The Predictive Utility of Early Childhood Disruptive Behaviors for School-Age Social Functioning

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Abstract

Research suggests that school-age children with disruptive behavior (DB) problems frequently demonstrate impaired social skills and experience rejection from peers, which plays a crucial role in the pathway to more serious antisocial behavior. A critical question is which DB problems in early childhood are prognostic of impaired social functioning in school-age children. This study examines the hypothesis that aggression in early childhood will be the more consistent predictor of compromised social functioning than inattentive, hyperactive-impulsive, or oppositional behavior. Participants included an ethnically diverse sample of 725 high-risk children from 3 geographically distinct areas followed from ages 2 to 8.5. Four latent growth models of DB from child ages 2 to 5, and potential interactions between dimensions, were used to predict latent parent and teacher ratings of school-age social dysfunction. Analyses were conducted in a multi-group format to examine potential differences between intervention and control group participants. Results showed that age 2 aggression was the DB problem most consistently associated with both parent- and teacher-rated social dysfunction for both groups. Early starting aggressive behavior may be particularly important for the early identification of children at risk for school-age social difficulties.

Keywords

Antisocial behavior; Externalizing; Early intervention; Prevention; Risk

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Disruptive behavior (DB) problems are a common complaint among parents of young children (Egger and Angold 2006). Although it may be normative to have some problem behavior in toddlerhood, DB problems in multiple contexts merits the concern of caregivers (Campbell et al. 2000). High levels of DB in early childhood that endure beyond the terrible twos portend poorly for child outcomes into school-age, adolescence, and adulthood, including academic performance (Brennan et al. 2012; Campbell et al. 2006), peer functioning (Kouros et al. 2010) and serious antisocial behavior (Dodge et al. 2008; Trentacosta and Shaw 2009). Of particular importance in childhood is establishing normative and positive relationships with peers and teachers at school. Cascade models of social and emotional development (e.g., Dodge et al. 2008) suggest that failure with peers and teachers potentiates the escalation into more serious forms of antisocial behavior, often as a result of peer clustering and deviancy training, that can begin in early elementary school (Snyder et al. 2005).

A critical question for developmental and intervention science is which specific DB problems in early childhood are prognostic of poor outcomes in elementary school age children. Research examining the predictive utility of DB problems during early childhood (i.e., ages 0–5) often encompasses a range of behaviors that fall under the DB umbrella, including aggressive and oppositional behavior, as well as behaviors associated with Attention-Deficit/Hyperactivity Disorder (ADHD), such hyperactivity, impulsivity, and inattention (e.g., Campbell et al. 2000; Kouros et al. 2010). However, these behaviors are moderately correlated during early and middle childhood (Egger and Angold 2006) and studies often examine broad constructs that encompass multiple dimensions of DB(e.g., externalizing, problem behavior) rather than evaluating independent contributions of one type of DB while controlling for another (e.g., Campbell and Ewing 1990; Keane and Calkins 2004). Consequently, unique associations between specific DB dimensions and later functioning are less clear. Moreover, very few studies examine the implications of high levels of DB during toddlerhood. It is unclear which DB problems measured at this young age will have predictive validity for later social functioning across context and informant. Alternatively, given the relative normativity of DB problems at this stage of development compared to any other point in the lifespan (Campbell 2002), it may be that changes in DB during early childhood, rather than initial level, are most important for predicting later social functioning. Thus, the current study seeks to examine associations between toddler-age levels of aggressive, oppositional, hyperactive, and inattentive behaviors, as well as changes in these dimensions throughout early childhood, and school-age social functioning.

An increased understanding of early childhood behaviors associated with later social functioning may be particularly important to study, as aspects of school-age social functioning such as deviant peer affiliation and rejection, have been theorized to be a mechanism through which an at-risk child becomes increasingly ensnared in a persistent trajectory of problem behavior, including antisocial behavior and substance use (Dishion and Patterson 2006; Trentacosta and Shaw 2009). The potential consequences of high and persistent levels of early childhood DB problemson social development are numerous. For example, children who demonstrate high levels of inattentive behaviors during early childhood may be less attuned to contextual rules and social cues (Mrug et al. 2007), which could contribute to underdeveloped social skills and increase the likelihood of future

problems in social settings. Similarly, relatively high levels of hyperactivity and impulsivity in young children are associated with inhibitory deficits (Barkley 1997) and an increased likelihood of socially inappropriate behavior during interactions with peers (DuPaul et al. 2001; Hebert-Myers et al. 2006). In addition, oppositional behavior in toddlers and preschoolers may be indicative of a behavioral strategy that carries over into social interactions with other adults and peers, leading to conflictual relationships with teachers and rejection/alienation from prosocial peers (Dishion and Patterson 2006; Snyder et al. 2005).

However, there are also theoretical reasons to expect that early childhood aggression, in particular, would impair later social functioning. Aggressive behaviors (e.g., hitting, yelling) inherently violate social norms and often others' rights, which may be particularly aversive to peers in comparison with high levels of other DB problems (e.g., difficulty sitting still). In addition, frequent aggressive acts during toddlerhood may be perceived as indicative of relatively extreme deficits in emotional and behavioral regulation, which may be a more meaningful indicator of a child's later social competence. Indeed, studies have shown that the majority of toddlers do not exhibit high levels of aggressive behavior (Carter et al. 2013) and, despite decreases in levels of DB throughout early childhood, children tend to maintain rank order stability (Baillargeon et al. 2007). Thus, a child who showed high levels of aggression early may be likely to continue exhibiting relatively high aggression at school-age. In summary, evidence and theory suggest that high levels of each DB dimension during early childhood may be associated with long-term deficits in social functioning, although it is unclear if these processes can be detected as early as toddlerhood and whether one dimension, such as aggression, is a better predictor of later social dysfunction than another.

An additional consideration is whether associations between DB problems during toddlerhood and later social functioning are altered in cases in which more than one DB is elevated. Campbell et al. (2000) argue that co-occurring DB problems may be a valuable indicator for distinguishing atypical from typical behaviors during early childhood and provide stronger predictive validity for later functioning than individual DB problems. For example, toddlers who exhibit high levels of aggressive and hyperactive behaviors may be those who are most extremely dysregulated and most likely to behave aversively (e.g., exhibit reactive aggression) during future social interactions. Similarly, toddlers who demonstrate high levels of both inattention and hyperactivity-impulsivity may be at greatest risk of a future ADHD diagnosis (Campbell 2002), a well-known correlate of peer dysfunction during middle childhood (Hoza et al. 2005). Thus, this study will also explore whether there are interactions between toddler-age DB dimensions in the prediction of school-age social functioning.

