Coercive Family Process and Early-Onset Conduct Problems From Age 2 to School Entry

Justin D. Smith,
Child and Family Center, University of Oregon

Thomas J. Dishion,
Arizona State University & Child and Family Center, University of Oregon

Daniel S. Shaw,
University of Pittsburgh

Melvin N. Wilson,
University of Virginia

Charlotte C. Winter, and
Child and Family Center, University of Oregon

Gerald R. Patterson
Oregon Social Learning Center

Abstract

The emergence and persistence of conduct problems during early childhood is a robust predictor of behavior problems in school and future maladaptation. In this study we examined the reciprocal influences between observed coercive interactions between children and caregivers, oppositional and aggressive behavior, and growth in parent report of early childhood (ages 2–5) and school-age conduct problems (age 7.5 and 8.5). Participants were drawn from the Early Steps multisite randomized prevention trial that includes an ethnically diverse sample of male and female children and their families ($N = 731$). A parallel process growth model combining latent trajectory and cross-lagged approaches revealed the amplifying effect of observed coercive caregiver–child interactions on children's noncompliance, whereas child oppositional and aggressive behaviors did not consistently predict increased coercion. The slope and initial levels of child oppositional and aggressive behaviors and the stability of caregiver–child coercion were predictive of teacher-reported oppositional behavior at school age. Families assigned to the Family Check-Up condition had significantly steeper declines in child oppositional and aggressive behavior and moderate reductions in oppositional behavior in school and in coercion at age 3. Results were not moderated by child gender, race/ethnicity, or assignment to the intervention condition. The implications of these findings are discussed with respect to understanding the early development of conduct problems and to designing optimal strategies for reducing problem behavior in early childhood with families most in need.

Keywords

coercion; dynamic systems; microsocial analysis; oppositional defiant behavior

---

The development of conduct problems (CPs) in early childhood is one of the strongest predictors of more serious delinquent behaviors at later developmental periods (e.g., Loeber & Dishion, 1983). However, few studies have enrolled participants in toddlerhood and then repeated measurement during early childhood through school age, with a focus on the development of more serious forms of antisocial behavior (Aguilar, Sroufe, Egeland, & Carlson, 2000; Shaw, Hyde, & Brennan, 2012). Coercive, harsh, and conflictual parenting practices are a salient risk factor for the development of clinically meaningful CPs (e.g., Odgers et al., 2008; Scaramella & Leve, 2004; Shaw, Gilliom, Ingoldsby, & Nagin, 2003; Waller et al., 2012), and these problem behaviors similarly elicit more harsh parenting from caregivers (e.g., Frick, Cornell, Barry, Bodin, & Dane, 2003; Gardner, Ward, Burton, & Wilson, 2003; Patterson, 1982; Shaw & Bell, 1993).

Coercive family dynamics are particularly germane to the development of early CPs and more serious forms of later antisocial behavior (Patterson, 1982; Patterson, Reid, & Dishion, 1992). Coercion theory (Patterson, 1982) describes a process of mutual reinforcement during which caregivers inadvertently reinforce children's difficult behaviors, which in turn elicits caregiver negativity, and so on, until the interaction is discontinued when one of the participants "wins." These cycles may begin when the child reacts with anger or resistance to a caregiver's directive or request, evoking anger and hostility from the caregiver, which is often intensified as the coercive cycle escalates (Snyder, Edwards, McGraw, Kilgore, & Holten, 1993). Thus, children learn a pattern of relating within the family that then carries over into interactions with others outside the family, such as peers and teachers in the school setting. When coercive interactions dominate within the family, child CPs emerge and then stabilize throughout development (Granic & Patterson, 2006).

Coercion theory was unveiled in the context of clinical studies of aggressive school-age children, which emphasized intensive observations in the home over multiple weeks (Patterson, 1976). Negative reinforcement characterized the structure of the coercion process. As such, parents inadvertently strengthened children's aversive behavior by their cyclical reactions of withdrawal and giving in (Patterson & Cobb, 1971; Patterson & Reid, 1970). This pattern was assessed in community samples of youths and found to predict escalations in CPs from middle childhood through adolescence (for a review, see Dishion & Patterson, 2006). When the coercion model was applied to intervention studies, it was found that interventions targeting coercive parenting practices prevented escalation of CPs and other problem behaviors (e.g., emotional problems, substance use) one would expect among high-risk youths (Dishion, Patterson, & Kavanaugh, 1992) and families undergoing divorce and remarriage (Forgatch & Patterson, 2010). Despite the appeal and promise of the coercion model for explaining early-onset CPs, few observational studies have systematically linked growth in CPs with dynamic changes in parent–child interactions, especially in early childhood (Martin, 1981; Patterson, 2002; Scaramella & Leve, 2004; Shaw, Keenan, & Vondra, 1994; Shaw et al., 1998).

Patterson (2002) described the transaction that defines the emergence of coercion in early childhood, which is functionally linked to parent–child exchanges of compliance and reactive aggression. Although in early childhood noncompliance and aggression are common, caregivers' emotional and ineffective reactions can inadvertently lead to increases in conflict that provide fertile ground for children to learn to be generally oppositional. Thus, by preschool age a child may have become openly defiant in a family context in which she or he has learned to "shut off" demands that are unpleasant or unrewarding. The literature suggests that a reciprocal process of reinforcement occurs between children's noncompliance and coercive exchanges with caregivers; noncompliance is met with caregiver responses that trigger a coercive exchange, which then elicits increased noncompliance. Children with more behavioral difficulties seem to elicit parenting from caregivers that is more coercive, controlling, and negative (for a review, see Scaramella & Leve, 2004). Patterson (2002) hypothesized that it is the interaction between an infant with behavioral difficulties and a caregiver who is only marginally competent at responding accurately to the child's cues that initially sets the coercive cycle in motion, an idea that was initially tested by Martin (1981) and subsequently twice replicated by Shaw and colleagues: Observational procedures revealed that infants with high levels of negative emotionality at 10–12 months in the context of low maternal responsiveness subsequently displayed more coercive interactions at 22–24 months and high levels of child oppositional and/or aggressive behavior between 36 and 42 months (Shaw et al., 1994; Shaw et al., 1998).

The interactional pattern between difficult-to-parent children and harsh parenting also has been consistently observed during videotaped interaction tasks. Fagot and Gauvain (1997) found that more difficult children receive more feedback and directives from caregivers during problem-solving tasks conducted at 18 months of age, but that the feedback involved more disapprovals and physical redirections (Gauvain & Fagot, 1995). Although toddlerhood and the preschool years are marked by increased willful noncompliance (Kochanska, 1995) and aggression (Tremblay et al., 2004), caregivers' directives naturally decrease during this developmental period (Kuczynski & Kochanska, 1990). As expected, children's strong, negative, noncompliant reactions have been found to elicit greater negative responses from caregivers (e.g., Braungart-Rieker, Garwood, & Stifter, 1997; Hartup & van Lieshout, 1995), which can be a precursor to increased coercive interactions in the home that shape expectations for social interactions in other contexts.

Early Coercion and School Adjustment

Normative socialization is arrested when coercive processes govern children's interactions with caregivers (Coie & Dodge, 1988; Dishion & Patterson, 2006; Patterson, 1982). Arrested development of critical social and academic skills leads to increased exposure to risk processes and decreased exposure to prosocial learning opportunities downstream in early adolescent development. This process, called a *developmental cascade,* has been well documented with longitudinal data linking childhood CPs with more serious adolescent delinquent behavior (e.g., Dishion, Véronneau, & Myers, 2010; Dodge et al., 2009). However, as of this writing, the process in which garden-variety noncompliance and aggression in toddlerhood lead to CPs at school age is less well documented. In particular,

the question of child versus parenting contributions to the coercion dynamic over time in early childhood remains less understood.

Social interactional theories emphasize early caregiver–child interactions as an important influence on behavior problems at later developmental stages (e.g., Dishion et al., 2010; Keenan & Shaw, 1995; Patterson, 2002; Shaw & Bell, 1993). Research has demonstrated that coercive, harsh, and overcontrolling parenting during early childhood contributes to adjustment difficulties during elementary school, including CPs (e.g., Campbell, Shaw, & Gilliom, 2000; McFadyen-Ketchum, Bates, Dodge, & Pettit, 1996; Shaw, Owens, Giovannelli, & Winslow, 2001). Of particular importance to our study are the results of the review by Shaw, Bell, and Gilliom (2000), who concluded that the quality of the caregiving environment at age 2 significantly predicted clinical-level elevations of CPs reported by caregivers and teachers 6 years later. This relationship might be more salient for children with more difficult to control behaviors (e.g., Shaw et al., 1994; Shaw et al., 1998). There is increasing awareness of the deleterious outcomes associated with high levels of mutual coercive exchanges during the second year and persistence into the preschool period (Martin, 1981; Shaw et al., 1994; Shaw et al., 1998). Instances of mutual negativity are almost inherent during caregiver–child interactions during toddlerhood and preschool. However, higher rates of this interaction pattern, and persistently high levels during early childhood, have been linked to children's problem behaviors at school entry (Dumas & LaFreniere, 1993; Dumas, LaFreniere, & Serketich, 1995; Patterson, 1982; Patterson et al., 1992).

Aims and Hypotheses

The purpose of this study was to examine the reciprocal influences between observed coercive caregiver–child interactions, caregiver-reported child oppositional/aggressive (OPP/AGG) behaviors, and observed noncompliance across the toddler to preschool period (ages 2–5). The OPP/AGG behaviors included items related to defiance, disobedience, destruction of belongings and other related indicators. In addition, we examined the relationship between these variables and oppositional and defiant behaviors reported by teachers during the early elementary school years (assessed at ages 7.5 and 8.5). Noncompliance and OPP/AGG behaviors in early childhood are often the precursors to school-age oppositionality, which increases the likelihood of the child remaining on a developmental trajectory of persistent CPs (e.g., Moffitt, 1993).

The bidirectional relationship between coercive caregiver–child interaction and young children's OPP/AGG and noncompliant behaviors has rarely been examined during this developmental period, and no studies using dynamic systems methods have been conducted to examine this specific issue during the period from age 2 to age 5. Dynamic systems approaches, which capture the moment-to-moment shifts in the caregiver–child dyad, are the state-of-the-science method for the assessment of coercive processes (Granic & Patterson, 2006). Specifically, we tested the following hypotheses:

1. Although the relationship between coercive interactions and child behaviors are expected to be bidirectional, the path coefficients from coercive interactions to

child behavior problems would be relatively stronger than those for the opposing influence of child behaviors on coercive interactions.

