the involvement, supervision and communication variables showed some departure from normality. Transformations (square for involvement and inverse square root for supervision and communication) brought the distributions into normality. We tested models with both transformed and untransformed values, using a Gaussian distribution. The results below are presented

using the untransformed values of these variables for clarity of interpretation of the parameter values, but there were no instances of meaningful discrepancy between the transformed and untransformed models in terms of significance tests for each variable in the models. Finally, for the dichotomous variable harsh punishment, we specified a logistic model.

The analytic strategy for each model was as follows. All variables were examined for their independent association with outcome variable, controlling for age. Those not significant were not included in further analyses, unless otherwise noted. For the prediction of child behavior, we then tested models controlling for ODD, CD, and ADHD to identify significant comorbid psychopathology to be controlled for in subsequent models. We then tested a model including those parenting behaviors identified as individually significant. Separately, a model of other covariates (see Table 2 below) which had been found to be independently significant was then tested, using backwards selection until a final set of significant covariates was identified. These were then included in a model with significant parenting behaviors and psychopathology, using a backwards regression model to determine a final set of significant predictors of each outcome. The process of predicting to parenting behaviors was essentially the same, with the identification of significant child behavioral predictors conducted separately from the identification of significant other covariates, and using a backwards selection process of those child behaviors and other covariates to determine a final model of significant predictors of parenting behaviors. Details of the initial bivariate testing of parenting outcomes are not included here, and may be obtained from the first author.

Results

Predicting Child Behaviors

At phase A, children showed mean symptom counts as follows: ADHD ($M=8.15$, $SD=3.47$); ODD ($M=5.29$, $SD=2.44$); CD ($M=2.39$, $SD=1.89$). Figure 1 depicts the course of each of these constructs over all waves of data. Table 1 shows the correlations between child behavior and parenting constructs at year 1. Table 2 shows the results of bivariate testing of covariates as predictors of ODD, CD and ADHD.

In basic transitional models predicting ADHD, ODD and CD symptom counts including only the time T measurement of the outcome of interest (ADHD, ODD, or CD) and age, both linear and quadratic terms for age were significant. Including both terms in models led to problems with multicollinearity, indicated by markedly high variance