Studies of DB Problems and Social Functioning that do not Account for Overlap in DB

Empirical studies of preschool and school-aged children have demonstrated concurrent associations between both broad and narrowband measures of DB problems, including aggression, noncompliance, hyperactivity, impulsivity, and inattention, and social functioning (Dodge 1983; DuPaul et al. 2001; Hebert-Myers et al. 2006; Hoza et al. 2005).

In addition, short-term longitudinal studies have shown predictive utility of DB problems rated at the beginning of the elementary school year for subsequent peer rejection (e.g., van Lier and Crijnen 2005). However, studies of the predictive utility of early childhood DB problems for later functioning are scarce, although a few studies have examined links between kindergarten or preschool DB problems and later peer relations. For example, in a study in a lower-to-middle class sample of kindergarteners and first graders, teacher-rated DB problems negatively predicted peer-rated social preference scores at 1 and 2 years' follow-up (Schwartz et al. 1999). Likewise, in an ethnically diverse sample of boys and girls enrolled in Head Start, teacher ratings of DB problems in preschool predicted (different) teacher ratings of social competence in kindergarten (Bulotsky-Shearer et al. 2010). Finally, in one study beginning in toddlerhood, parent-rated DB problems at age 2 were negatively associated with sociometric ratings of liking in kindergarten (Keane and Calkins 2004). Although these studies demonstrate consistent short-term relationships between broad measures of early childhood DB problems and social skills, little is known about associations between individual dimensions of DB, including changes in these behaviors throughout early childhood, and social functioning at school-age.

Few studies have considered both initial levels of problem behaviors during early childhood and changes over time in relation to social skills in middle childhood. In one longitudinal study of predominantly middle class boys and girls followed from kindergarten to middle school, parent reports of DB problems in kindergarten *and* increases in DB problems from kindergarten to second grade predicted lower teacher-rated prosocial behavior and higher parent-rated social problems at age 12 (Kouros et al. 2010). Another study examined trajectories of aggressive behavior from toddlerhood to age 9 in a large, predominantly middle class sample of boys and girls in relation to later peer functioning (Campbell et al. 2006). The authors found that children who exhibited either moderate stable or high stable levels of parent-reported aggression had lower levels of teacher-rated social competence and poorer friendship quality at age 12, while those who showed initially moderate but decreasing levels of aggression showed no such difficulties. In both studies, initial levels and changes in DB problems were related to school-age social functioning. However, neither study controlled for correlated DB; thus, associations between specific dimensions of DB problems and social functioning were not examined.

Studies of DB Problems and Social Functioning that Account for DB Overlap

There is a relative dearth of research attempting to tease apart dimensions of DB during early childhood in relation to school-age outcomes, including social functioning, despite evidence that oppositional, inattentive, hyperactive-impulsive, and aggressive behaviors can be distinguished as early as 17 months of age (Baillargeon et al. 2007) and, although there is substantial change during this period, children often maintain inter-individual rank-order on these dimensions (Baillargeon et al. 2007; Carter et al. 2013). Studies that have examined dimensions of DB in older children have produced mixed results, likely due in part to the use of clinical versus non clinical samples and measurement differences. For example, in a multivariate analysis of school-aged children diagnosed with ADHD, observed behaviors of

rule-following, helping, whining, and attention, but not aggression or non-compliance, emerged as short-term predictors of sociometric peer ratings (Mrug et al. 2007). In contrast, in a German community sample of kindergarteners, parent and teacher reports of oppositional and aggressive behaviors, but not hyperactive/inattentive behaviors, were associated with teacher and child reports of peer victimization (Perren et al. 2006). One study was identified that examined dimensions of DB from toddlerhood in relation to later social functioning. The authors found that in a large community sample of Canadian boys and girls, mother-rated aggressive, but not hyperactive, behavior at 17 months predicted mother ratings of child victimization from ages 3 to 6 (Barker et al. 2008). Although this study extends associations between dimensions of DB and social functioning into toddlerhood, only two DB problems were considered. Furthermore, variables were rated exclusively by mothers and it is unclear whether early childhood DB problems would predict school-age social functioning across informant and context. Thus, the current study seeks to examine associations between toddler-age levels of aggressive, oppositional, hyperactive-impulsive, and inattentive behaviors, as well as changes in these dimensions throughout early childhood, and both parent and teacher reports of school-age social functioning. Specifically, based on previous research and theory, we hypothesize that toddler-age aggression will be a better predictor of compromised social skills and relationships at school-age than inattentive, hyperactive-impulsive, and oppositional behavior. However, based on theory linking each behavioral dimension with potential social deficits, we expect that growth in each domain will be associated with later social skills and relationships. Lastly, we will explore the potential for interactions among different dimensions of toddler-age DB problems to contribute unique variance to children's school-age social functioning.

Method

Participants

Participants included 731 mother–child dyads recruited between 2002 and 2003 from WIC programs in the metropolitan areas of Pittsburgh, Pennsylvania, and Eugene, Oregon, and in and outside of Charlottesville, Virginia (Dishion et al. 2008). Families were approached at WIC sites and then briefly screened. Families were invited to participate if they had a son or daughter between age 2 years 0 months and 2 years 11 months, following a screen to ensure they met the study criteria by having socioeconomic, family, and/or child risk factors for future behavior problems. Risk criteria were identified in the following three domains: (a) child behavior (conduct problems, high-conflict relationships with adults), (b) family problems (maternal depression, daily parenting challenges, substance use problems, teen parent status), and (c) sociodemographic risk (low education achievement and low family income relevant to the WIC criterion). Two or more of the three risk factors were required for inclusion in the sample. For more information, see Dishion et al. 2008.

Of the 1666 parents with 2-year-olds who were approached at WIC sites, 879 families met the eligibility requirements (52 % in Pittsburgh, 57 % in Eugene, 49 % in Charlottesville) and 731 (83.2 %) agreed to participate (88 % in Pittsburgh, 84 % in Eugene, 76 % in Charlottesville). The children in the sample had a mean age of 29.9 months (SD=3.2) at the

time of the age 2 assessment. Across sites, primary caregivers self-identified as belonging to the following ethnic groups: 50 % European American, 28 % African American, 13 % biracial, and 9 % other groups (e.g., American Indian, Native Hawaiian). Thirteen percent of the sample reported being Hispanic American. During the 2002 to 2003 screening period, more than two thirds of those families enrolled in the project had an annual income of less than $20,000, and the average number of family members per household was 4.5 (SD=1.63). Forty-one percent of the adult population had a high school diploma or GED equivalency, and an additional 32 % had 1 to 2 years of post–high school training.