2. The initial levels and growth in caregiver-reported OPP/AGG, observed noncompliance, and greater duration of observed caregiver–child coercive interactions between ages 2 and 5 would be associated with teacher-reported oppositionality during early elementary school.

3. Randomization to the FCU would result in steeper declines in caregiver-reported OPP/AGG behaviors and observed noncompliance during this developmental period. Similarly, participation in the intervention would result in shorter durations of observed caregiver–child coercive interactions at ages 3, 4, and 5, as hypothesized.

Potential moderators

Theory and empirical findings indicate the need to test for gender differences when examining the sequelae of coercive family processes during this developmental period. Having examined the extensive body of literature about early CPs, Patterson (2002) speculated that gender differences contribute to the process by which coercive exchanges shape behavior in early childhood. He posited that males are more likely than females to react negatively to aversive parenting and to experience a "win" as a reinforcer, thus perpetuating coercive interaction patterns. For example, McFadyen-Ketchum and colleagues (1996) found that coercive interactions with caregivers prior to school entry were predictive of initial levels of CPs for both boys and girls. However, the association of coercion with a trajectory of CPs that followed differed by gender, with boys' CPs being more likely to increase and girls' CPs being more likely to decrease. In addition, Gray and colleagues (2012) found that girls' observed CPs were sensitive to context, whereas boys' CPs were not, suggesting potential gender differences in the association of early coercive interactions with caregivers and problem behaviors in the school.

We tested ethnic group membership as a potential moderator of coercive family dynamics in early childhood and school-age outcomes by (a) comparing European American families with families from all other ethnic groups in the sample, and (b) comparing European American families with African American families. Although coercion theory has a relatively robust empirical grounding, familial contributions to the development of CPs in youths are potentially culturally bound because parents' socialization strategies are guided by variability in optimal parenting practices that are largely based on a family's cultural values, beliefs, and racial socialization (Dunsmore & Halberstadt, 2009). One empirical example is a study by Lansford, Deater-Deckard, Dodge, Bates, and Pettit (2004), who followed 585 children from age 5 to 13 and found that growth in CPs during this period was related to harsh discipline for European American children but not for African American children. Evidence also suggests that coders from dominant racial or cultural groups rate minority families higher on coercion and other negative parenting practices (Yasui & Dishion, 2008).

In addition, we tested intervention condition as a potential moderator of the relationship between the variables to ensure that our results were representative of naturally occurring processes. This is particularly relevant when the intervention is found to be effective.

Methods

Participants

This study examined 731 mother–child dyads (49% female) recruited from the Women, Infants, and Children Nutrition Program (WIC) in three geographically and culturally diverse U.S. regions near Charlottesville, VA (188 dyads), Eugene, OR (271), and Pittsburgh, PA (272), for a randomized trial. Of the 1,666 WIC families with children between ages 2 years 0 months and 2 years 11 months screened, 879 indicated socioeconomic, family, or child risk factors for future child behavior problems and were invited to participate in the study. Of the 731 families who consented to participate, 367 were assigned to the Family Check-Up (FCU) condition and 364 families to the control condition, which received WIC services as usual (e.g., vouchers for nutritionally healthful food items). The flow of participants through the recruitment and randomization procedures is shown in Figure 1. The primary caregivers who participated in the assessment tasks were predominantly biological mothers at each age (2: 96%; 3: 95%; 4: 94%; 5: 93%). Biological fathers and grandmothers had the next highest participation. The sample reflects cultural diversity, including African American (27.9%), European American (50.1%), and Latino/Hispanic (13.4%) families.

Procedures

Home observation assessment protocol—Caregivers (i.e., predominantly mothers and, if available, alternative caregivers, such as fathers or grandmothers) and children who agreed to participate in the study were scheduled for a 2.5-hour home visit. Each assessment began by introducing the child to an assortment of age-appropriate toys and having them play for 15 minutes while the mother completed questionnaires. For ages 2 and 3, free play was followed by the primary caregiver and child participating in a clean-up task (5 minutes). Except for children age 2, a delay of gratification task followed (5 minutes). Next was a set of 3-minute-long teaching tasks (two at age 2, three at age 3, and two at age 5). Afterward, different inhibition-inducing toys were introduced for 2 minutes each (two toys at ages 2 and 3 and one at age 5). Last, a meal preparation and lunch task followed (20 minutes total). Additional tasks were added when an alternate caregiver participated in the study (free play, cleanup, and inhibition). During the home assessments, assessment staff completed ratings of caregiver involvement with and supervision of their child (described in the Measures section).

The Family Check-Up—The FCU is an ecological approach to family intervention and treatment designed to improve children's adjustment across settings (home, school, neighborhood) by motivating positive behavior support and other family management practices (e.g., effective limit setting, parental monitoring) in those settings. The FCU is a second-generation intervention grounded in the Parent Management Training–Oregon Model (PMTO; Forgatch & Patterson, 2010) and designed to be implemented in community

settings with the potential for a high public health impact, such as schools. The FCU is a brief, three-session intervention that is individually tailored to the needs of youths and families on the basis of results obtained via an ecological assessment. Typically, the three meetings include an initial contact session, a home-based multi-informant ecological observational assessment session, and a feedback session (Dishion & Stormshak, 2007). Feedback emphasizes parenting and family strengths, yet draws attention to possible areas of change. One goal of the FCU feedback session is to enhance the family's motivation to change by using collaborative, therapeutic techniques based on motivational interviewing, such as promoting change talk and fostering motivation to address key problems in parenting. The *Everyday Parenting* curriculum (Dishion, Stormshak, & Kavanagh, 2011) was used for subsequent intervention sessions aimed at family management. Research has indicated that participation in the FCU leads to reductions in problem behaviors during the preschool years (e.g., Dishion et al., in press; Dishion et al., 2008; Gardner, Shaw, Dishion, Burton, & Supplee, 2007). Therapists in this randomized trial were found to have delivered the FCU with adequate fidelity, which was related to improvements in parenting and subsequent changes in children's problem behaviors between ages 2 and 4 (Smith, Dishion, Shaw, & Wilson, in press).

Measures

Dyadic coercive interactions—The videotaped interaction tasks involving the child and the primary caregiver were coded using the Relationship Affect Coding System (RACS; Peterson, Winter, Jabson, & Dishion, 2009). RACS is a dynamic systems measurement method consisting of three continuous streams of parallel behavior: verbal, physical, and affect. Verbal codes comprise positive, neutral, and negative talk and include verbal behavior change codes, such as positive structuring, neutral, and negative directives. Physical behaviors (e.g., handing each other objects, hugging) are coded as positive, neutral, and negative. Affect codes include anger/disgust, distress, ignoring, validation, and positive affect. The "off" codes of no talk, no physical, and neutral affect are used when the other codes in the verbal, physical behavior, or affect streams are not observed. The RACS coding was recorded using Noldus Observer XT, Version 11.0 (Noldus Information Technology, 2012), which allows for continuous coding of an interaction of child and caregivers simultaneously. Using this approach, it is possible to calculate durations and frequencies of behavior clusters for each family member, and even more essential, the interaction dynamic between family members.

Addressing the complexity of three parallel behavior streams for two people necessitated further manipulation of the data streams. First, the verbal, physical, and affect streams were combined to create six behavior clusters—positive engagement (POS), neutral engagement (NEU), no talk (NTK), directives (DIR), negative engagement (NEG), and ignore (IGN)—that comprise a state-space grid with one person on each axis (caregiver on the *y*-axis and child on the *x*-axis in Figure 2). A set of priority rules was formed from the three parallel streams. For instance, if the caregiver smiled and at the same time was observed saying something negative to the child, the negative verbal code trumped the smile, a positive affect code, and the caregiver's behavior was classified as within the negative engagement cluster, which is labeled NEG in Figure 2. The end result enables one to analyze and identify dyadic

interaction patterns that can be graphed on a state-space grid (Hollenstein, 2007; Lewis, 2000). State-space grids have previously been adapted for the study of caregiver–child interactions and their relationship to child psychopathology (e.g., Granic, Hollenstein, Dishion, & Patterson, 2003; Hollenstein, Granic, Stoolmiller, & Snyder, 2004). For a review of the development of antisocial behavior from a dynamic systems perspective, see Granic and Patterson (2006).

We then identified dyadic regions of the grid representing distinct and meaningful behavior patterns. In this study, *dyadic coerce* (i.e., mutually coercive behaviors between the caregiver and the child) was defined as either participant being negatively engaged (NEG) or directive (DIR), while the other member of the dyad responds by not talking (NTK), ignoring (IGN), NEG, or DIR. This region thus comprises 12 cells from the 36 total possible cells of the complete matrix, represented by the black outlined area in Figure 2. We then calculated the total duration of observed caregiver–child dyadic interactions in this region and divided that time by the overall session time to get a duration proportion score. Reliability coefficients were in the "good" to "excellent" range, with overall kappa scores of .93 at each age and percent agreement of 93, 94, 93, and 94 at ages 2, 3, 4, and 5, respectively. Kappa coefficients were obtained from Noldus Observer. The kappas are computed based on the duration and sequencing of coded behavior. Only interaction tasks administered at the home assessments across all four ages (the teaching, inhibition, and meal tasks) were included in the analysis.

Observed child noncompliance—During the home assessments, assessment staff completed macroratings of the child's compliance with parent directives. Child noncompliance with the primary caregiver was measured using the following three items from the Coder Impressions Inventory (COIMP; Dishion, Hogansen, Winter, & Jabson, 2004): (1) Is the child compliant and cooperative with the caregiver's directives and requests? (reverse-scored); (2) Does the child seem dysregulated and difficult to manage, unable to control his/her behavior and emotions?; and (3) a rating of the overall quality of the child's compliance. The first two items were rated on a 1–9 Likert scale (1 = *not at all,* 5 = *somewhat,* 9 = *very much*). To assess overall compliance (Item 3), raters selected one of the following options: committed compliance, situational compliance, passive compliance, refusal/negotiation, and defiance. Items were *z*-scored prior to creating a composite because they were rated using different scales. *Z*-scores were initially calculated for each age, resulting in a mean score of 0 at each assessment point. To accurately estimate a growth curve in subsequent analyses, *z*-scores were recomputed across ages 2–5 to derive meaningful mean values from which a slope could be estimated. Internal consistencies (Chronbach's α) for ages 2, 3, 4, and 5 were .86, .84, .84, and .86, respectively. Average interrater agreement was high at each age, ranging from 87% to 88% agreement.