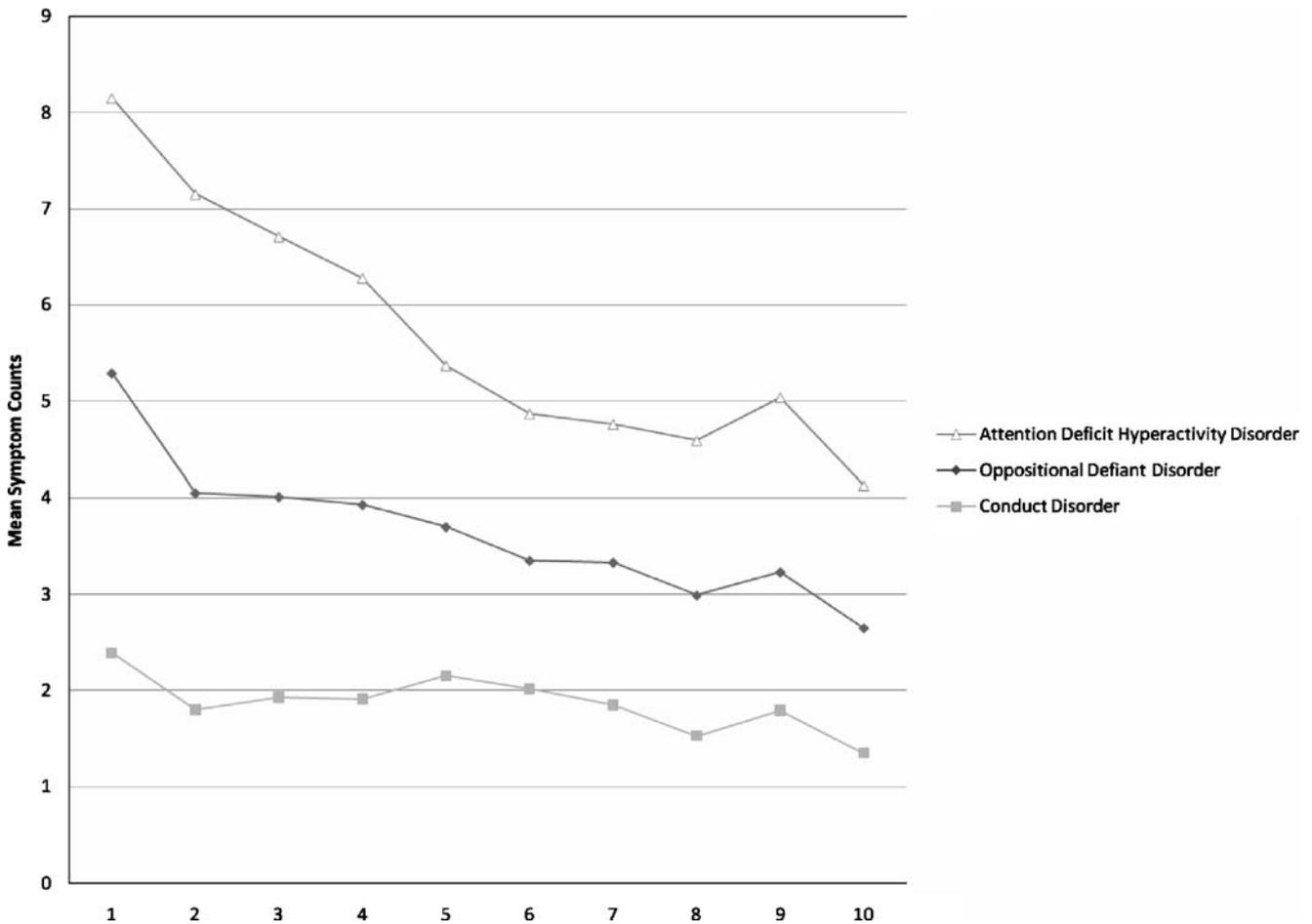


Fig. 1 Child symptom counts across waves

inflation factor values. We centered age and recomputed the age squared term using the centered values. Including these terms eliminated the problems of multicollinearity. In all subsequent models of ADHD, ODD or CD, both the linear and quadratic terms for age were included.

Predictors of ODD Testing ADHD and CD at time *T* as predictors of ODD at time *T*+1 found that ADHD [incidence rate ratio (IRR)=1.03, *p*=0.001], but not CD (IRR=1.01, *p*=0.56), significantly predicted ODD symp-

toms. Each model predicting ODD subsequently controlled for ADHD symptoms at time *T*, as well as linear and quadratic terms for age. In bivariate models, poor supervision (IRR=1.01, *p*=0.007), poor communication (IRR=1.02, *p*=0.02), positive involvement (IRR=0.96, *p*=0.005) and timid discipline (IRR=1.03, *p*<0.001) were individually predictive of ODD, whereas harsh punishment (IRR=1.06, *p*=0.34) was not. When tested simultaneously, only timid discipline (IRR=1.03, *p*=0.001) and positive involvement (IRR=0.97, *p*=0.025) remained significantly

Table 1 Correlations among child behavior and parenting constructs at year 1

	ODD	CD	ADHD	Poor supervision	Poor communication	Positive involvement
ODD						
CD	0.55					
ADHD	0.44	0.43				
Poor supervision	0.31	0.39	0.14			
Poor communication	0.40	0.37	0.31	0.48		
Positive involvement	-0.38	-0.41	-0.18	-0.78	-0.55	
Timid discipline	0.54	0.42	0.24	0.39	0.49	-0.43

All correlations shown are statistically significant, apart from that between ADHD and supervision (*p*=0.06) ODD oppositional defiant disorder, CD conduct disorder, ADHD attention deficit hyperactivity disorder.