Of the 731 families who initially participated, 659 (90 %) were available at the 1-year follow-up, 619 (85 %) participated at the 2-year follow-up when children were between age 4 and 4 years 11 months, 621 (85 %) participated at the 3-year follow-up when children were between age 5 and 5 years 11 months. At ages 3, 4, and 5, selective attrition analyses revealed no significant differences relevant to project site; children's race, ethnicity, or gender; levels of maternal depression; or parent-reported disruptive problem behavior.

Teacher reports were available for 54 % of children at age 7.5 and 68 % of children at age 8.5; 510 (70 %) children had data at one or both ages. Due to difficulties associated with obtaining cooperation to collect data in some school systems, particularly for the age 7.5 assessment, a mean score for each age 7.5–8.5 (i.e., school-age) outcome was computed. To maximize the amount of data available, in cases where data from only one age were available, scores from the available age were used. Attrition analyses revealed no significant differences between families with versus without teacher data within project site; children's race, ethnicity, or gender; levels of maternal depression; or parent-reported disruptive problem behavior.

Procedure

At the ages of 2, 3, 4, 5, 7.5, and 8.5, the target child (TC), primary caregiver (97 % of whom was TC's parent) and when available, alternate caregiver, participated in 2–3 h assessments at the family's home. These assessments consisted of a battery of self-report measures and observational interaction tasks (for a detailed description of the protocol, see Dishion et al. 2008). In addition, at child ages 7.5 and 8.5, teachers completed measures about the TC. This study used a subset of the collected data: the parent-report measures from ages 2–5 and teacher reports at ages 7.5 and 8.5. Following the initial assessment at age 2, families were randomly assigned to the Family Check-Up (*n*=367, 50.2 %).

The Family Check-Up (FCU). 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 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 and 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. The FCU is designed to make assessment based decisions about the need for follow up parenting services that are tailored to meet the families' specific needs. The Everyday Parenting curriculum was used to guide the follow-

up interventions (Dishion et al. 2011). For the purposes of this randomized trial, the order of the first three FCU sessions was altered to assure that assessments were not biased by the potential for intervention. Thus, families were first assessed, and then invited to engage in the initial contact session and feedbacks. Therapists in this 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 et al. 2013).

Measures

Demographics Questionnaire—A demographics questionnaire was administered to the parent at each home visit. This measure included questions about family structure, parental education and income, parental criminal history, and areas of familial stress. For the current study, parent reports of education and TC race/ethnicity at age 2 were included as covariates.

Child Behavior Checklist 1 ½–5& 6–18 (CBCL)—Parents completed the CBCL 1 ½–5 (Achenbach and Rescorla 2000) at the ages 2, 3, and 4 visits and the CBCL 6–18 (Achenbach and Rescorla 2001) at the age 5 assessment. The CBCL has two broad-band factors, internalizing and externalizing. Items from the externalizing factor that were consistent across ages 2–5 were combined with items from the Eyberg Child Behavior Inventory to create scales of inattention, hyperactivity-impulsivity, aggression, and oppositional behavior (see description below).

Eyberg Child Behavior Inventory (ECBI)—The ECBI is a 36-item parent-report behavior checklist also administered at the ages 2, 3, 4, and 5 assessments (Robinson et al. 1980). The ECBI assesses conduct problems in children between 2 and 16 years of age via two factors, one that focuses on the perceived intensity of behavior and another on the degree the behavior is a problem for caregivers. As the intensity factor is similar in structure, and complementary in content, to the CBCL externalizing factor, items from this were used to supplement items from the CBCL in creating DSM-based scales of inattention, hyperactivity-impulsivity, aggression, and oppositionality (description below).

Disruptive Behavior Scales (Ages 2 to 5)—To create disruptive behavior composites, individual items from the ECBI and CBCL that matched with DSM-IV-TR criteria for ADHD-Inattentive, ADHD-Hyperactive-Impulsive, Oppositional Defiant Disorder, and the aggressive items from the CD diagnosis were selected. ECBI items were rescaled from a 7-point Likert scale to match the 3-point scale of the CBCL. Scores were recoded so that values reflecting conceptually similar behavior frequencies were equated (i.e., ECBI scores of 1 [*Never*] were equated to 0 [*Not True*] on the CBCL; ECBI scores of 2–4 [*Sometimes*] were equated to 1 [*Somewhat or Sometimes True*] on the CBCL; and ECBI scores of 5–7 [*Always*] were equated to 2 [*Very True or Often True*] on the CBCL. Selected items were averaged to create four scales at ages 2 through 5: inattention (INATT; 1 CBCL, 4 ECBI items), hyperactivity-impulsivity (HYP; 1 CBCL, 2 ECBI), oppositionality (OPP; 2 CBCL, 5 ECBI items), and aggression (AGG; 5 CBCL, 5 ECBI items), respectively.

As shown in Table 1, all scales demonstrated acceptable reliability, with values increasing at each age (αs between 0.48 and 0.73 at age 2; αs between 0.67 and 0.85 at age 5). At age 2, correlations between DB scales were moderate (i.e., rs= 0.29–0.51, all ps<0.01), indicating that the behaviors are related, yet distinct, sharing a maximum of 26 % of their variance (in the case of INATT and HYP). In addition, a confirmatory factor analysis of all INATT and HYP items demonstrated that a 2-factor, rather than a 1-factor (i.e., ADHD), solution provided the best fit to the data, with each item significantly loading on its hypothesized factors (all standardized estimates>0.4). Thus, based on this study's aim to investigate the predictive utility of dimensions of DB problems, INATT and HYP were retained as separate scales.

Social Skills Rating System (SSRS)—Child social skills were assessed via teacher report on the 38-item SSRS (Gresham and Elliot 1990) when children were 7.5 and 8.5 years old. This scale has been widely used and demonstrates high reliability and validity. The self control scale, which includes items such as "TC controls temper in conflict situations with peers," rated on a 3-point scale, was summed and averaged across ages 7.5 and 8.5 (α=0.79) for use in this study.

Preschool Social Behavior Scale (PSBS)—Six items from the PSBS (Crick et al. 1997) that were determined to be developmentally appropriate for school-age children were used to assess relational aggression as reported on by parents and teachers at ages 7.5 and 8.5. The measure produces a continuous relational aggression scale that includes items such as, "This child tries to get others to dislike a peer," rated on an 5-point scale, and has been previously adapted for use with elementary school children (Brown et al. 2007). Scores from ages 7.5 and 8.5 were averaged to create a composite measure of relational aggression for teachers (α=0.63) and parents (α=0.72).