Child OPP/AGG behavior—We created a measure of child OPP/AGG behavior from the Child Behavior Checklist for ages 1.5–5 (CBCL; Achenbach & Rescorla, 2001). The CBCL is an empirically validated measure of child behavior problems administered to primary caregivers at each assessment. Caregivers are asked to rate the validity of several statements regarding potential child behaviors by using a 3-point Likert scale in which 0 = *not true,* 1 =

somewhat, sometimes true, and 2 = *very true, often true.* To generate a factor of OPP/AGG behavior that was both developmentally meaningful in the age 2 through 5 period and clinically relevant, individual items that were continuously present on the CBCL across ages 2, 3, 4, and 5 were chosen that mapped onto DSM-IV (American Psychiatric Association, 2000) criteria for oppositional defiant disorder and conduct disorder, including their aggressive hallmarks (labeled as OPP/AGG for simplicity, 8 items). A composite variable was computed by averaging the values for these items at each assessment age. Internal consistencies for the OPP/AGG scale were acceptable at each age (.71, .75, .83, .80 for ages 2, 3, 4, and 5, respectively).

Child oppositional behavior at school (age 7.5 and 8.5)—Teacher-reported oppositional behavior in the classroom was assessed using the DSM-oriented Oppositional Defiant Problems scale from the Teacher Report Form (TRF; Achenbach & Rescorla, 2001) version of the CBCL. The TRF is a well-validated measure of child problem behavior and was administered to the primary teacher of study participants at age 7.5 and age 8.5. Internal consistencies of .90 and .92 were obtained for the 5-item scale at ages 7.5 and 8.5, respectively. Because of high levels of missing teacher reports (43% available at age 7.5; 52% available at age 8.5), either report was used as the outcome when only 1 year was available. A mean of the two scores was used when data were available at both time points. This approach yielded 453 available cases (62%). *T*-scores were used in the final analysis.

Data Analytic Strategy

To address our hypotheses and simultaneously illuminate the developmental trajectories and processes involved in early coercive family interactions and child CPs, we first used an iterative approach to construct a model in a structural equation modeling (SEM) framework. When conducting longitudinal inquiries in which the modeling of individual trajectories of change and the longitudinal prediction of one variable from another are of interest, a hybrid model combining latent trajectory (i.e., latent growth curve [LGC]) and cross-lagged modeling strategies is indicated. This modeling approach is a variant of the parallel process latent growth model and the autoregressive latent trajectory model described by Curran and Bollen (e.g., Bollen & Curran, 2004; Curran & Bollen, 2001) and others. The LGC and cross-lagged modeling approaches have a long history in the developmental literature and have unique strengths and weaknesses in situations in which relationships between variables over time are proposed. They are often cast as competing means of analyzing longitudinal data (see Collins, 2006), yet each grants primacy to certain longitudinal influences: Cross-lagged models favor fixed and lagged effects, whereas latent trajectories focus on individual differences in change over time. The patent advantage of a hybrid model synthesizing latent trajectory and cross-lagged models is the simultaneous examination of the time-specific relationships between multiple variables (i.e., cross-lag) with their individual developmental trajectories. This approach sacrifices fixed effects in favor of the individual trajectories. Our modeling approach examined the relationship between observed caregiver–child coercive interactions at ages 2, 3, 4, and 5 with the latent trajectories of caregiver-rated child OPP/AGG behavior and observed child noncompliance at identical time points.

To address our first research question, we used a series of deviance tests to compare the relative strength of the association between the child behavior variables and coercive interactions. That is, we compared whether there was a significant difference between the two directions of the cross lags, one way going from coercive interactions to the child behavior and the other way from the child behavior to coercive interactions. A freely estimated model was compared with a model in which these paths were constrained to be equal. A significant decrement in model fit after imposing these constraints indicates that there are differences in the relative strengths of the associations by direction. This was done for each child behavior variable. We then conducted a deviance test of the overall model to test relative differences across the two indicators, which would be less susceptible to the potential bias of caregiver report and reduce any monomethod bias of the two observed variables (child noncompliance and coercive interactions).

Second, in addition to revealing the developmental course of, and relationship between, coercive interactions, caregiver-reported child OPP/AGG, and observed child noncompliance, we sought to examine if the relationship of these early indicators was significantly predictive of teacher-reported oppositional behaviors in the school arena. Following the approach advocated by MacKinnon, Lockwood, Hoffman, West, and Sheets (2002), we examined indirect effects by testing the joint significance of the paths leading from the predictor through other variables to the outcome, also known as an *intervening effect*. The Model Indirect command in Mplus was used to test for significant indirect effects from the three age 2 variables to the teacher-reported CPs. We then tested for intervention effects per our third research question by using the intention-to-treat (ITT) analytic approach for randomized trials. Last, we tested for the possible moderating effects of gender, ethnicity, and treatment group on the model by using a multiple-group analysis approach that compared fit indices of unconstrained and constrained models. We did not posit a specific direction of the moderating variables but expected potential racial and gender differences in teacher reported oppositional behaviors, given previous research (Fagot & Leve, 1998; Youngstrom, Loeber, & Stouthamer-Loeber, 2000). Last, we conducted the analyses for the nonintervention subsample as well to compare results of the full sample. This additional step was intended to increase confidence in the generalizability of the findings.

Path modeling was conducted in Mplus 7.0 (Muthén & Muthén, 2013). To include the full randomized sample in the analysis, we used maximum likelihood estimation with robust standard errors (MLR), which has been shown to provide unbiased estimates when data are missing at random (MAR) or missing completely at random (MCAR; Little & Rubin, 2002). MLR also provides more valid estimates when dependent variables are nonnormally distributed. There was some degree of missing data in our sample (see Table 1 for valid Ns of each variable), but the data were MCAR (Little's [1988] MCAR test, $\chi^2(423) = 436.21$, ns), so the missing data did not introduce bias into the analyses. Alpha (α) was set to .05.

Results

Intercorrelations among variables in this study are provided in Table 1, along with means and standard deviations and the number of available observations. The duration of time

caregivers and children spent in coercive interaction during the home assessment tasks declined over time from age 2 to age 5. Primary caregivers' ratings of child OPP/AGG and the observer ratings of noncompliance similarly declined between age 2 and 5. Examination of the correlations reveals that relationships between variables were largely in the expected direction. Coercive interactions were significantly and modestly intercorrelated amongst the three measurements ($r = .21–.29$; α set to .05). Intercorrelations among observed noncompliance ($r = .15–.31$) and caregiver-reported OPP/AGG ($r = .45–.63$) were similarly significant. These three variables were somewhat correlated within ages and across ages, but the relationships were not consistently significant. With the exception of noncompliance assessed at age 4 ($r = .05$), all other predictor variables were significantly correlated with teacher-reported oppositional behaviors at school ($r = .10–.28$).

Building the Model

The first step in our model-building process was to examine the fit of the two LGCs in our sample. Model fit for all analyses was examined using the chi-square statistic, comparative fit index (CFI; Bentler, 1990), and root mean square error of approximation (RMSEA; Steiger, 1990). Chi-square statistics measure the amount of discrepancy between the unrestricted sample covariance matrix and the restricted covariance matrix. Small chi-squares correspond to better fit to the data. CFI provides a measure of complete covariation of a hypothesized model with the independent model. Values greater than 0.95 indicate good fit to the data (Bentler, 1992). RMSEA values less than 0.05 indicate good model fit, and values up to 0.08 represent reasonable errors of approximation (Browne & Cudeck, 1993). Standardized root mean square residual is an index of absolute model fit defined as the standardized difference between the observed and predicted correlation. Values less than .08 are generally considered good fit (Hu & Bentler, 1999).

The unconditional LGC of caregiver-reported OPP/AGG was found to be a better fit to a quadratic effect, $\chi^2(1) = 9.44$, CFI = .988, RMSEA = .107, SRMR = .020, than to a linear effect, $\chi^2(5) = 76.15$, CFI = .900, RMSEA = .140, SRMR = .063. A linear effect was the best fit for the LGC of observed noncompliance, $\chi^2(5) = 9.59$, CFI = .960, RMSEA = .035, SRMR = .033. When included in the same model, the two curves provided acceptable fit to the data for the purposes of model building, $\chi^2(16) = 36.42$, CFI = .979, RMSEA = .042, SRMR = .053. Slope estimates of OPP/AGG (linear = −.361; quadratic = −.136) indicate a downward trajectory that becomes steeper over time. The LGC of noncompliance had a significant downward linear trend (−.179). The slope and quadratic parameters of both curves were significantly different from zero (p-values <.05). Figure 3 illustrates the trajectories of observed child noncompliance, OPP/AGG (caregiver-reported), and coercive interactions between ages 2 and 5.

Second, we examined fit when including observed coercive interactions in a cross-lagged model with each of the growth curves independently. Fit statistics were adequate for the purposes of model building; that is, OPP/AGG: $\chi^2(4) = 8.08$, CFI = .996, RMSEA = .037, SRMR = .016; noncompliance: $\chi^2(9) = 11.78$, CFI = .992, RMSEA = .021, SRMR = .022, so we proceeded to include both LGCs in a model with observed coercive interactions in a cross-lagged fashion with both curves. The measurements of OPP/AGG and noncompliance

within each growth curve were correlated with the respective measures of coercive interactions but not with each other, because the slopes and intercepts of the growth curves were allowed to correlate. The resultant fit statistics indicated good fit to the data, $\chi^2(23) = 37.10$, CFI = .989, RMSEA = .029, SRMR = .023, and we added the outcome variable of teacher-reported child oppositional behaviors at school. Model fit was significantly improved by including additional paths between coercive interactions at age 2 to age 4 and 5 directly, as well as age 3 to age 5 directly. These paths were used in each model that included coercive interactions.

Analysis of the final model presented in Figure 4 began with an examination of fit. With adequate model fit, $\chi^2(29) = 46.15$, CFI = .987, RMSEA = .028, SRMR = .026, we proceeded by examining the results of the path model. The path coefficients for the model in Figure 4 are provided in Table 2. Table 3 provides the correlations estimated by Mplus between the slopes and intercepts of the growth curves, which were allowed to correlate with one another and with coercive interactions at age 2. Stability coefficients indicated a significant relationship between successive observations of coercive interactions, despite the overall decline in mean levels of coercion between ages 2 and 5. Direct paths from coercive interactions at age 2 to age 4 and age 5, and age 3 to age 5, were also significant. The path from age 4 OPP/AGG to age 5 coercive interactions was significant. Age 2 and age 4 coercive interactions significantly predicted subsequent noncompliance at ages 3 and 5, respectively.