Table 2 Other covariates predicting ODD, CD and ADHD

	ADHD	ODD	CD
Married	1.02	1.08	1.28***
Siblings	0.99	1.02	1.07*
African American ethnicity	0.97	1.08	1.23***
Urban residence	1.02	1.23****	1.24***
SES	0.99*	0.99*	0.99****
Maternal police contact	1.06**	1.05****	1.10****
Prenatal smoking	1.02	1.03	1.18****
Parental APD	1.08†	1.11**	1.22***
Parental substance use	1.01	1.01	1.05**
Parental psychopathology	1.02	1.01	1.07**
Parental depression	1.02	0.95	1.04
Disliked by peers	1.08**	1.04	1.15***
Poor schoolwork	1.02	1.08**	1.17***
Maternal age	1.00	0.99	0.98***
Pubertal development	1.00	1.03**	1.02

The numbers in the cells of the table are the incidence rate ratios (IRR), which are the exponentiated parameter estimates from the regression models. Each of the above statistics reflects the bivariate relationship as found in a regression between the predictors listed in each row and the outcome variables given in each column.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$, **** $p < 0.001$

predictive of ODD, along with ADHD, and the linear and quadratic terms for age.

Simultaneous testing of the other covariates identified as significant when tested independently as predictors of ODD yielded a model with maternal police contact (IRR=1.04, $p=0.035$), parental APD (IRR=1.12, $p=0.042$), pubertal development (IRR=1.03, $p=0.018$), and urban residence (IRR=1.15, $p=0.034$) as significant other covariates (see Table 2). When these were included in the model predicting ODD symptoms along with parenting behaviors, timid discipline (IRR=1.04, $p < 0.001$) remained significantly predictive of ODD, along with ADHD (IRR=1.04, $p < 0.001$), maternal police contact (IRR=1.07, $p=0.002$), urban residence (IRR=1.25, $p=0.001$) and pubertal development (IRR=1.03, $p=0.025$), whereas parental APD (IRR=1.09, $p=0.15$) and positive involvement (IRR=0.98, $p=0.12$) were removed from the model.

Predictors of CD Symptoms ADHD and ODD symptoms were first tested as predictors of CD symptoms. ADHD was not predictive (IRR=1.01, $p=0.22$), whereas ODD symptoms did predict CD symptoms (IRR=1.08, $p < 0.001$). ODD symptoms were included as a control in all subsequent models.

When parenting behaviors were tested independently as predictors of CD symptoms, controlling for ODD symptoms and the linear and quadratic terms of age, only poor communication (IRR=1.02, $p=0.04$) was significantly

predictive of CD, and harsh punishment was marginally significant (IRR=1.14, $p=0.07$). Positive involvement (IRR=.98, $p=0.35$), poor supervision (IRR=1.01, $p=0.24$), and timid discipline (IRR=1.01, $p=0.59$) were not. We tested a model with poor communication and harsh punishment together. Harsh punishment was non-significant (IRR=1.10, $p=0.16$), leaving only poor communication as predictive of CD symptoms (IRR=1.02, $p=0.04$).

Simultaneous testing of the other covariates found to be independently predictive of CD symptoms (see Table 2) resulted in a model of covariates that included maternal smoking (IRR=1.13, $p=0.001$), urban residence (IRR=1.18, $p=0.05$) and SES (IRR=0.99, $p=0.001$). These were included in the model with poor communication, ODD symptoms and the linear and quadratic terms for age. With these covariates in the model, poor communication (IRR=0.02, $p=0.13$) and urban residence (IRR=1.16, $p=0.06$) were no longer significantly predictive of CD symptoms.

Predictors of ADHD Neither ODD (IRR=1.01, $p=0.113$) nor CD (IRR=0.99, $p=0.36$) were predictive of ADHD, and were not included in any subsequent models. When parenting behaviors were tested independently as predictors of ADHD symptoms, timid discipline was significantly predictive of ADHD (IRR=1.02, $p=0.02$) and poor communication (IRR=1.00, $p=0.07$) was marginally so; positive involvement (IRR=0.99, $p=0.43$), poor supervision (IRR=1.00, $p=0.28$) and harsh punishment (IRR=1.02, $p=0.65$) were not. A model testing timid discipline and poor communication found that poor communication was non-significant (IRR=1.01, $p=0.26$), whereas timid discipline remained significant.