Peer Affiliation and Social Acceptance (PASA)—This measure was developed to assess peer relationships and affiliation patterns in childhood and adolescence, and has been validated with respect to peer nominations of relationships and a peer assessment of deviant peer affiliation in early adolescence (Dishion et al. 2014a). For this study, a deviant peer affiliation scale including items such as, "Friends misbehave or break rules in school," and one item rating peer rejection, "Peers dislike and reject TC," were rated by parents and teachers on an 5-point scale and used as child outcome indicators of peer functioning. Items were averaged across ages 7.5 and 8.5 to create a deviant peer affiliation score and a peer rejection score for teachers (αs=0.54 and 0.58, respectively) and parents (αs=0.59 and 0.57, respectively).

Student Teacher Relationship Survey (STRS)/Adult Child Relationship Scale (ACRS)—An abridged version of the STRS (Pianta 2001), including the conflict and openness/warmth factors, was administered to teachers to assess the quality of relationships they have with target children at ages 7.5 and 8.5. The ACRS, a version of the STRS adapted to assess parent-child relationships (Weaver et al. 2014), was administered to parents at ages 7.5 and 8.5. For purposes of the present study, we focused on the conflict factor, which includes items such as, "This child and I always seem to be struggling with

each other," rated on a 5-point scale. Scores for each of the conflict items were summed and averaged across ages 7.5 and 8.5 to create teacher (α=0.78) and parent (α=0.84) conflict scores.

Social Dysfunction (Ages 7.5–8.5)—Two latent social dysfunction variables were computed to reflect each child's level of social dysfunction as rated by parents and teachers at school-age. Higher values reflect greater dysfunction. For teachers, the construct reflects their reports of child self control, relational aggression, deviant peer affiliation, peer rejection, and student-teacher conflict at child ages 7.5–8.5. The model provided a good fit to the data, χ^2 (5)=14.90, p<0.05, comparative fit index (CFI)=0.99, root mean square of error approximation (RMSEA)=0.07, standardized root mean square residual (SRMR)=0.02. For parents, the construct reflects their reports of child relational aggression, deviant peer affiliation, peer rejection, and parent-child conflict at child ages 7.5–8.5. The model also provided a good fit to the data, χ^2 (1)=0.69, p>0.10, CFI=1.0, RMSEA=0.00, SRMR=0.01.

Analytic Plan: To carry out the study's aims, structural equation models were analyzed in MPlus 6.12 (Muthén and Muthén 2007). Missing data were estimated using full information maximum likelihood, which enables one to utilize participants with at least one non-missing data point (Enders and Bandalos 2001), resulting in a sample size of 725 for this study. Multiple indices, including the χ^2 value, CFI, RMSEA, and SRMR, were used to evaluate model fit. In all analyses, child gender, child race and ethnicity, project site, and parent education level at age 2 were included as covariates because of gender, ethnic, and socioeconomic differences associated with disruptive behavior (Campbell et al. 2000), although no differences based on these factors were expected in the magnitude of associations between early DB problems and later social functioning. It should also be noted that previous publications using the current sample have shown that treatment group assignment has been linked to group differences in child aggressive and oppositional behavior according to parents in early childhood (Dishion et al. 2008) and based on parent and teacher reports in middle childhood (Dishion et al. 2014b). Thus, for all analyses, multi-group models were estimated for treatment and control group children and path estimates were compared by successively constraining paths and conducting χ^2 difference tests. These results are presented below.

Unconditional Growth Models

Prior to evaluating the study's hypotheses, unconditional latent growth curves were estimated for aggressive, oppositional, inattentive and hyperactive-impulsive behaviors separately. Nested model comparisons revealed that each DB followed a linear growth pattern from child ages 2 to 5, although the best-fitting models allowed the final time point (age 5) to be freely estimated, rather than constrained to be linear. Next, based on the study's focus on examining independent predictive utility of each DB, all four growth models were estimated simultaneously. Again, each DB followed a linear growth pattern from child ages 2 to 5 with a freely estimated age 5 time score. For both intervention and control group participants, mean slopes for aggression, oppositional behavior, and hyperactivity-impulsivity were negative and significant, suggesting declining rates of these DB problems from ages 2 to 5. For inattention, mean slopes were not significantly different from zero.

Successive χ^2 difference tests freeing intercept and slope factor means for intervention and control groups revealed no significant model improvements (all χ^2 difference tests<3.84); thus, DB growth models demonstrated model invariance across groups. Due to the complexity of running four simultaneous growth curves in a multi-group format, including interaction terms and a latent outcome, factor scores (intercepts and slopes) from unconditional growth models were saved and used in subsequent analyses.

Results

Descriptive statistics for observed variables are presented in Table 2 for intervention and control group children. Independent sample t-tests revealed that mean levels of age 2 dimensions of DB did not significantly differ between groups (all *t*s<1.0, all *n*s). For teacher-rated social outcomes, only teacher-rated conflict for children in the control group was significantly higher than for children in the intervention group (t=2.39, p<0.05). For parent-rated social outcomes, there was only one trend-level difference between groups, with control group children rated as more relationally aggressive than intervention group children (t=1.96, p<0.10).

Covariates

Pathways were estimated between covariates (age 2 parent education, project site, child race/ethnicity, and child sex) and all intercept, slope, interaction, and peer dysfunction terms for FCU and control group participants. The groups showed no differences in the magnitude or direction of associations between covariates and: 1) DB dimensions or 2) peer dysfunction (all χ^2 difference tests<3.84). The results are depicted in Figs. 1 and 2 for teacher-rated and parent-rated outcomes, respectively. Findings demonstrated that children from Charlottesville (versus Eugene) showed lower initial levels of INATT (β=−0.094, p<0.05) and lower ratings of parent-rated peer dysfunction at school-age (β=−0.116, p<0.05), while children from Pittsburgh (versus Eugene) showed initially higher levels of AGG (β=0.108, p<0.05) and greater increases in INATT from ages 2 to 5 (β=0.101, p<0.05). Parent education at age 2 was negatively associated with the AGG (β= −0.117, p<0.01) and HYP (β=−0.114, p<0.01) intercepts. Females had lower AGG (β=−0.169, p<0.001), INATT (β= −0.079, p<0.05), and HYP (β=−0.163, p<0.001) intercepts and showed greater decreases in OPP (β=−0.079, p<0.05) and INATT (β=−0.115, p<0.01) from ages 2 to 5 than males. Females also had lower mean levels of teacher- (β=−0.125, p<0.01), but higher levels of parent-, (β=0.118, p<0.01) rated peer dysfunction at school-age. Finally, Hispanic children had lower OPP intercepts (β=−0.144, p<0.001) and greater decreases in OPP (β=−0.130, p<0.01), INATT (β=−0.101, p<0.05), and HYP (β=−0.143, p<0.001) from ages 2 to 5 than Caucasian children, while African American children had higher teacher-rated peer dysfunction at school-age (β=0.133, p<0.01) than Caucasian children.

