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Indirect Effects of the Fast Track Intervention on Conduct Disorder Symptoms and Callous-Unemotional Traits: Distinct Pathways Involving Discipline and Warmth

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Abstract Little is known about intervening processes that explain how prevention programs improve particular youth antisocial outcomes. We examined whether parental harsh discipline and warmth in childhood differentially account for Fast Track intervention effects on conduct disorder (CD) symptoms and callous-unemotional (CU) traits in early adolescence. Participants included 891 high-risk kindergarteners (69 % male; 51 % African American) from urban and rural United States communities who were randomized into either the Fast Track intervention (n=445) or non-intervention control (n=446) groups. The 10-year intervention included parent management training and other services (e.g., social skills training, universal classroom curriculum) targeting various risk factors for the development of conduct problems. Harsh discipline (Grades 1 to 3) and warmth (Grades 1 and 2) were measured using parent responses to vignettes and direct observations of parent–child interaction, respectively. Parents reported on children's CD symptoms in Grade 6 and CU traits in Grade 7. Results demonstrated indirect effects of the Fast Track intervention on reducing risk for youth antisocial outcomes. That is, Fast Track was associated with lower scores on harsh discipline, which in turn predicted decreased levels of CD symptoms. In addition, Fast Track was associated with higher scores on warmth, which in turn predicted reduced levels of CU traits. Our findings inform developmental and intervention models of youth antisocial behavior by providing evidence for the differential role of harsh discipline and warmth in accounting for indirect effects of Fast Track on CD symptoms versus CU traits, respectively.

Keywords Prevention · Indirect effects · Parenting · Conduct problems · Callous-unemotional

A major goal of prevention science in youth violence is to understand intervening processes that explain how interventions reduce child problem behavior (Sandler et al. 2011). Parent management training (PMT) for conduct problems aims to improve parenting practices (e.g., discipline) and the parent–child relationship (McMahon and Pasalich 2015). Despite 50 years of research examining PMT programs, the role of parenting processes in these interventions has only received empirical attention since 2000, and these studies are relatively scarce (Forehand et al. 2014). Prevention programs that include PMT components have shown promising results in reducing risk for child antisocial outcomes, such as conduct disorder; CD (Sandler et al. 2011). Children with CD are heterogeneous and those with co-occurring callous-unemotional (CU) traits (e.g., lack of guilt and empathy)—a specifier for CD in DSM-5—face increased risk for poorer developmental outcomes (Frick et al. 2014). Although CD symptoms and CU traits are positively correlated, CU traits can be elevated in the absence of clinical levels of CD, and vice-versa (Viding and McCrory 2012). Moreover, CD and CU traits are distinguishable in children and may have both shared and unique psychosocial influences. To the best of our knowledge, we are unaware of research that has investigated whether different parenting mechanisms account for prevention program effects on these distinct antisocial outcomes.

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Various developmental theories describe parent–child processes implicated in the emergence of child antisocial outcomes. From the perspective of social learning theory, Patterson's coercion model (e.g., Patterson et al. 1992) posits a mutually reinforcing and escalating cycle of parent and child aversive behavior as a training context for children's conduct problems. In resorting to using harsh and inconsistent parenting practices to manage child disruptive behavior, parents inadvertently socialize their child to become increasingly aggressive. Other theorists focus on relational processes in the broader context of the emotional tone of the parent–child relationship, to describe the development of child compliance and internalized conscience. These accounts suggest that children are more likely to comply with parents' directives and internalize their morals and values if the parent–child relationship involves reciprocated positive affect and responsiveness (Kochanska 2002; MacDonald 1992). Overall, developmental theories have identified parents' harsh discipline and warmth as key factors involved in the development and prevention of conduct problems and other antisocial-related outcomes. Although some prior studies have found significant associations between these parenting dimensions in early and middle childhood (e.g., Kroneman et al. 2011; Waller et al. 2015a), there is reason to believe that they may have non-overlapping influences on developmental outcomes.

Longitudinal research suggests that harsh discipline and warmth independently predict later conduct problems in childhood and early adolescence (Hipwell et al. 2008; Pardini et al. 2007). However, in a sample of preschoolers, Dodge et al. (1994) found harsh discipline, but not warmth, to be a unique predictor of early-onset conduct problems. A cross-sectional study involving first graders from the same sample used in the current study showed that harsh discipline correlated with both aggression and oppositional behavior, whereas warmth was only correlated with oppositional behavior (Stormshak et al. 2000). Moreover, in a study examining mediators of a preventive parenting intervention for high-risk preschoolers, harsh parenting, but not warmth, partially accounted for program effects on decreased conduct problems (Hanisch et al. 2014). Taken together, prior research provides more consistent support for the proximal effects of harsh discipline than warmth on conduct problems. Further research is needed, however, to investigate whether these parenting dimensions predict unique facets of child antisocial outcomes.