A model testing maternal police contacts, peer rejection, and parental APD, which had individually been associated with ADHD symptoms (see Table 2), found that maternal police contacts (IRR=1.06, $p=0.001$) and peer rejection (IRR=1.08, $p=0.02$) were significantly predictive of ADHD when tested together simultaneously. When these variables were included in the model with timid discipline and ADHD symptoms at time T and linear and quadratic age, timid discipline was no longer significantly predictive of ADHD (IRR=1.01, $p=0.12$), and was thus removed from the model.

Predicting Parenting Behaviors

Figure 2 shows the mean scores of parenting constructs over time. As is evident, apart from supervision, mean parenting behaviors remained fairly stable over time.

Timid Discipline In the model of psychopathology symptoms predicting timid discipline, ODD was significant

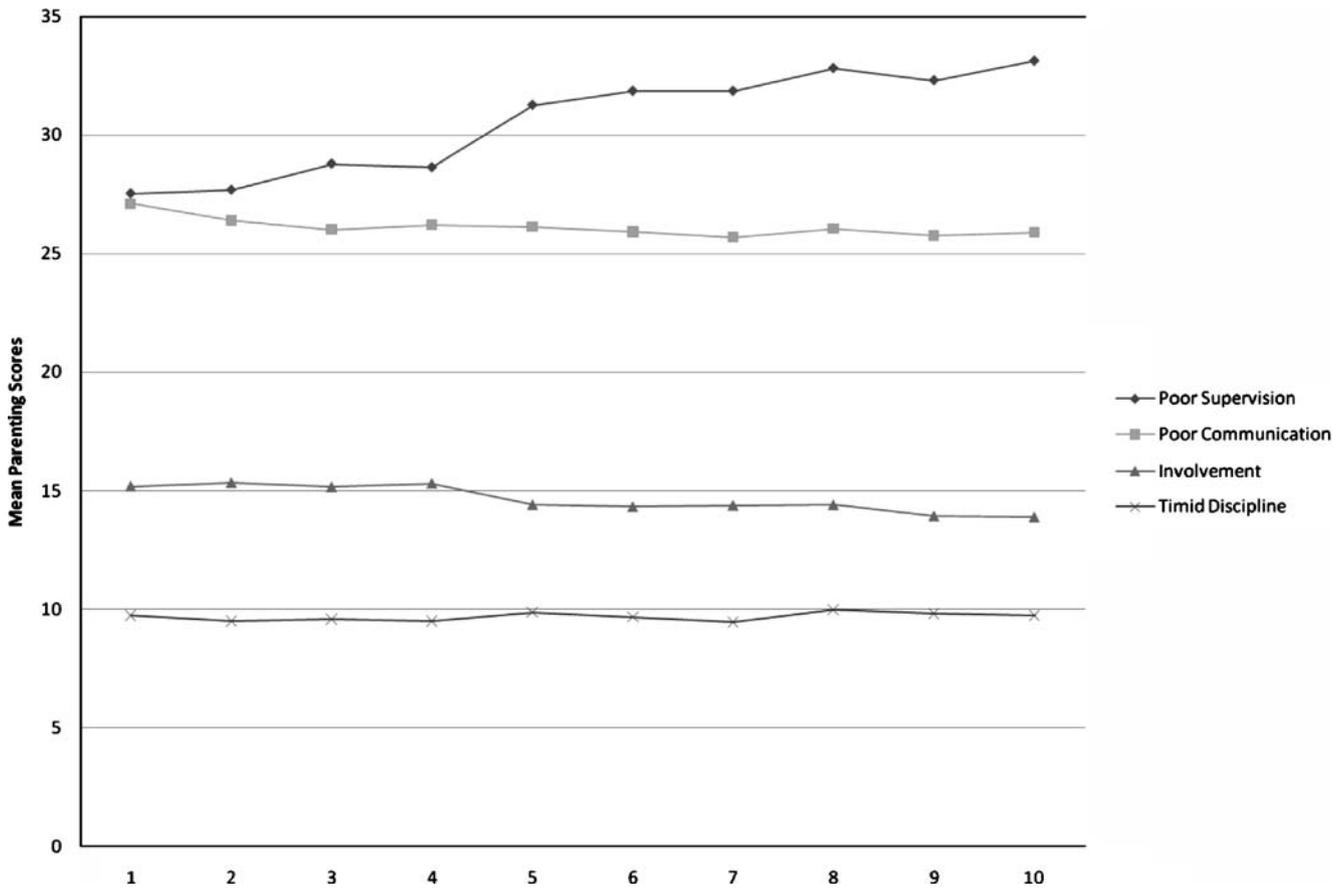


Fig. 2 Parenting behaviors across waves

(IRR=1.08, $p<0.001$), whereas CD (IRR=0.99, $p=0.58$) and ADHD (IRR=0.99, $p=0.99$) were not. The final model of covariates included parental APD (IRR=1.13, $p=0.005$) and pubertal development (IRR=1.02, $p=0.038$). When tested with ODD as predictors of timid discipline, neither was significant, leaving ODD as the only significant predictor of timid discipline (IRR=1.08, $p<0.001$; see Table 3).

Parental Involvement ODD ($B=-0.06$, $p=0.005$) was significantly predictive of positive parental involvement, whereas CD ($B=-0.05$, $p=0.20$) and ADHD were not ($B=0.001$, $p=0.95$). A quadratic term for age was signif-

Table 3 Predictors of timid discipline

Predictor	IRR	SE	p	95% CI	
Timid discipline, time T	1.17	0.01	<0.001	1.15	1.19
ODD symptoms, time T	1.08	0.014	<0.001	1.05	1.10
Age	1.01	0.007	0.47	0.99	1.02

The above table shows the results of the final model of all significant predictors of timid discipline. IRR incidence rate ratio