Predictive Utility of Dimensions of DB Problems

Models included covariates, AGG, OPP, INATT, and HYP intercept and slope terms, as well as all 2-way intercept-by-intercept interactions. To calculate interaction terms, intercepts were centered at the mean and multiplied to create AGGxOPP (i.e., aggression by oppositional), AGGxINATT, AGGxHYP, OPPxINATT, OPPxHYP, and INATTxHYP

terms. Only significant pathways are depicted in Figs. 1 and 2, although all interactions were retained in final models. For teacher-rated peer dysfunction, χ^2 square difference tests revealed only one pathway, that between AGGxOPP and peer dysfunction, that significantly improved model fit when allowed to differ for intervention and control group participants (χ^2 square difference= 4.43). For parent-rated outcomes, only the pathway between INATT slope and peer dysfunction significantly differed for intervention and control group participants (χ^2 square difference=5.17); thus, all other pathways were constrained to be equal across groups.

As shown in Fig. 1, the AGG intercept was the only DB problem individually associated with higher teacher-rated peer dysfunction at school-age ($\beta=0.17$, $p<0.05$). Additionally, for both intervention and control group participants, there was a significant association between INATTxHYP and teacher-rated peer dysfunction ($\beta=0.11$, $p<0.05$); simple slope analyses demonstrated that for children who showed high levels of INATT at age 2, HYP was positively associated with later peer dysfunction (simple slope $B=0.19$, $p<0.05$), albeit no association was observed for children with low INATT at age 2 (simple slope $B=-0.01$, ns). For intervention group participants only, there was a significant AGGxOPP intercept interaction ($\beta= 0.17$, $p<0.05$), such that there was an association between higher levels of OPP intercept and lower levels of later peer dysfunction for children who had initially low levels of AGG at age 2 (simple slope $B=-0.05$, $p<0.05$), but not for children with initially high levels of AGG (simple slope $B=0.018$, ns). Contrary to expectations, DB slopes from ages 2 to 5 were not associated with teacher-rated peer dysfunction at school-age.

Findings with respect to parent-rated peer dysfunction (Fig. 2) revealed that for both intervention and control group participants, AGG ($\beta=0.39$, $p< 0.001$) and OPP ($\beta=0.27$, $p<0.001$) intercepts were each positively associated with peer dysfunction at school-age. Changes in AGG ($\beta=0.24$, $p<0.001$) and OPP ($\beta= 0.28$, $p<0.001$) from ages 2 to 5 were also positively associated with later parent-rated peer dysfunction. For intervention group participants only, there was a significant negative association between INATT slope ($\beta= -0.20$, $p< 0.05$) and later peer dysfunction, which was not evident in the control group. Unlike results for teacher-rated outcomes, interactions between DB intercepts and school-age peer functioning were not significant. In sum, patterns of associations between dimensions of early childhood DB and peer dysfunction differed for teacher- and parent-rated outcomes, with only the AGG intercept significantly predicting later peer dysfunction across raters and context.

Discussion

The results demonstrated that age 2 aggression was reliably associated with poorer school-age social skills, including relational aggression and self-control (for teacher outcomes), as well as relationship factors such as parent/teacher conflict and negative peer status. However, associations between other DB problems and later social functioning differed for teacher- and parent-reported outcomes. For teacher-rated peer functioning, high levels of inattention and hyperactivity-impulsivity at age 2 were only prognostic of later social difficulties when both behaviors were elevated. For intervention group children only, unexpectedly age 2 oppositional behavior was negatively associated with later social

dysfunction but only in cases where age 2 aggression was low. Surprisingly, growth in dimensions of DB throughout early childhood were not significantly associated with teacher-rated school-age social functioning.

For parent-rated social functioning, both aggressive and oppositional behaviors at age 2, as well as changes in these dimensions from ages 2 to 5, were associated with later social outcomes. However, unlike teacher-rated outcomes, initial levels of inattention and hyperactivity-impulsivity, even in combination, were not prognostic of later social dysfunction. Unexpectedly, for children in the intervention group, increases in inattention from ages 2 to 5 were associated with lower levels of parent-rated social dysfunction at school-age. Overall, the findings support the hypothesis that aggressive behavior during toddlerhood is a more reliable risk factor for difficulties in later social skills and relationships than other DB problems. However, based on teacher reports, high levels of ADHD behaviors and, based on parent reports, high levels of oppositional behavior, measured as early as age 2 can indicate risk for later social difficulties.

Dimensions of DB and Social Dysfunction

The results are consistent with previous findings from this sample (Brennan et al. 2012) that age 2 aggression is a more consistent predictor of school-age academic achievement compared to other toddlerhood DB problems (i.e., oppositional, inattentive, or hyperactive-impulsive behaviors). Thus, accumulating evidence supports the theory that during toddlerhood, aggressive behaviors may be a more reliable marker of emerging behavioral dysregulation relative to other types of DB problems, and will more likely have cascading effects on later academic and socioemotional functioning. This work is also consistent with work from others (Campbell 2002; Egger and Angold 2006), who emphasize caution when identifying clinical levels of DB from age-normative behaviors during toddlerhood, particularly when examining a single time point, as this developmental period is well-known to be a transition period in the socialization process. Once the overlap among DB problems was taken into account, aggressive behavior was the only age 2 DB that demonstrated a consistent pattern of predictive utility for later social skills and relationships across informant and context.

It is noteworthy that early childhood oppositional behaviors were only associated with later social functioning according to parent-reported outcomes. This finding is consistent with the notion that oppositional behavior is highly relationship-based and dynamic (Dishion and Patterson 2006). Thus, parents who experienced coercive cycles and power struggles with their children during early childhood may continue to view them as problematic at school-age, in part, because of their own negative histories with the child. Similarly, changes in child aggression and oppositional behavior were significant predictors of social dysfunction only according to parents. This suggests that parents who perceive decreases in child aggressive and oppositional behavior throughout childhood are more likely to perceive their children as having adequate social skills at school-age. It is somewhat surprising that changes in DB problems from ages 2 to 5 were not associated with teacher-rated outcomes based on the considerable development that takes place during this period; however, this is consistent with the finding that children maintain inter-individual stability even as their

problem behaviors decrease throughout childhood (Baillargeon et al. 2007). Therefore, changes in child DB according to parent impressions may be less important to teachers than initial levels of DB (e.g., children who showed the highest levels of DB problems at age 2 may still be those showing the most problem behaviors in the classroom, regardless of whether those behaviors decreased according to parent impressions). Taken together, the findings suggest that parents' perceptions of DB problems also are likely reflected in their ratings of the child's social behaviors with themselves, siblings, and peers.