Relative strength of the associations—We first determined the average strength of the association for each cross-lag direction by constraining them to be equal, one direction at a time. This model includes 4 directions of cross-lagged relationships: OPP/AGG → Coercive interactions (Mean: $\beta = .05$); Coercive interactions → OPP/AGG ($\beta = .00$); Noncompliance → Coercive interactions ($\beta = .00$); Coercive interactions → Noncompliance ($\beta = .07$). Deviance tests resulted in significant differences in the relative strength of the relationships between child problem behaviors and coercive interactions in all three ways tested: (a) paths from OPP/AGG to coercion are relatively stronger compared with the other direction; (b) paths from coercive interactions to noncompliance are relatively stronger; (c) paths from coercive interactions to the child behavior variables ($\beta = .033$), measured simultaneously, are relatively stronger than the opposing relationship ($\beta = .027$).

Predicting school-age oppositional behaviors—Concerning the association between study variables and children's oppositional behavior in school as reported by teachers, coercive interactions at age 5 were a significant predictor. A significant indirect effect was found from age 2 coercive interactions through subsequent assessments of coercion (age 2 to age 5 and age 2 to age 3 to age 5; see Table 2). The 95% confidence intervals of these adjacent paths do not contain 0 and are thus considered significant indirect effects (MacKinnon et al., 2002). The slope and intercept of the noncompliance LGC was significantly related to the outcome, such that greater initial levels of observed noncompliance and less steep declines over time predicted greater oppositional behaviors in the classroom. The intercept of the OPP/AGGLGC was similarly related to later behavior problems in school. The quadratic term of OPP/AGG was significant. The final model

accounted for a significant amount of the variance in the outcome (R^2 = .18, SE = .047, p < .001).

Intervention effects—We tested for intervention effects by using an ITT analytic framework of randomized group assignment. The intervention condition was regressed on the slope of each LGC, the quadratic term of the OPP/AGGLGC, teacher-reported oppositional behaviors, and coercive interactions at ages 3, 4, and 5. Assignment to the FCU was associated with steeper declines in parent report of OPP/AGG from age 2 through 5, compared with control group outcomes (B = −.12, SE =.04, β = −.08, p < .05). Figure 3 illustrates this significant difference in the decline of OPP/AGG by including the slope of the intervention and control groups separately: After beginning at similar levels, the intervention group falls below the control group at age 3, and the difference widens at age 4 and remains even wider at age 5. No significant effects were found on coercive interactions.

Moderation—Multiple potential moderating variables were tested using a step-wise multiple-groups analysis approach. We tested for differences in the structural covariance of the model based on gender, ethnic group membership, and intervention group assignment by using a chi-square deviance test, which compares the fit of two groups when paths are freely estimated and when they are constrained to be equal across groups. Constraining the paths to be equal across the groups did not result in a significant decrement in model fit, as evidenced by the chi-square deviance test, when comparing males and females, intervention group assignment, European American and nonmajority group membership, and European American and African American families, indicating that the relationship between the paths in the model did not significantly differ across the groups tested.

Analysis of nonintervention group—In addition to tests of moderation by intervention group assignment, we also ran the model using only families in the control group to further ensure that the intervention did not significant alter the key findings in this study. Overall, the results were analogous to those found for the full sample, as evidenced by the directionality and relative strength of the relationships between the variables. However, the test yielded fewer statistically significant paths, which was likely due to power issues (N = 364). Importantly, the model provided good fit to the data ($\chi^2(29)$ = 44.98, CFI = .979, RMSEA = .039, SRMR = .034) and accounted for a similar degree of variance in teacher-reported oppositionality (R^2 = .24, SE = .077, p < .01) compared to the full model (R^2 = .18, SE = .047, p < .001). Teacher-reported oppositionality was found to be significantly associated with the slope (B = 11.97, SE =5.34, β = .35, p < .05) and intercept (B = 7.34, SE =3.49, β = .51, p < .05) of the noncompliance LGC and the indirect effect of coercion from age 2 to age 5 (B = 3.81, SE =2.01, β = .03, p = .058). The intercept and quadratic parameters of the OPP/AGG LCG were again strongly associated with school-age oppositionality, but were not statistically significant (p > .05) as they had been in the full sample: intercept (B = .90, SE =1.06, β = .20) quadratic (B = 5.10, SE =7.08, β = .32). In terms of the relative strength of the relationship between coercive family interactions and child behaviors, the former was similarly found to be significantly stronger in this analysis (β = .045; β = .022).

Discussion

A number of theoretical models hypothesize and have found support for a relationship between children's behavioral characteristics and coercive interactions with caregivers during early childhood. Higher levels of oppositional and aggressive behavior in toddlerhood appear to reliably predict CPs and other deleterious outcomes at subsequent developmental periods (e.g., Loeber & Farrington, 2000; Shaw & Gross, 2008), as does a preponderance of coercive interactions (e.g., Dishion & Patterson, 2006; Keenan & Shaw, 1995; Patterson, 1982). However, studies with rigorous measurement during early childhood have been lacking in the literature (Patterson, 2002; Scaramella & Leve, 2004). It is essential to observationally assess caregiver–child coercive interactions given the problems associated with using caregiver report to assess these dynamics (Dishion & Patterson, 1999). In our study, coercive interactions were rigorously assessed by using a sophisticated, relational observational coding procedure and state-of-the-science dynamic systems measurement methods at four time points. Inclusion of observed (noncompliance) and caregiver-reported symptoms of CPs at four time points, measured yearly by trained coders, addressed the weaknesses of previous empirical examinations of coercion during this developmental period and strengthened the conclusions of our study. The link between coercive family interactions and later child outcomes is well established (e.g., Dishion & Patterson, 2006; Shaw et al., 2003); it is the mutual influences of coercion and child behaviors over time that begs for further inquiry.

In this study, we sought to address the limitations just noted. We tested three specific hypotheses. First, we predicted that the paths from coercive interactions to child behavior problems would be relatively stronger than the opposing influence of child behaviors on coercive interactions. This hypothesis was supported: Coercive interactions had a relatively stronger relationship to child behaviors the following years, suggesting that coercive interactions between children and caregivers drive escalations in child oppositional and aggressive behavior, as well as noncompliance. Although this pattern of findings might be partially accounted for by measurement method (i.e., stronger relations were found between observed noncompliance and coercive caregiver–child interactions than between parent-reported child OPP/AGG and observed coercion), this finding contrasts with Patterson's (2002) prediction that children's noncompliance and oppositional behaviors perpetuated coercive cycles in early childhood.

Our second hypothesis, that teacher-reported oppositional behaviors during early elementary school would be significantly associated with initial levels and growth over time in caregiver-reported OPP/AGG and observed noncompliance, was supported. Higher initial levels (i.e., intercept of the LGCs) of both factors were related to more CPs in early elementary school. A less steep decline in the slope of noncompliance was also associated with higher teacher ratings. The same pattern was found for the slope parameter of caregiver-reported OPP/AGGLGC, but it was nonsignificant. The quadratic function of OPP/AGG was significant, suggesting that children who remain more oppositional and aggressive across the preschool years are likely to be rated as oppositional in elementary school. Caregiver–child coercive interactions, beginning at age 2, were also predictive of school-age oppositional behaviors. Coercion was relatively stable from year to year during

the developmental period between ages 2 and 5, and this indirect effect was related to oppositionality in school. The strongest effect was found for the direct path from age 2 to age 5 and then to CPs in school, further suggesting that higher rates of early coercion that persist are a primary process by which CPs develop in childhood. This finding is consistent with findings from previous research (e.g., Shaw et al., 2001; Shaw et al., 1998).

Taken together, these results paint a clearer picture of the relationship between children's behaviors, coercion dynamics, and children's oppositionality in the school context. As children become increasingly mobile and the potential grows for noncompliance and aggression to occur in response to caregiver directives, the duration of coercive interactions hits its peak. Although noncompliant and aggressive child behaviors are likely to increase the potential for engaging in coercive exchanges (Patterson, 1982), early coercive exchanges appear to be the prominent amplifying factor in the developmental trajectory of CPs from early childhood to school age. Coercion and child CPs typically decline during this period; when they persist, children are more likely to display CPs in the classroom. High levels of coercive interactions in the home increase the likelihood that teachers experience similar behaviors in the classroom. Similarly, teachers likely observe the child engaging in coercive exchanges in the classroom with peers. Coercive interactions and CPs in the classroom often result in the child being rejected by prosocial peers, and he or she starts down a negative developmental trajectory toward later antisocial problems (e.g., Dishion et al., 2010; Dodge et al., 2009). Aggression, noncompliance, and other child behaviors undoubtedly contribute to the developmental cascade, yet our study results strongly indicate that coercive processes play an important amplifying role in this process. These results held for children of both genders and families of diverse racial and ethnic backgrounds.

Intervention Effects and Clinical Implications

With the collective empirical evidence of the role of coercive family dynamics in the development of youth problem behaviors and related outcomes, it is not surprising that a number of family-based treatments target coercive dynamics. However, because this was a prevention trial, many of the families in this sample who participated in the intervention services were not engaged in coercive interactions and their young child was not demonstrating clinically elevated levels of CPs. In fact, previous research with this sample revealed intervention effects to be most pronounced in families whose child demonstrated clinically elevated oppositional behavior at age 2 (Dishion et al., 2008). Although some family-based interventions have achieved reductions in coercive family interactions (e.g., Conduct Problems Prevention Research Group, 1999; Reid, Eddy, Fetrow, & Stoolmiller, 1999), our analyses indicate that coercion was only moderately reduced in the intervention group at one time point (age 3), despite the longer term effects on oppositional behavior at home and in the school (Dishion, Brennan, et al., in press). We hypothesize that increasing levels of positive behavior support in parents has an independent effect on the salience of coercive conflict in the home, providing the conditions under which children learn more positive behaviors and coping strategies. Regardless, the randomized intervention did not seem to alter the relationship between coercion dynamics and child behaviors tested in the overall model, as the results held in both the control and intervention groups.