icant. Significant covariates after variable selection were urban residence ($B=-0.47$, $p<0.001$) and SES ($B=0.015$, $p<0.001$). A final model testing ODD with other covariates found that ODD ($B=-0.05$, $p=0.017$), urban residence ($B=-0.45$, $p<0.001$) and SES ($B=0.01$, $p<0.001$) were predictive of positive involvement (see Table 4), and CD was removed from the model.

Poor Supervision CD ($B=0.22$, $p=0.006$) was significantly predictive of parental supervision, whereas ODD ($B=0.078$,

Table 4 Predictors of positive parental involvement

Predictor	B	SE	P	95% CI	
Positive involvement, time T	0.55	0.04	<0.001	0.47	0.62
ODD symptoms, time T	-0.05	0.02	0.017	-0.09	-0.01
Urban residence	-0.45	0.12	<0.001	-0.68	-0.22
SES	0.01	0.004	<0.001	0.006	0.02
Age, linear	-0.30	0.04	<0.001	-0.38	-0.26
Age, quadratic	1.35	0.69	0.05	0.005	2.70
Constant	6.55	0.60	<0.001	5.39	7.72

The above table shows the final model of all significant predictors of positive parental involvement. IRR incidence rate ratio

$p=0.32$) and ADHD ($B=0.005$, $p=0.92$) were not. Significant covariates were African American ethnicity ($B=0.89$, $p=0.03$), urban residence ($B=1.00$, $p=0.003$), maternal age ($B=-0.07$, $p=0.019$), and maternal police contacts ($B=-0.25$, $p=0.045$). When these covariates were included in a final model, CD remained significantly predictive of supervision ($B=0.20$, $p=0.018$), as did the other covariates (see Table 5).

Poor Communication ODD ($B=.14$, $p=0.006$) and ADHD ($B=0.06$, $p=0.06$) were predictive of poor communication, whereas CD was not ($B=0.06$, $p=0.24$). Despite being only marginally significant, we retained ADHD for further testing in subsequent models. Significant other covariates included SES ($B=-0.02$, $p=0.047$), African American ethnicity ($B=0.55$, $p=0.045$), peer rejection ($B=0.30$, $p=0.053$), and parental APD ($B=0.59$, $p=0.008$), and a quadratic term for age was also significant. When tested simultaneously, ODD ($B=0.16$, $p<0.001$), SES ($B=-0.17$, $p=0.045$), African American ethnicity ($B=0.64$, $p=0.02$) and parental APD ($B=0.42$, $p=0.07$) were predictive of poor communication, and peer rejection and ADHD were removed from the model (see Table 6).