Another notable difference between teacher- and parent-reported outcomes is the finding that early inattention and hyperactivity-impulsivity, in combination, were associated with later social dysfunction only according to teachers. Thus, individual dimensions of inattention or hyperactivity-impulsivity at age 2 were not associated with parent or teacher perceptions of later social skills. The lack of findings with respect to individual ADHD dimensions indicate that when measured in toddlerhood neither inattention nor hyperactivity-impulsivity alone is a stable predictor of later social functioning, which may be due in part to the aforementioned difficulty distinguishing between typical and atypical levels of these behaviors in toddlers (Campbell 2002; Egger and Angold 2006). However, consistent with theory suggesting that children who demonstrate multiple problem behaviors and/or problems in multiple contexts are those at greatest risk of continued DB (Campbell et al. 2000), children who demonstrated elevations across both dimensions of ADHD at age 2 in this sample may at greatest risk of later ADHD and associated social impairments, particularly in the context of high risk. These findings are also consistent with a body of literature linking ADHD in older children to social difficulties (DuPaul et al. 2001; Mrug et al. 2007). The current results suggest this association may be identifiable as early as age 2 if both dimensions of ADHD behaviors are perceived to be high.

Differences with respect to parent- and teacher-rated outcomes associated with ADHD may also suggest that parents are less aware of consequences associated with inattention and hyperactivity-impulsivity in their children's social lives than they are for aggressive behavior (e.g., they may be more likely to be notified if their child hits another child than for having problems turn-taking), and that ADHD-like behavior may be more impactful (and noticeable) for teachers trying to structure a class of 25–30 students than for parents managing a much smaller number of children. In addition, the results indicate that parents of children who showed high levels of early ADHD behaviors may not have the negative impressions of their children that appeared to affect parents of children with histories of oppositional and aggressive behaviors,

Overall, the differing results based on parent and teacher report are consistent with prior studies showing the value of having multiple reporters for child social and behavior deficits, given the different contexts in which parents and teachers interact with children and teachers' reduced potential for bias (De Los Reyes and Kazdin 2005). However, more research is needed to determine whether these findings would be replicated in other samples when multiple dimensions of early childhood DB problems are examined with respect to school-age social outcomes rated by multiple informants.

Two associations between dimensions of DB problems and social dysfunction were identified for intervention participants only. First, an interaction between aggressive and oppositional behaviors at age 2 and later social functioning indicated that oppositional behavior at age 2 was actually associated with less social dysfunction at school-age, but only when age 2 aggressive behavior was low. Although unexpected, this finding is less surprising based on the FCU's focus on reducing coercive processes in parent-child relationships and prior reports from this sample demonstrating effectiveness of the intervention for improving oppositional behavior into school-age according to parent and teacher ratings (see Dishion et al. 2014b). Second, increases in inattention during early childhood were associated with less social dysfunction later, according to parent reports. This finding is surprising based on consistent associations in the literature between ADHD and social dysfunction at school-age. However, because this finding was only present in the intervention group, it may be that these parents were simply more likely to receive feedback about and seek outside intervention for inattentive behaviors, which often go overlooked and are less disruptive when not accompanied by other DB problems (Milich et al. 2001). Both findings speak to the importance of accounting for multiple dimensions of DB, as those with mean or high levels of aggressive behavior showed social deficits at school-age regardless of their level of oppositionality, and inattention was associated with improved social skills once other DB problems were taken into account.

In sum, consistent with expectations, toddler-age aggression was related to school-age reports of social dysfunction according to parents and teachers; however, the predictive utility of other dimensions of DB problems, alone or in combination, as well as changes in DB problems during early childhood, depended on the rater. The findings suggest that parent reports of aggressive behavior as early as age 2 provide modest but significant and consistent information about teacher and parent perceptions of child social functioning up to 6.5 years later.

Study Contributions and Clinical Implications

Although previous studies have shown associations between early childhood aggression and later social skills and relationships (e.g., Campbell et al. 2006), to our knowledge this is the first study to do so while accounting for both initial levels and changes in correlated DB, as well as potential interactions between dimensions. Moreover, very few studies have shown such consistent, longitudinal, cross-informant associations between toddler-age DB problems and school-age social skills and parent/teacher/peer relationships. In addition, this study utilizes a sample recruited at age 2 based on the presence of risk for early-starting DB problems. Identifying early behaviors that predict later social functioning may be particularly important in this sample, as social rejection and deviant peer affiliation in middle childhood have been posited as a mechanism differentiating early starting persisters from desisters (e.g., Snyder et al. 2005; Trentacosta and Shaw 2009). The results of this study suggest that even in the context of multiple risk factors for DB problems, early childhood aggression is the only DB related to less adaptive social skills and more social difficulties (e.g., peer rejection) at school-age across informant and context. Coercion theory would predict that aggression, if unabated, would have dire consequences for the development of social competence and relationships in childhood (Dishion and Patterson

2006). Once aggression is learned as a response to unpleasant circumstances, it can become a powerful tool for organizing the social environment. However, as revealed in several developmental studies, aggression is a key disruptor of peer relationships (Coie and Dodge 1983). Emanating from this work, we know that even when aggressive children are placed in a new group of peers in childhood, they quickly become disliked (Dodge 1983). Early peer and teacher rejection further reduces the likelihood that children will be provided with prosocial contexts to develop the self-regulatory capacities to develop and refine critical social skills (Dishion and Patterson 2006; Schwartz et al. 1999). Therefore, it would be important for early prevention programs targeting DB problems to work with toddlers exhibiting high levels of aggression.

It is noteworthy that of the nine school-age social outcomes examined, random assignment to the FCU was only associated with direct effects on one outcome, teacher-rated conflict. However, based on the FCU's focus of reducing child DB problems through changes in parenting, the lack of direct effects on child social skills is not surprising. Although prior work from this sample has demonstrated that numerous targeted and collateral child outcomes have been affected through modifying parent behavior (Dishion et al. 2014b; Lunkenheimer et al. 2008; Smith et al. 2013), the FCU may not have affected parenting behaviors that translate into improved child social skills. Based on associations between aggression in toddlerhood and later social skills, it would be important for interventions targeting early childhood DB problems to include components (e.g., training in emotion regulation and social skills; see Greenberg et al. 1995; Mostow et al. 2002) to address potential child social dysfunction directly, particularly when children reach school-age and social interactions play an increasingly integral role in their lives.