Another study involving the same sample focused more intensively on the families with children who displayed clinically elevated oppositional behavior at age 2 and on changes in coercion dynamics as a function of the FCU (Smith, Dishion, Moore, Shaw, & Wilson, 2013). One important aspect of coercion is that it involves emotionally driven interaction dynamics that are often attributable to overlearned patterns of behavior and therefore difficult to control and regulate. Changing these parenting dynamics requires more direct feedback and training. Video feedback procedures are one particularly relevant therapeutic technique. This technique and its potential mechanism of action have been found to reduce caregivers' coercive behaviors with their young children during the preschool years (Smith et al., 2013). Therapists' behaviors and techniques were examined during the FCU assessment feedback session of a clinical subsample ($N = 79$) of the participants in this study. We found that the inclusion of video feedback procedures during the age 2 FCU, which consists of showing caregivers brief videotaped clips of desirable interactions with their children (i.e., the FCU's ecological assessment) to reinforce positive parenting practices, reduced caregivers' negative schemas of their child. This in turn was found to be an intervening variable in reducing coercive parenting behaviors 3 years later (age 5). This finding is consistent with a complementary study finding that more negative caregiver relational schemas about the child predict a less steep decline in observed coercive interactions during early childhood (Smith, Dishion, Shaw, & Wilson, under review). As such, interventions ought to target the underlying parental beliefs and schemas that govern and maintain coercive patterns of responding to and interacting with their child. The lack of intervention effect on coercion in our study notwithstanding, results clearly indicate that the FCU has an effect on children's CPs during this period, which most likely occurs by improving family management strategies, such as positive behavior support (Dishion et al., 2008). The Smith et al. (2013) study also measured coercion differently and focused on caregivers' negative engagement and directives, not the mutual or dyadic coercive interactions examined in this study.

The link between early coercion in the family and later behavior problems in the school context has implications for the prevention of school bullying. Teacher reports of child behaviors at school are likely based, at least in part, on their observations of the child engaging in aggressive and coercive interactions with peers. Following a developmental cascade framework, early family-based intervention targeting coercive dynamics is a sensible strategy. Interventions such as the FCU, in conjunction with evidence-based programs embedded in schools (e.g., Olweus & Limber, 2010), would likely reduce the substantial prevalence rates of school bullying (Stassen Berger, 2007). This multidimensional prevention strategy might be more effective than school-based programs alone given the strong familial influences on aggressive behavior.

Limitations

Despite numerous strengths of this study, some limitations and caveats must be mentioned. First, the sample represents a low-income group of mothers and children, which limits the generalizability of our findings to families with fewer economic and contextual risk factors. The developmental correlates of early coercive processes are likely to be most prominent in high-risk families in which caregivers are under greater stress and have fewer resources,

such as those with mental health and substance use issues and single and teen parenthood. However, socialization processes are salient in all families, suggesting that our findings are likely to hold in a representative sample as well.

Second, intervention effects of this study may be underestimated in that a highly conservative ITT approach was used, which does not account for families' engagement status (i.e., receipt of the FCU) and instead treats assignment to the intervention condition equally regardless of whether or not the family engaged in the FCU. For this reason, prevention scientists have begun to use analytic approaches that account for engager status, such as complier average causal effect models (CACE; Jo, 2002). CACE could not be used to analyze the intervention effects of this study's complex modeling approach, because it is limited to evaluating a single longitudinal outcome and does not allow for examination of the relationship between variables.

Along similar lines, the context of this study, a randomized intervention trial, is a potential limitation for examining naturally occurring developmental processes. Perhaps due to a lack of robust intervention effects on coercive dynamics, the results of analyses using the full sample were sustained by analyses of the control group only. This additional element of the study increases our confidence that the relationships reported in this study are representative of typical developmental processes. No moderation by intervention condition provides further support for this contention.

Third, one of the aims of this study was to determine the relationship between coercive interactions and child behaviors, which has largely been the dominion of social learning theorists (e.g., Patterson, 1982). Because coercive interactions emerge in toddlerhood when caregivers begin to use directives to maintain the child's safety as mobility increases, it is not feasible to assess this variable much earlier than was done in this study. However, earlier indicators of the child's behavioral and interpersonal characteristics, such as temperament, attachment, and inhibitory control, could prove to be important covariates or moderators of the mutual influences explored in this study. Similarly, genetic factors and neuropsychological indicators could be included in future research, which is consistent with some prominent developmental models (Cicchetti, 1993; Moffitt, 1990; Scaramella & Leve, 2004).

Fourth, combining LGC and cross-lag models allowed us to address our hypotheses. However, one drawback of the type of parallel process growth model we selected is that, unlike a traditional cross-lag analysis, the prediction of noncompliance and OPP/AGG from prior levels of dyadic coercion cannot be said to be above the stability of that variable because of the lack of direct paths between measurements of these variables (i.e., stability paths). The stability paths are essentially sacrificed to estimate the LGCs, which allow for greater flexibility to assess separate trajectories with unique time trends because the traditional cross-lag model with autoregressive parameters does not incorporate the specific random components underlying the trajectory of the child behaviors (Bollen & Curran, 2004). Autoregressive latent trajectory models might be a comparable alternative, but generally can be used to examine the longitudinal relationship between only two variables of interest and not three.

Last, the measurement of each variable in this analysis could have contributed to our findings. Observers rated coercive dynamics and child noncompliance using the same interaction tasks, which as noted previously, could have led to monomethod bias in the final analysis. However, correlating these variables at each time point reduced this biasing effect. On a similar note, we used caregiver-reported OPP/AGG behaviors, which are subject to a number of potentially biasing effects, such as demand characteristics, intentional and unintentional over- or underreporting because of caregiver factors (e.g., depression, dismissing attachment), and a more subjective perspective of their child. Teacher reports also had a moderate degree of missing data (38%). Although it is a strength of the study to include multiple raters and methods of assessment, predicting an observed interaction pattern with another observed variable could have made it difficult to account for significant variance with a parent-report measure.

Conclusions

The contexts in which children are raised shape and influence their behavior. Interactions with caregivers are arguably the strongest predictor of later CPs outside of the home (e.g., Dishion & Patterson, 2006; Shaw et al., 2000). Coercive family dynamics are mutually influenced by caregivers' reactions to children's behaviors, the child's response to the caregiver, and so forth (Patterson, 2002). Toddlers demonstrating more oppositionality and aggression are more likely to elicit directives from caregivers and potentially initiate coercive exchanges if the child fails to comply with the request. Our study indicates that early coercive family processes amplify children's OPP/AGG behaviors and noncompliance and predict oppositionality in school. We found evidence indicating that coercive interactions are a relatively stronger predictor of subsequent child noncompliance and oppositional behaviors than are the child behaviors that amplify coercion. Overall, oppositional and noncompliant behaviors decline fairly rapidly during this developmental period; however, a higher preponderance of coercive exchanges appears to reduce the rate of decline, and CPs persist into the school arena. The FCU was found to improve the rate of decline in caregiver-reported OPP/AGG but did not appreciably reduce coercive interactions or noncompliance, indicating a need to refine treatment approaches to target these variables. Alternatively, because coercive interactions are somewhat normative during toddlerhood, perhaps parent training interventions achieve effectiveness through other mechanisms of change, such as decreasing coercion indirectly by directly increasing positive parenting.

Moving forward, studies of this nature might consider including additional child and caregiver risk factors. Evidence suggests that prenatal (e.g., Fagot, Pears, Capaldi, Crosby, & Leve, 1998), genetic (see Raine, 2002, for a review), and caregiver characteristics, including maternal depression (e.g., Goodman & Gotlib, 1999) and caregivers' antisocial behaviors (e.g., Patterson, 1999), also contribute to the emergence of coercive family interactions and the subsequent emergence of children's CPs. Based on the known long-term correlates of early-starting CPs and more serious forms of antisocial behavior, understanding the developmental processes that contribute to early and persistent problem behaviors is key and paves the way for effective intervention and prevention strategies that curtail this deleterious trajectory.

Acknowledgments

References

Achenbach, TM.; Rescorla, LA. Manual for the ASEBA school-age forms and profiles. U.S.A.: Library of Congress; 2001.

Aguilar B, Sroufe LA, Egeland B, Carlson EA. Distinguishing the early-onset/persistent and adolescence-onset antisocial behavior types: From birth to 16 years. Development and Psychopathology. 2000; 12(02):109–132. [PubMed: 10847620]

American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th. Washington, DC: Author; 2000. text rev

Bentler PM. Comparative fit indexes in structural models. Psychological Bulletin. 1990; 107:238–246. [PubMed: 2320703]

Bentler PM. On the fit of models to covariances and methodology to the *Bulletin*. Psychological Bulletin. 1992; 112:400–404. [PubMed: 1438635]

Bollen KA, Curran PJ. Autoregressive latent trajectory (ALT) models a synthesis of two traditions. Sociological Methods & Research. 2004; 32(3):336–383.

Braungart-Rieker J, Garwood MM, Stifter CA. Compliance and noncompliance: The roles of maternal control and child temperament. Journal of Applied Developmental Psychology. 1997; 18(3):411–428.

Browne, WM.; Cudeck, R. Alternative ways of assessing model fit. In: Bollen, KA.; Long, JS., editors. Testing structural equation models. Newbury Park, CA: Sage; 1993. p. 136-162.

Campbell SB, Shaw DS, Gilliom M. Early externalizing behavior problems: Toddlers and preschoolers at risk for later maladjustment. Development and Psychopathology. 2000; 12(03):467–488. [PubMed: 11014748]

Cicchetti DV. Developmental psychopathology: Reactions, reflections, projections. Developmental Review. 1993; 13(4):471–502.

Coie JD, Dodge KA. Multiple sources of data on social behavior and social status in the school: A cross-age comparison. Child Development. 1988; 59:815–829. [PubMed: 3383681]

Collins LM. Analysis of longitudinal data: The integration of theoretical model, temporal design, and statistical model. Annual Review of Psychology. 2006; 57(1):505–528.

Conduct Problems Prevention Research Group. Evaluation of the first 3 years of the Fast Track Prevention Trial with children at high risk for adolescent conduct problems. Journal of Abnormal Child Psychology. 1999; 30:19–35.

Curran, PJ.; Bollen, KA. The best of both worlds: Combining autoregressive and latent curve models. In: Collins, LM.; Sayer, AG., editors. New methods for the analysis of change. Washington, DC: American Psychological Association; 2001. p. 107-135.

Dishion TJ, Brennan LM, Shaw DS, McEachern AD, Wilson MN, Jo B. Prevention of problem behavior through annual Family Check-Ups in early childhood: Intervention effects from the home to the second grade of elementary school. Journal of Abnormal Child Psychology. in press.