Harsh Punishment CD symptoms were predictive of harsh punishment ($OR=1.10$, $p=0.02$), while ODD ($OR=1.03$, $p=0.28$) and ADHD symptoms ($OR=1.03$, $p=0.20$) were not. Significant other covariates were African American ethnicity ($OR=1.77$, $p=0.009$), SES ($OR=0.98$, $p=0.007$), and urban residence (marginally significant, but retained for further analyses; $OR=1.42$, $p=0.06$). A quadratic term for age was also significant. In a model simultaneously testing CD, African American ethnicity, urban residence, and SES, CD was not significant ($OR=1.07$, $p=0.14$), nor was urban residence ($OR=1.38$, $p=0.09$). African American ethnicity ($OR=1.79$, $p=0.007$) and SES ($OR=0.98$, $p=0.015$) remained significantly predictive of harsh punishment (see Table 7).

Table 5 Predictors of poor supervision

Predictor	<i>B</i>	SE	<i>p</i>	95% CI	
Poor supervision, time <i>T</i>	0.61	0.04	<0.001	0.54	0.68
CD symptoms, time <i>T</i>	0.20	0.08	0.02	0.04	0.36
African American ethnicity	0.95	0.41	0.02	0.15	1.76
Urban residence	0.94	0.34	0.01	0.27	1.61
Maternal age	-0.06	0.03	0.05	-0.12	0.001
Maternal police contacts	-0.29	0.13	0.03	-0.55	-0.037
Age	0.40	0.06	<0.001	0.28	0.51
Constant	12.56	1.37	<0.001	9.87	15.25

The above table shows the final model of all significant predictors of poor supervision.

Table 6 Predictors of poor communication

Predictor	<i>B</i>	SE	<i>p</i>	95% CI	
Poor communication, time <i>T</i>	0.64	0.03	<0.001	0.57	0.70
ODD symptoms, time <i>T</i>	0.16	0.05	<0.001	0.07	0.25
SES	-0.02	0.01	0.04	-0.03	-0.001
African American ethnicity	0.63	0.28	0.02	0.09	1.17
Parental APD	0.41	0.23	0.07	-0.04	0.86
Age, linear	0.03	0.03	0.40	-0.035	0.09
Age, quadratic	-0.03	0.01	0.01	-0.05	-0.01
Constant	9.31	0.93	<0.001	7.49	11.13

The above table shows the final model of all significant predictors of poor communication.

The clinical services that these children may have received over time might have influenced the course of their behavioral symptoms or changes in parenting behavior. We examined the effect of behavioral services for each model. There was no significant effect of therapy for ADHD ($IRR=1.03$, $p=0.13$), ODD ($IRR=1.03$, $p=0.26$) or CD ($IRR=1.05$, $p=0.16$). Therapy did not significantly predict positive involvement ($B=-0.001$, $p=0.28$), timid discipline ($IRR=1.02$, $p=0.54$), poor supervision ($B=-0.26$, $p=0.27$), poor communication ($B=0.06$, $p=0.69$), or harsh discipline ($OR=0.95$, $p=0.44$).

Discussion

In general, we found more support for child disruptive symptoms influencing parenting behaviors than we did for parenting behaviors predicting child behaviors. Specifically, regarding the prediction from child behaviors to parenting behaviors, although poor supervision, poor communication, positive involvement and timid discipline were individually predictive of ODD, only timid discipline predicted changes when tested simultaneously with other covariates. No other parenting behaviors were predictive of changes in child behaviors after controlling for other significant predictors.