Limitations and Future Directions

Despite this study's methodological strengths, including its relatively large sample size, the use of multiple informants, as well as a 6.5-year longitudinal design, the results should be interpreted in light of a number of limitations. First, school-age teacher reports were present for only 54 % of participants at age 7.5 due to difficulties obtaining school permissions at some study sites. Therefore, it was necessary to composite ages 7.5 and 8.5 teacher reports to have adequate sample coverage. However, we considered teacher reports to be crucial for providing accurate reports of child social functioning outside of the home context. Moreover, no differences were observed on baseline demographics between those with and without teacher reports when using the composited age measure. Second, teacher and parent report measures of peer functioning were not identical across informants; thus, discrepancies between reporters could be due to the inclusion of the self-control variable present for teachers but not parents. Further, this study did not have peer-rated data. It would be important for follow-up studies to evaluate whether peer nominations and ratings of child social skills and relationships produce similar results. Finally, although we consider the use of a high-risk sample a strength, it possible that these results may not generalize to lower risk samples. Future work should replicate the current findings and evaluate whether toddler-age aggression is more consistently related to later social (and academic) functioning than other DB problems in a representative sample.

Despite these limitations, the current study adds to our understanding of associations between early childhood DB problems and school-age social skills and relationships. The results demonstrated that the age 2 level of aggression was more reliably related to poorer middle childhood social functioning than initial levels and changes in other DB. These findings are consistent with a prior study in this sample showing that age 2 aggression was more consistently related to school-age academic achievement than other DB problems. Thus, accumulating evidence indicates that, during early childhood, high levels of aggressive behavior may be particularly indicative of risk for future socio-emotional and academic difficulties, which places children at even greater risk for adolescent and adult antisocial behavior.

Acknowledgments

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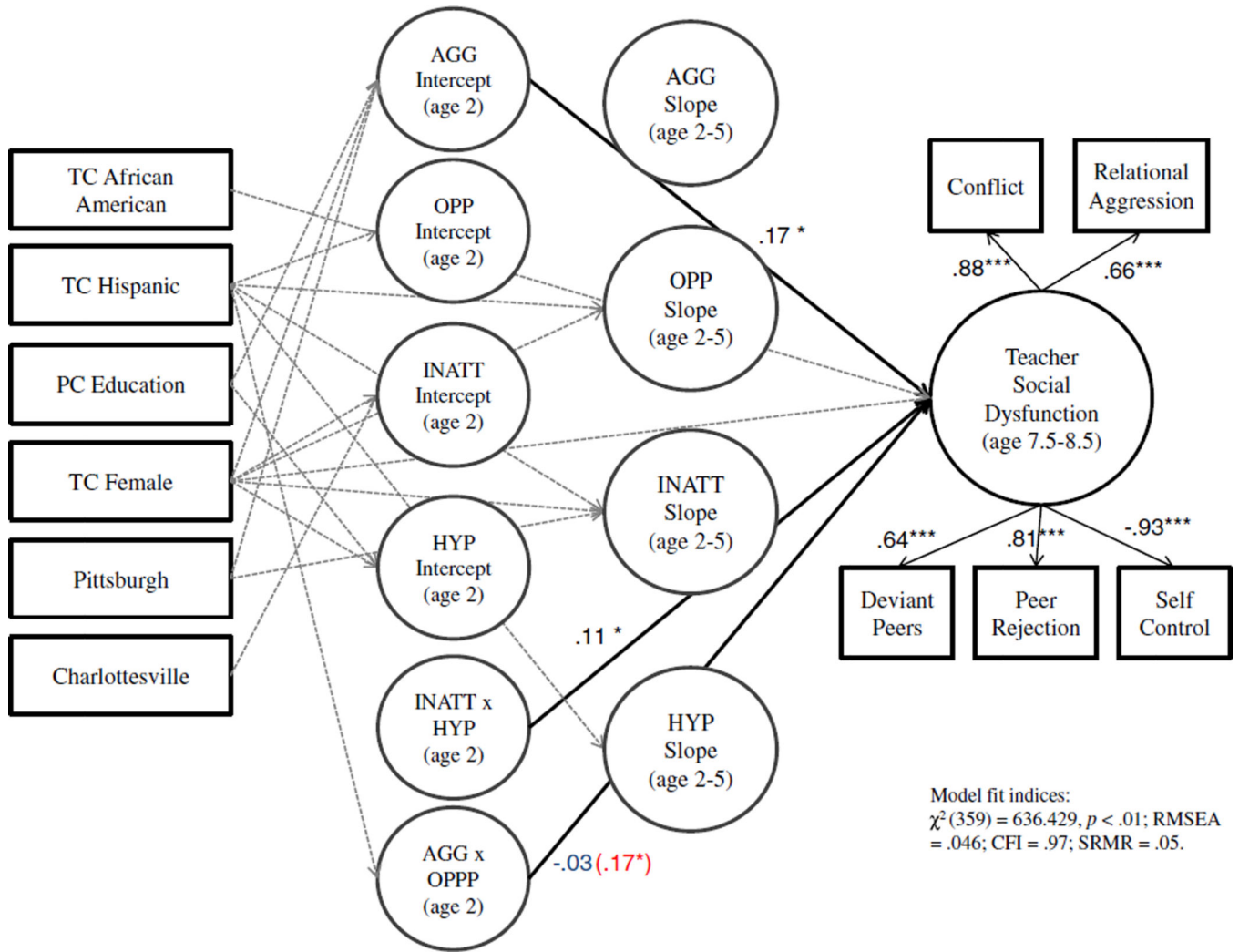
Fig. 1.
Results from the multi-group model using DB intercept and slope factors to predict teacher-rated social dysfunction. *Note*. Path estimates in black font are equal across group; *red* reflects the value for the intervention group only while *blue* reflects the control group value. Covariances between slopes and intercepts, non-significant pathways, and path estimates from covariates are omitted from the model
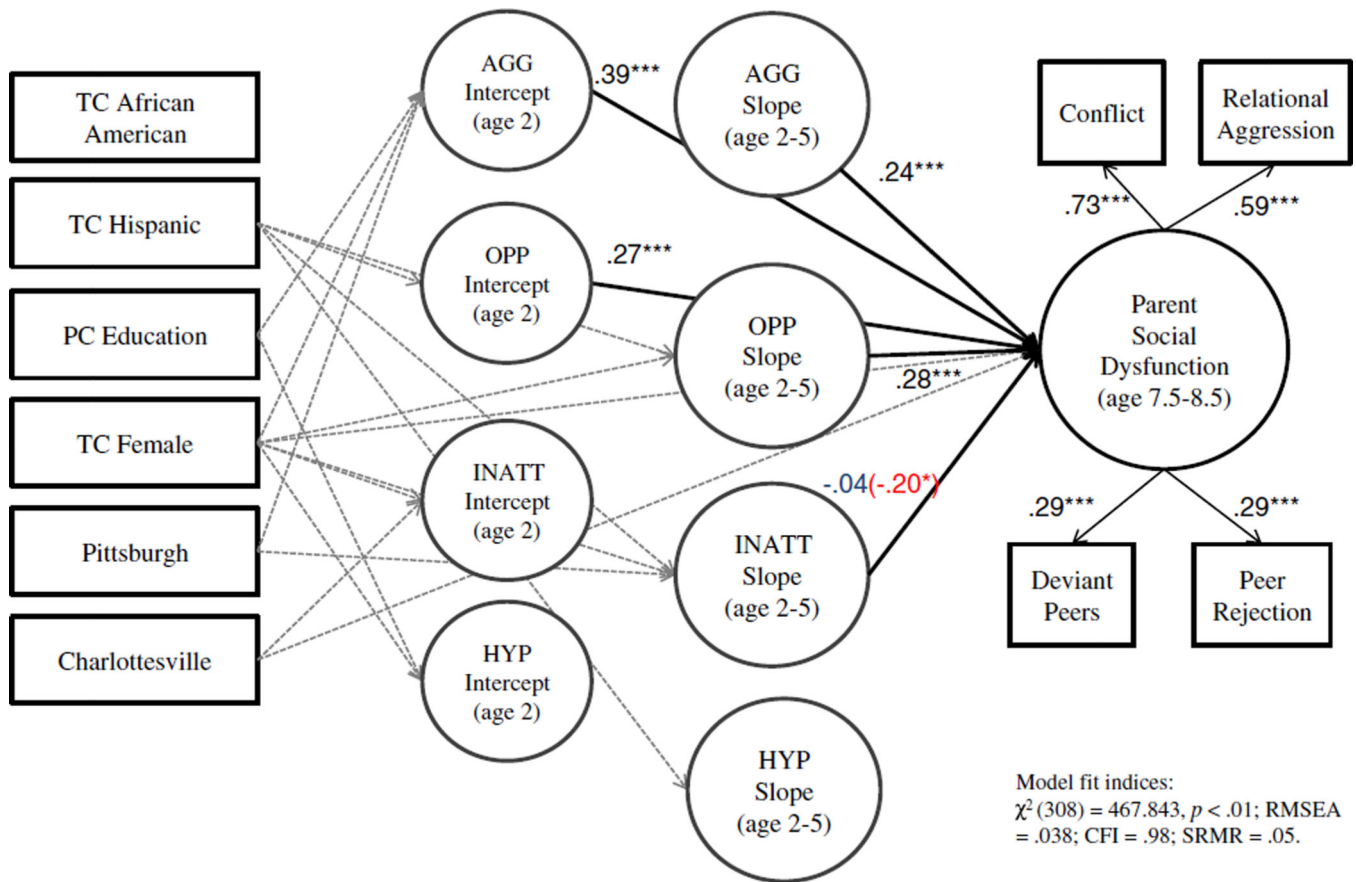
Fig. 2.
Results from the multi-group model using DB intercept and slope factors to predict parent-rated social dysfunction. *Note*. Path estimates in black font are equal across group; *red* reflects the value for the intervention group only while *blue* reflects the control group value. Covariances between slopes and intercepts, non-significant pathways, and path estimates from covariates are omitted from the model