Dishion, TJ.; Hogansen, J.; Winter, C.; Jabson, JM. Unpublished coding manual. Child and Family Center, 6217 University of Oregon, Eugene, OR 97403: 2004. The Coder Impressions Inventory. Available from the

Dishion TJ, Patterson GR. Model-building in developmental psychopathology: A pragmatic approach to understanding and intervention. Journal of Clinical Child Psychology. 1999; 28(4):502–512. [PubMed: 10587901]

Dishion, TJ.; Patterson, GR. The development and ecology of antisocial behavior. In: Cicchetti, D.; Cohen, DJ., editors. Developmental psychopathology: Vol 3 Risk, disorder, and adaptation. New York, NY: Wiley; 2006. p. 503-541.

Dishion, TJ.; Patterson, GR.; Kavanagh, K. An experimental test of the coercion model: Linking theory, measurement, and intervention. In: McCord, J.; Tremblay, R., editors. Preventing antisocial behavior: Interventions from birth through adolescence. New York, NY: Guilford; 1992. p. 253-282.

Dishion TJ, Shaw DS, Connell A, Gardner FEM, Weaver C, Wilson M. The Family Check-Up with high-risk indigent families: Preventing problem behavior by increasing parents' positive behavior support in early childhood. Child Development. 2008; 79(5):1395–1414. [PubMed: 18826532]

Dishion, TJ.; Stormshak, EA. Intervening in children's lives: An ecological, family-centered approach to mental health care. Washington, DC: American Psychological Association; 2007.

Dishion, TJ.; Stormshak, EA.; Kavanagh, K. Everyday parenting: A professional's guide to building family management skills. Champaign, IL: Research Press; 2011.

Dishion TJ, Véronneau MH, Myers MW. Cascading peer dynamics underlying the progression from problem behavior to violence in early to late adolescence. Development and Psychopathology. 2010; 22(3):603–619. [PubMed: 20576182]

Dodge KA, Malone PS, Lansford JE, Miller S, Pettit GS, Bates JE. A dynamic cascade model of the development of substance-use onset: Early peer relations problem factors. Monographs of the Society for Research in Child Development. 2009; 74(3):51–54.

Dumas JE, LaFreniere PJ. Mother–child relationships as sources of support or stress: A comparison of competent, average, aggressive, and anxious dyads. Child Development. 1993; 64:1732–1754. [PubMed: 8112116]

Dumas JE, LaFreniere PJ, Serketich WJ. "Balance of power": A transactional analysis of control in mother–child dyads involving socially competent, aggressive, and anxious children. Journal of Abnormal Psychology. 1995; 104(1):104–113. [PubMed: 7897032]

Dunsmore, JC.; Halberstadt, AG. The dynamic cultural context of emotion socialization. In: Mancini, JA.; Roberto, KA., editors. Pathways of human development: Explorations of change. Lanham, MD: Lexington; 2009.

Fagot BI, Gauvain M. Mother–child problem solving: Continuity through the early childhood years. Developmental Psychology. 1997; 33(3):480–488. [PubMed: 9149926]

Fagot BI, Leve LD. Teacher ratings of externalizing behavior at school entry for boys and girls: Similar early predictors and different correlates. The Journal of Child Psychology and Psychiatry and Allied Disciplines. 1998; 39(04):555–566.

Fagot BI, Pears KC, Capaldi DM, Crosby L, Leve CS. Becoming an adolescent father: Precursors and parenting. Developmental Psychology. 1998; 34:1209–1219. [PubMed: 9823506]

Forgatch, MS.; Patterson, GR. Parent management training-Oregon model: An intervention for antisocial behavior in children and adolescents. In: Weisz, JR.; Kazdin, AE., editors. Evidence-based psychotherapies for children and adolescents. New York, NY: Guilford Press; 2010. p. 159-178.

Frick PJ, Cornell AH, Barry CT, Bodin SD, Dane HE. Callous-unemotional traits and conduct problems in the prediction of conduct problem severity, aggression, and self-report of delinquency. Journal of Abnormal Child Psychology. 2003; 31(4):457–470. [PubMed: 12831233]

Gardner FEM, Shaw DS, Dishion TJ, Burton J, Supplee L. Randomized prevention trial for early conduct problems: Effects on proactive parenting and links to toddler disruptive behavior. Journal of Family Psychology. 2007; 21(3):398–406. [PubMed: 17874925]

Gardner FEM, Ward S, Burton J, Wilson C. The role of mother–child joint play in the early development of children's conduct problems: A longitudinal observational study. Social Development. 2003; 12:361–379.

Gauvain M, Fagot BI. Child temperament as a mediator of mother–toddler problem solving. Social Development. 1995; 4(3):257–276.

Goodman SH, Gotlib IH. Risk for psychopathology in the children of depressed mothers: A developmental model for understanding mechanisms of transmission. Psychological Review. 1999; 106(3):458–490. [PubMed: 10467895]

Granic I, Hollenstein T, Dishion TJ, Patterson GR. Longitudinal analysis of flexibility and reorganization in early adolescence: A dynamic systems study of family interactions. Developmental Psychology. 2003; 39(3):606–617. [PubMed: 12760527]

Granic I, Patterson GR. Toward a comprehensive model of antisocial development: A dynamic systems approach. Psychological Review. 2006; 113(1):101–131. [PubMed: 16478303]

Gray SAO, Carter AS, Briggs-Gowan MJ, Hill C, Danis B, Keenan K, Wakschlag LS. Preschool children's observed disruptive behavior: Variations across sex, interactional context, and disruptive psychopathology. Journal of Clinical Child & Adolescent Psychology. 2012; 41(4):499–507. [PubMed: 22540388]

Hartup WW, van Lieshout CFM. Personality development in social contex. Annual Revew of Psychology. 1995; 45:655–687.

Hollenstein T. State space grids: Analyzing dynamics across development. International Journal of Behavioral Development. 2007; 31(4):384–396.

Hollenstein T, Granic I, Stoolmiller M, Snyder J. Rigidity in parent–child interactions and the development of externalizing and internalizing behavior in early childhood. Journal of Abnormal Child Psychology. 2004; 32(6):595–607. [PubMed: 15648527]

Hu LT, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. Structural Equation Modeling: A Multidisciplinary Journal. 1999; 6(1):1–55.

Jo B. Statistical power in randomized intervention studies with noncompliance. Psychological Methods. 2002; 7(2):178–193. [PubMed: 12090409]

Keenan, K.; Shaw, DS. The development of coercive family processes: The interaction between aversive toddler behavior and parenting factors. In: McCord, J., editor. Coercion and punishment in long-term perspectives. New York, NY: Cambridge University Press; 1995. p. 165-180.

Kochanska G. Children's temperament, mothers' discipline, and security of attachment: Multiple pathways to emerging internalization. Child Development. 1995; 66(3):597–615.

Kuczynski L, Kochanska G. Development of children's noncompliance strategies from toddlerhood to age 5. Developmental Psychology. 1990; 26(3):398–408.

Lansford JE, Deater-Deckard K, Dodge KA, Bates JE, Pettit GS. Ethnic differences in the link between physical discipline and later adolescent externalizing behaviors. Journal of Child Psychology and Psychiatry. 2004; 45(4):801–812. [PubMed: 15056311]

Lewis MD. The promise of dynamic systems approaches for an integrated account of human development. Child Development. 2000; 71:36–43. [PubMed: 10836556]

Little RJA. A test of missing completely at random for multivariate data with missing values. Journal of the American Statistical Association. 1988; 83:1198–1202.

Little, RJA.; Rubin, DB. Statistical analysis with missing data. 2nd. New York, NY: Wiley; 2002.

Loeber R, Dishion TJ. Early predictors of male delinquency: A review. Psychological Bulletin. 1983; 94:68–99. [PubMed: 6353467]

Loeber R, Farrington DP. Young children who commit crime: Epidemiology, developmental origins, risk factors, early interventions, and policy implications. Development & Psychopathology. 2000; 12(4):737–762. [PubMed: 11202042]

MacKinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychological Methods. 2002; 7(1):83–104. [PubMed: 11928892]

Martin JA. A longitudinal study of the consequences of early mother–infant interaction: A microanalytic approach. Monographs of the Society for Research in Child Development. 1981; 46(3):59.

McFadyen-Ketchum SA, Bates JE, Dodge KA, Pettit GS. Patterns of change in early childhood aggressive-disruptive behavior: Gender differences in predictions from early coercive and affectionate mother–child interactions. Child Development. 1996; 67(5):2417–2433. [PubMed: 9022248]

Moffitt, TE. The neuropsychology of juvenile delinquency: A critical review. In: Tonry, M.; Morris, N., editors. Crime and justice: A review of research. Chicago, IL: University of Chicago Press; 1990. p. 99-169.

Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: Developmental taxonomy. Psychological Review. 1993; 100:674–701. [PubMed: 8255953]

Muthén, LK.; Muthén, BO. Mplus (Version 7) [Computer software]. Los Angeles, CA: Muthén & Muthén; 2013.

Noldus Information Technology. The Observer XT reference manual 11.0. Wageningen, the Netherlands: Author; 2012.

Odgers CL, Moffitt TE, Broadbent JM, Dickson N, Hancox RJ, Harrington H, et al. Caspi A. Female and male antisocial trajectories: From childhood origins to adult outcomes. Development and Psychopathology. 2008; 20(2):673–716. [PubMed: 18423100]

Patterson, GR. The aggressive child: Victim and architect of a coercive system. In: Mash, EJ.; Hamerlynck, LA.; Handy, LC., editors. Behavior modification and families. New York, NY: Brunner/Mazel; 1976. p. 267-316.

Patterson, GR. Coercive family process. Eugene, OR: Castalia; 1982.

Patterson, GR. A proposal relating a theory of delinquency to societal rates of juvenile crime: Putting Humpty Dumpty together again. In: Cox, MJ.; Brooks-Gunn, J., editors. Conflict and cohesion in families: Causes and consequences. Mahwah, NJ: Erlbaum; 1999.

Patterson, GR. The early development of coercive family process. In: Reid, JB.; Patterson, GR.; Snyder, J., editors. Antisocial behavior in children and adolescents: A developmental analysis and model for intervention. Washington, DC: American Psychological Association; 2002. p. 25-44.

Patterson, GR.; Cobb, JA. A dyadic analysis of "aggressive" behaviors. In: Hill, JP., editor. Minnesota symposia on child psychology. Minneapolis, MN: University of Minnesota Press; 1971. p. 72-129.