Timid discipline was also predicted by ODD behaviors, indicating a reciprocally influential relationship. Children

Table 7 Predictors of harsh punishment

Predictor	OR	SE	<i>p</i>	95% CI	
Harsh punishment, time <i>T</i>	9.95	2.16	<0.001	6.50	15.23
African American ethnicity	2.01	0.45	0.002	1.30	3.10
SES	0.98	0.01	0.005	0.97	0.99
Age, linear	0.78	0.03	<0.001	0.73	0.84
Age, quadratic	0.98	0.01	0.047	0.96	1.00

The above table shows the final model of all significant predictors of harsh punishment.

OR odds ratio

of parents who reported a reluctance to engage in disciplinary actions because of a fear of the child's behavioral response showed increasing rates of ODD symptoms in the following year. In turn, parents of children who showed higher levels of ODD symptoms were more likely to show increasing reluctance to engage in disciplinary practices from 1 year to the next, which is essentially supportive of Patterson and Reid's (1970; Patterson 1982) model of coercion.

It should be noted, however, that our measure of timid discipline included items regarding parents' concern about particularly aggressive or hostile behavior. The "training" of the parent by the child that is hypothesized to occur during coercive child–parent interactions likely occurs not only due to concerns about such behavior, but also in response to less severe behavior, such as whining, crying, complaining and persistent non-compliance. It will be important to further explore the present findings to determine if coercion occurs when behaviors include those of a less severe but still unpleasant and undesirable nature. Nevertheless, in the present data, timid discipline was neither predictive of nor predicted by the typically more severe CD symptoms, but rather was linked to ODD symptoms.

Timid discipline influenced ODD symptoms from childhood through adolescence. Despite a decreasing trend in ODD, along with other psychopathology, wave to wave increases were predicted by timid parenting. Although timid discipline was initially predictive of increasing ADHD symptoms, controlling for peer rejection and maternal contact with the police reduced the influence of timid discipline to non-significance. Thus, as anticipated, we found no evidence for parenting behaviors influencing ADHD symptoms. However, we did not anticipate that none of the parenting behaviors we examined would influence CD behaviors. Poor communication was significantly predictive of CD at the individual level, and harsh punishment was marginally predictive. However, after controlling for marital status and prenatal smoking, neither was significantly associated with later CD symptoms.

Unlike the limited prediction from parenting behaviors to child behaviors, we found several links from child behaviors to parenting behaviors, almost all involving ODD symptoms. These overall findings are in accord with the suggestion (Edwards et al. 2001; Huh et al. 2006) that child behaviors may be more influential of parenting behaviors than vice versa. We found that ODD symptoms predicted increases in timid discipline, lower parental involvement and poor communication, but did not predict changes in supervision or in the use of harsh punishment. ODD symptoms appear to be related to the decline in a range of parenting behaviors; parents may withdraw not only from engagement in disciplinary practices with children who

display ODD symptoms, but also from communication and interaction in general. We did not find any evidence of ADHD symptoms influencing parenting behaviors over time.

We found that ODD and CD were distinguished from one another in their effects on parenting practices. CD, unlike ODD, did not predict changes in timid discipline, communication or involvement, but did predict decreases in parental supervision. These asymmetrical findings between CD and supervision are consistent with those of Stice and Barrera (1995). They differ, however, from Laird et al. (2003), who found that low levels of parental knowledge predicted increases in delinquent behavior, in addition to finding that delinquent behavior predicted decreasing knowledge. It may be that as conduct problems develop over time, parents experience decreasing success with their efforts to supervise their children, and desist over time. It may also be the case that children who engage in CD behaviors exert greater effort to evade their parents' supervision, reducing the success of parents' efforts. Further examination will be necessary to elucidate the mechanisms at work in this relationship.

Although several variables that were predictive at the bivariate level were removed from later models, it may be that these still have some important role in the outcome. For example, poor supervision and poor communication were predictive of ODD at the bivariate level, but not after controlling for timid discipline. It may be that such variables are the initial part of a causal chain, with timid parenting being more proximal to the outcome of ODD. We were not able, in the present analyses to discern any such potential causal chains. Examining these relationships in other data sets should help to determine how robust these final models are.