Table 1

Item break-down and scale information for disruptive behavior scale dimensions at each child age

Disruptive behavior scale	Age	Internal consistency (alpha)	Items from child behavior checklist 1 ½ to 5 (6–18)	Items from Eyberg child behavior inventory
Hyperactivity/ Impulsivity	2	0.484	#6 (#10) – can't sit still	#35 – overactive/restless
	3	0.622		#29 – interrupts
	4	0.661		
	5	0.671		
Inattention	2	0.734	#5 (#8) – can't concentrate	#31 – short attention span
	3	0.804		#32 – fails to finish tasks/projects
	4	0.846		#34 – difficulty concentrating on one thing
	5	0.833		#30 – is easily distracted
Aggression	2	0.687	#35 (#37) – gets in many fights	#23 – teases or provokes
	3	0.769	#53 (#57) – physically attacks people	#26 – physically fights with friends
	4	0.787	#14 (#15) – cruel to animals	#27 – physically fights with sibs
	5	0.786	#17/#18 (#20/#21) – destroys own/ others' things	#18 – hits parents
				#19 – destroys toys/objects
Oppositional	2	0.681	#15 (#28) – defiant	#13 – temper tantrums
	3	0.841	#20 (#22) – disobedient	# 11 – argues with parents about rules
	4	0.852		#14 – sasses adults
	5	0.854		#10 – acts defiant when told to do something
				#12 – angry when doesn't get own way

Note. For the Child Behavior Checklist, the item number from the age 1 ½–5 version is presented with the corresponding item number from the age 6–18 version in parentheses

Table 2

Descriptive statistics between observed variables for participants in the intervention and control groups

Variable (age)	Control group			Intervention group		
	N	Mean	(SD)	N	Mean	(SD)
1. AGG (2)	364	0.57	0.33	367	0.58	0.34
2. OPP (2)	364	1.23	0.35	367	1.21	0.35
3. INATT (2)	364	1.01	0.45	367	1.00	0.47
4. HYP (2)	364	1.21	0.46	367	1.24	0.47
5. Peer Rejection-T (7–8)	198	2.50	1.49	199	2.45	1.43
6. Deviant Peers-T (7–8)	223	1.66	0.70	218	1.69	0.72
7. Conflict-T (7–8)	227	18.90	9.28	219	16.97	7.75
8. Relational Agg –T (7–8)	198	1.79	0.86	198	1.69	0.73
9. Self Control-T (7–8)	227	13.59	4.43	218	13.85	4.40
10. Deviant Peers-P (7–8)	306	1.54	0.43	296	1.54	0.44
11. Peer Rejection-P (7–8)	304	1.33	0.59	288	1.39	0.62
12. Conflict-P (7–8)	310	25.87	9.15	299	25.38	8.87
13. Relational Agg-P (7–8)	310	14.26	5.05	299	13.46	5.07

AGG Aggression, *OPP* Oppositional, *INATT* Inattention, *HYP* Hyperactivity-Impulsivity; T denotes teacher report; P denotes parent report