Patterson, GR.; Reid, JR. Reciprocity and coercion: Two facets of social systems. In: Neuringer, C.; Michael, JL., editors. Behavior modification in clinical psychology. New York, NY: Appleton-Century-Crofts; 1970. p. 133-177.

Patterson, GR.; Reid, JB.; Dishion, TJ. Antisocial boys. Eugene, OR: Castalia; 1992.

Peterson J, Winter C, Jabson J, Dishion TJ. Relationship Affect Coding System. Unpublished instrument. 2009 Available from Child and Family Center, 6217 University of Oregon., Eugene, OR 97403.

Raine, A. The biological basis of crime. In: Wilson, JQ.; Petersilia, J., editors. Crime: Public policies for crime control. San Francisco, CA: ICS Press; 2002. p. 43-74.

Reid JB, Eddy M, Fetrow RA, Stoolmiller M. Description and immediate impacts of a prevention intervention for conduct problems. American Journal of Community Psychology. 1999; 27:483–517. [PubMed: 10573832]

Scaramella LV, Leve LD. Clarifying parent–child reciprocities during early childhood: The early childhood coercion model. Clinical Child and Family Psychology Review. 2004; 7(2):89–107. [PubMed: 15255174]

Shaw DS, Bell RQ. Developmental theories of parental contributors to antisocial behavior. Journal of Abnormal Child Psychology. 1993; 21(5):493–518. [PubMed: 8294650]

Shaw DS, Bell RQ, Gilliom M. A truly early starter model of antisocial behavior revisited. Clinical Child and Family Psychology Review. 2000; 3(3):155–172. [PubMed: 11225751]

Shaw DS, Gilliom M, Ingoldsby EM, Nagin DS. Trajectories leading to school-age conduct problems. Developmental Psychology. 2003; 39(2):189–200. [PubMed: 12661881]

Shaw, DS.; Gross, H. What we have learned about early childhood and the development of delinquency. In: Lieberman, A., editor. The long view of crime: A synthesis of longitudinal research. New York, NY: Springer; 2008. p. 79-127.

Shaw DS, Hyde LW, Brennan LM. Early predictors of boys' antisocial trajectories. Development and Psychopathology. 2012; 24:871–888. [PubMed: 22781860]

Shaw DS, Keenan K, Vondra JI. The developmental precursors of antisocial behavior: Ages 1-3. Developmental Psychology. 1994; 30:355–364.

Shaw DS, Owens EB, Giovannelli J, Winslow EB. Infant and toddler pathways leading to early externalizing disorders. Journal of the American Academy of Child & Adolescent Psychiatry. 2001; 40(1):36–43. [PubMed: 11195559]

Shaw DS, Winslow EB, Owens EB, Vondra JI, Cohn JF, Bell RQ. The development of early externalizing problems among children from low-income families: A transformational perspective. Journal of Abnormal Child Psychology. 1998; 26(2):95–107. [PubMed: 9634132]

Smith JD, Dishion TJ, Moore KJ, Shaw DS, Wilson MN. Video feedback in the Family Check-Up: Indirect effects on observed parent–child coercive interactions. Journal of Clinical Child & Adolescent Psychology. 2013; 42(3):405–417. [PubMed: 23534831]

Smith JD, Dishion TJ, Shaw DS, Wilson MN. Caregivers' relational schemas predict the trajectory of coercive dynamics during early childhood. under review.

Smith JD, Dishion TJ, Shaw DS, Wilson MN. Indirect effects of fidelity to the Family Check-Up on changes in parenting and early childhood problem behaviors. Journal of Consulting and Clinical Psychology. in press.

Snyder, J.; Edwards, P.; McGraw, K.; Kilgore, K.; Holten, A. Escalation and reinforcement in family conflict: Developmental origins of physical aggression. Wichita, KS: Kansas State University; 1993.

Stassen, Berger; Kathleen. Update on bullying at school: Science forgotten? Developmental Review. 2007; 27(1):90–126.

Steiger JH. Structural model evaluation and modification: An interval estimation approach. Multivariate Behavioral Research. 1990; 25:173–353.

Tran AGTT, Lee RM. Perceived ethnic–racial socialization, ethnic identity, and social competence among Asian American late adolescents. Cultural Diversity and Ethnic Minority Psychology. 2010; 16(2):169–178. [PubMed: 20438155]

Tremblay RE, Nagin DS, Séguin JR, Zoccolillo M, Zelazo PD, Boivin M, et al. Japel C. Physical aggression during early childhood: Trajectories and predictors. Pediatrics. 2004; 114(1):e43–e50. [PubMed: 15231972]

Waller R, Gardner FEM, Hyde LW, Shaw DS, Dishion TJ, Wilson MN. Do harsh and positive parenting predict parent reports of deceitful-callous behavior in early childhood? Journal of Child Psychology and Psychiatry. 2012; 53(9):946–953. [PubMed: 22490064]

Yasui M, Dishion TJ. The ethnic context of child and adolescent problem behavior: Implications for child and family interventions. Clinical Child and Family Psychology Review. 2007; 10(2):137–179. [PubMed: 17588150]

Yasui M, Dishion TJ. Direct observation of family management: Validity and reliability as a function of coder ethnicity and training. Behavior Therapy. 2008; 39(4):336–347. [PubMed: 19027430]

Youngstrom E, Loeber R, Stouthamer-Loeber M. Patterns and correlates of agreement between parent, teacher, and male adolescent ratings of externalizing and internalizing problems. Journal of Consulting and Clinical Psychology. 2000; 68(6):1038–1050. [PubMed: 11142538]
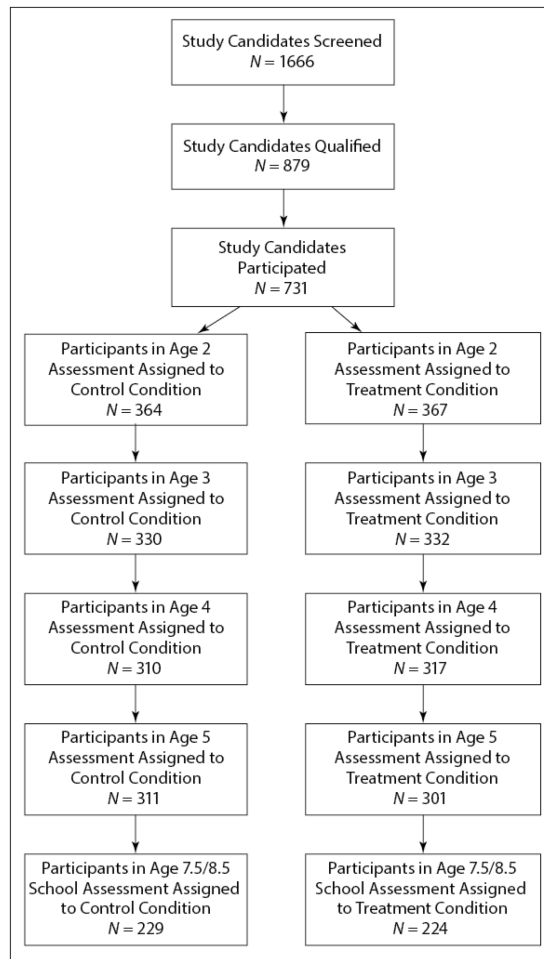
Figure 1.
Participant flow.

Note. Participant figures at each age represent the number of originally enrolled families (*N* = 731) that completed the assessment each year.
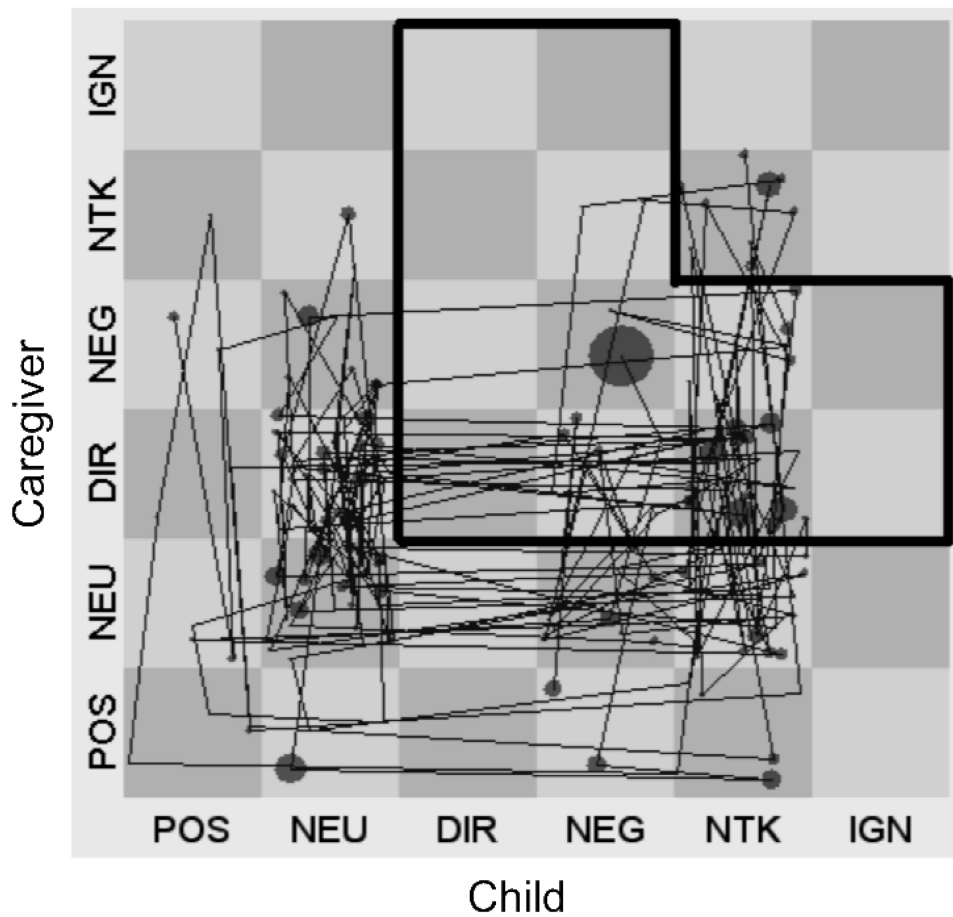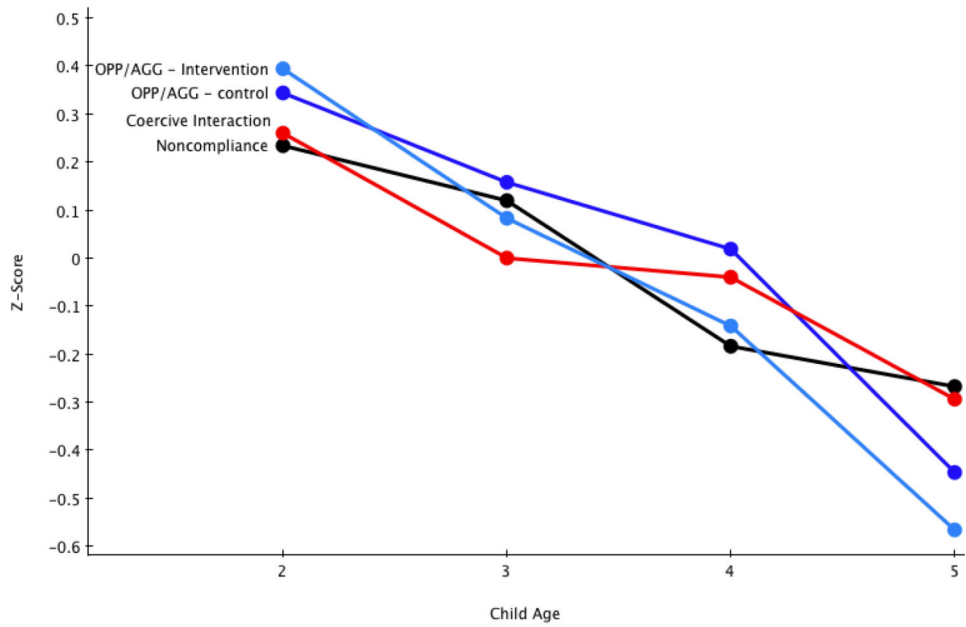
Figure 2.
Dyadic coercive interactions region on the state-space grid.