Clinical Implications

Whether child behaviors exert greater influence on parenting behaviors or vice versa, the practicalities of service utilization, and evidence regarding effective treatments, suggest that interventions will need to continue to involve parents first and foremost in treatment. In the parent-child dynamic, parents must be the primary agent of change. Nevertheless, the overall direction of influence suggested by the current results does highlight the importance of also seeking to make change in the child's behavior through means in addition to parenting behaviors, including changes in the child's environment and working with the child directly.

Successful interventions do tend to recognize that parents must maintain consistency and minimize the display of hostility. The present findings indicate that parents must avoid any reluctance to engage in disciplinary strategies out

of a fear of the child's behavioral reaction, or they will likely see an increase in the child's opposition and defiance in response to future efforts at discipline. Some support for the importance of positive parent involvement, albeit tempered by the effects of other covariates, is also found in the present analyses. Although these findings do not suggest a clear link between poor communication, supervision, or harsh punishment and child disruptive behaviors, worsening parental behaviors in these domains likely contribute to an overall negative parent-child dynamic and familial context.

Limitations

Several limitations must be taken into account in considering the present findings. These data include only boys. It is very likely that parents differ in their concerns regarding girls' behavioral reactions to disciplinary efforts, and may anticipate hostile or aggressive reactions more from boys than girls. Boys may increase caregiver strain more than girls (Bussing et al. 2003a). Girls may also show differences in both the timing and course of the development of behavioral problems, as well as in which types of symptoms are more prevalent for girls. Such issues would potentially impact the nature of parents' responses to girls in contrast to boys.

As noted previously, the current measure of timid discipline focused more on severe behavioral reactions and less on unpleasant intolerable, yet non-aggressive, child behaviors. A measure assessing a wider range of parental concerns about children's undesirable responses to discipline might be needed for girls. It could possibly show differences for boys relative to the measure used here, although timid discipline was found to be associated with ODD rather than the generally more severe behaviors of CD. Likewise, our measure of harsh punishment was limited to one item, which likely captured a small subset of parental use of corporal punishment, leading to the low rates of endorsement here. This issue must be addressed more completely in a data set with a more comprehensive measure of physical punishment. Our measure of treatment was rudimentary, asking how many times in the past year behavioral services were used. A more nuanced index of the nature, timing and duration of services used would be preferable in order to assess the relationship between services, parenting behaviors and child behaviors.

These data also come from a clinic referred sample, with high rates of ODD and CD symptoms. Not only are the boys in this sample likely to show higher severity of disruptive behavior than children in non-referred samples, there may be higher levels of contextual or environmental risk factors. There may also be higher rates of behavioral or psychological difficulties on the part of parents that

influence parent-child interactions and parenting behaviors over time. The absence of reports of parenting from informants other than parents themselves is a limitation. Parents in such a referred sample may be poor reporters due to a desire to avoid appearing inadequate as parents or blameworthy for their children's behavior. They may also simply have a particularly biased understanding of their own parenting behaviors.

A final limitation of the present data set is the absence of information prior to the age of 7. It is likely that prior to 7, parents and children have already established patterns of interaction that could influence children's behavior. This may be evident in the fact that the age of onset of ODD is usually by 8 years of age (American Psychiatric Association 1994). Thus, additional study of these parent-child interactions using data from earlier in the child's development should be informative. However, it is also of interest that, despite the apparent stability in the overall levels of parenting behavior during the window of the present dataset, year to year changes in parenting behavior, particularly timid discipline, were nevertheless associated with changes in ODD behaviors.

Despite these limitations, the results of this study illustrate important relationships between parenting and child psychopathology. Of primary importance is the confirmation of the coercive process within the reciprocal relationship between timid discipline and ODD symptoms. The associations between ODD and multiple parenting practices, in either direction, is consistent with prior literature suggesting that ODD symptoms are more salient for parents (Teagle 2002), exert greater strain on parents (Bussing et al. 2003a, b), and drive greater help-seeking behavior (Bussing et al. 2003b) than CD. CD does appear to influence poorer supervision on the part of parents, suggesting that intervention with parents should include efforts to aid parents in developing adequate supervisory strategies.

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