Note. Dyadic coerce region outlined in black. Lines within the grid indicate transitions between regions. The larger the circle, the longer the duration of time the dyad spent in the region. POS = postive engagement. NEU = neutral engagement. DIR = directive. NEG = negative engagement. NTK = no talk. IGN = ignore.

Figure 3.
Trajectories of child noncompliance, caregiver-reported child oppositional and aggressive behaviors, and caregiver–child coercive interactions.

Note. OPP/AGG = caregiver-reported oppositional and aggressive behavior on the *Child Behavior Checklist. Z*–scores were created for each variable by using the mean of the four time points (ages 2–5). There was a significant intervention effect on the slope of OPP/AGG, which is why it is presented separately for the intervention and control groups.
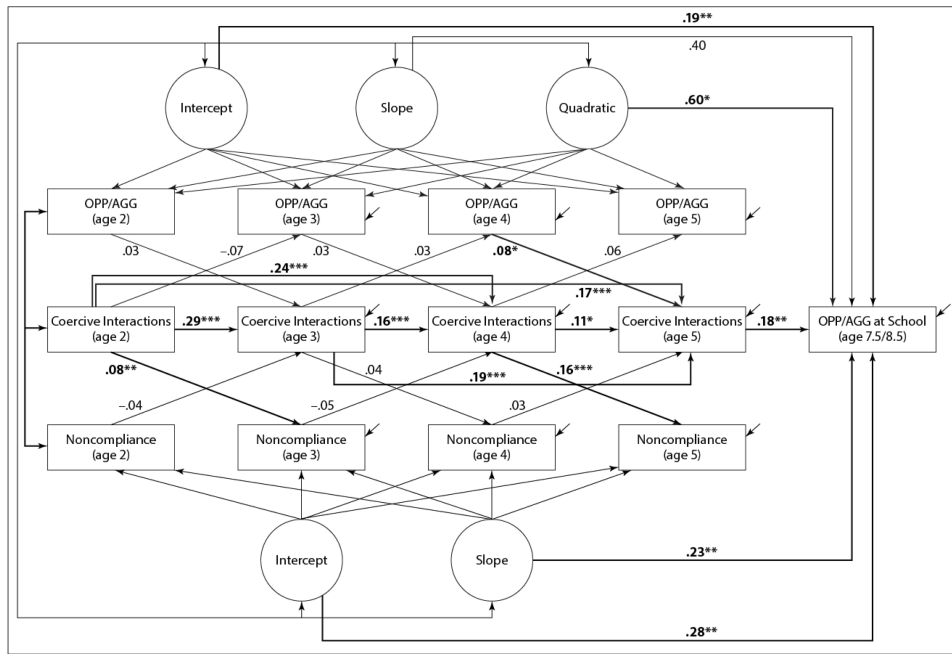
Figure 4.

Path model.

Note. OPP/AGG= caregiver-reported oppositional and aggressive on the *Child Behavior Checklist.* Bold paths are significant at *p* < .05. Correlations between variables measured within age are not shown in the figure for readability.

Table 1

Intercorrelations Between Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Coercive interactions (age 2)	–	.29**	.28**	.25**	.19**	.01	.00	.06	.02	.08*	.04	.04	.12**	.01
2. Coercive interactions (age 3)		–	.21**	.28**	.09**	.25**	.08	.12**	.03	.11**	.09*	.07	.14**	-.06
3. Coercive interactions (age 4)			–	.22**	.10*	.02	.19**	.17**	.01	.07	.09*	.08	.14**	.04
4. Coercive interactions (age 5)				–	.16**	.11**	.08	.24**	.08	.18**	.13**	.12**	.20**	-.06
5. Noncompliance (age 2)					–	.23**	.17**	.15**	.11**	.17**	.13**	.11**	.12**	-.01
6. Noncompliance (age 3)						–	.27**	.19**	.02	.13**	.13**	.05	.12*	-.02
7. Noncompliance (age 4)							–	.31**	.02	.15**	.22**	.11*	.05	-.02
8. Noncompliance (age 5)								–	.06	.09*	.17**	.19**	.22**	-.07
9. Oppositional/Aggressive (age 2)									–	.51**	.45**	.42**	.10*	.03
10. Oppositional/Aggressive (age 3)										–	.63**	.52**	.14**	-.04
11. Oppositional/Aggressive (age 4)											–	.63**	.16**	-.08
12. Oppositional/Aggressive (age 5)												–	.28**	-.07
13. Oppositional in School (age 7.5/8.5)													–	-.08
14. Treatment group														–
Mean	.098	.082	.080	.064	.242	.120	.184	.268	5.76	5.09	4.60	3.42	56.32	–
Standard Deviation	.071	.064	.053	.048	.872	.910	.795	.806	2.35	2.67	2.81	2.30	7.56	–
N	726	633	559	573	725	634	543	567	730	657	627	612	453	731

*
Note. $p < .05$.

**
$p < .01$.

Table 2

Results of Path Analysis

Model Path	*B*	*SE (B)*	β	95% Confidence interval
Coercive interactions (age 2) → Coercive interactions (age 3)	.26***	.04	.29	.202 | .377
Coercive interactions (age 3) → Coercive interactions (age 4)	.13***	.04	.16	.066 | .244
Coercive interactions (age 4) → Coercive interactions (age 5)	.10*	.05	.11	.009 | .208
Coercive interactions (age 2) → Coercive interactions (age 4)	.18***	.04	.24	.152 | .337
Coercive interactions (age 2) → Coercive interactions (age 5)	.11***	.03	.17	.086 | .257
Coercive interactions (age 3) → Coercive interactions (age 5)	.14***	.03	.19	.098 | .272
Coercive interactions (age 2) → OPP/AGG (age 3)	−2.45	1.50	−.07	−.143 | .013
Coercive interactions (age 3) → OPP/AGG (age 4)	1.30	1.51	.03	−.039 | .099
Coercive interactions (age 4) → OPP/AGG (age 5)	2.45	1.37	.06	−.004 | .118
OPP/AGG (age 2) → Coercive interactions (age 3)	.00	.00	.03	−.044 | .101
OPP/AGG (age 3) → Coercive interactions (age 4)	.00	.00	.03	−.052 | .106
OPP/AGG (age 4) → Coercive interactions (age 5)	.001*	.00	.08	.003 | .156
Coercive interactions (age 2) → Noncompliance (age 3)	1.07**	.38	.08	.027 | .140
Coercive interactions (age 3) → Noncompliance (age 4)	.44	.42	.04	−.030 | .101
Coercive interactions (age 4) → Noncompliance (age 5)	2.37***	.63	.16	.072 | .241
Noncompliance (age 2) → Coercive interactions (age 3)	.00	.00	.04	−.039 | .117
Noncompliance (age 3) → Coercive interactions (age 4)	−.00	.00	−.05	−.143 | .045
Noncompliance (age 4) → Coercive interactions (age 5)	.00	.00	.03	−.054 | .108
Coercive interactions (age 5) → Oppositional behaviors at school (age 7.5/8.5)	28.58**	8.66	.18	.073 | .283
OPP/AGG quadratic → Oppositional behaviors at school (age 7.5/8.5)	8.53*	3.75	.60	.110 | 1.098
OPP/AGG slope → Oppositional behaviors at school (age 7.5/8.5)	1.93	1.19	.40	−.138 | .930
OPP/AGG intercept → Oppositional behaviors at school (age 7.5/8.5)	.85**	.26	.19	.082 | .299
Noncompliance slope → Oppositional behaviors at school (age 7.5/8.5)	9.57*	4.42	.23	.027 | .426
Noncompliance intercept → Oppositional behaviors at school (age 7.5/8.5)	4.55**	1.71	.28	.072 | .494
Significant Indirect Effects				
Coercive interactions: ages 2 → 5 → Oppositional behaviors at school (age 7.5/8.5)	3.19**	1.21	.03	.008 | .052
Coercive interactions: ages 2 → 3 → 5 → Oppositional behaviors at school (age 7.5/8.5)	1.03*	.43	.01	.002 | .017

Note. Effect is considered significant if the 95% confidence interval does not contain zero.

*
p < .05.

**
p < .01.

***
p < .001.

Table 3

Estimated Standardized Correlations Between Observed Coercive Interactions at Age 2 and Slopes and Intercepts of Latent Growth Curves

Variable	1	2	3	4	5	6
1. Coercive interactions (age 2)	–	.49*	–.34	.16	–.18	.22
2. OPP/AGG intercept		–	.20	–.28	.24**	–.16
3. OPP/AGG slope			–	–.93**	.44***	–.03
4. OPP/AGG quadratic				–	–.44***	.14
5. Noncompliance intercept					–	–.52***
6. Noncompliance slope						–

Note.

*
$p < .05$.

**
$p < .01$.

***
$p < .001$.