Harsh discipline and warmth have also been examined in relation to child callous-unemotional (CU) traits (see Waller et al. 2013, for a review). Prior longitudinal research shows that harsh discipline predicts CU traits in early (Waller et al. 2012) and late (Pardini et al. 2007) childhood. Furthermore, decreased harsh parenting mediated the effects of PMT on reductions in CU traits (McDonald et al. 2011). The affective quality of the parent–child relationship appears to be significant in the socialization of children with, or at risk for, CU traits. Parental warmth may be more important for preventing behavior problems in children with high versus low CU traits (Kimonis et al. 2013; Kochanska et al. 2013; Pasalich et al. 2011), and parental warmth/involvement is associated with decreasing levels of CU traits (Pardini et al. 2007; Waller et al. 2015b). Overall, results from this body of research suggest that both harsh discipline and warmth may be implicated in the emergence of CU traits.

A significant limitation of these studies is that they have not examined differential associations between parenting dimensions and both conduct problems and CU traits in a single model (Waller et al. 2013). An exception is a recent study by Barker et al. (2011) using a community sample of children. Harsh parenting at age 4 predicted conduct problems and CU traits in boys at age 13. Furthermore, there was an association between warmth at age 4 and CU traits at age 13 in girls. However, these findings were limited by a reliance on maternal reports for assessing parenting dimensions and child antisocial outcomes, the use of a measure of warmth at age 4 comprising items reflecting maternal involvement (e.g., how much mother plays with child), and the inclusion of a community sample of children with a generally low risk of developing antisocial outcomes.

To extend previous research, we utilized an experimental design to examine associations between intervention-induced changes in harsh discipline and warmth and later changes in CD symptoms and CU traits. The Fast Track intervention involved a randomized controlled trial of a multimodal preventive intervention targeting conduct problems in high-risk children. The intervention was administered from Grades 1 to 10 and addressed various risk factors (e.g., negative parenting, deviant peer affiliation). The different components of Fast Track were selected on the basis of developmental theory and longitudinal research regarding early-starter pathways of conduct problems (Conduct Problems Prevention Research Group 1992). During the elementary school grades, the program consisted of parent management training (PMT), a social-emotional skills curriculum, child social skills groups, and individualized components (see Slough et al. 2008, for a review). PMT targeted positive parenting skills—such as consistent discipline and involvement/warmth—during the elementary school years to strengthen the parent–child relationship and prevent the escalation of negative patterns of parent–child interactions (e.g., coercive exchanges) that may have emerged during the preschool years (Slough et al. 2008). Ineffective parenting in early/middle childhood can have cascading effects on the emergence of conduct problems in later childhood and adolescence (Dodge et al. 2008). In this light, Fast Track was designed to influence both proximal (e.g., parenting) and distal (e.g., conduct problems) outcomes across development.

Indeed, previous studies have demonstrated proximal effects of the Fast Track intervention on improving harsh discipline after Grades 1 and 3 and warmth after Grade 1 (CPPRG

1999, 2002a). Change in parenting behavior after Grade 3 partially mediated intervention effects on reducing conduct problems after Grade 4 (CPPRG 2002b). Furthermore, the intervention was associated with reduced CD symptoms and diagnoses across elementary and high school; however, only in children with the highest initial risk scores in kindergarten (i.e., pre-intervention) (CPPRG 2011). Whether Fast Track reduced risk for CU traits has not yet been examined.

The current study tested a model wherein the Fast Track intervention would reduce risk for CD and CU traits in early adolescence, by way of improving parental harsh discipline and warmth in childhood. The Fast Track project assessed CU traits only in Grade 7; thus, we used the most proximal measure of CD symptoms (which was in Grade 6) to examine these antisocial outcomes in tandem during this transitional developmental phase. We did not know whether the intervention would have a direct effect on CU traits. In the case of a significant intervention effect on an antisocial outcome, we planned to examine parenting factors as mediators. If we did not find a direct effect of Fast Track on an antisocial outcome, we would examine parenting dimensions as intervening variables (MacKinnon et al. 2002). That is, we would evaluate whether the Fast Track intervention had direct benefits for improving parenting, which in turn reduced risk for later antisocial outcomes. Based on prior research, we hypothesized that harsh discipline would account for direct/indirect intervention effects on CD and CU traits, and warmth would account for direct/indirect intervention effects on CU traits only. Given the interaction effect between intervention and initial risk in predicting CD in adolescence (CPPRG 2011), we included this interaction effect in our model to examine whether it significantly predicted CD and CU traits over and above effects involving parenting dimensions.

Method

Participants

Participants were kindergarten children (*M* age at initial assessment=6.5 years, *SD*=0.48, 69 % boys) and their parents in the Fast Track intervention (*n*=445) and high-risk control (*n*=446) groups. Children were recruited from schools located in neighbourhoods with high rates of crime and poverty. The 55 participating schools came from four different US regions (i.e., Durham, NC; Nashville, TN; rural Pennsylvania; and Seattle, WA) that varied widely in ethnicity and poverty. Within each site, schools were matched for demographics (e.g., ethnic composition, size, proportion reduced lunch) and then divided into one to three paired sets, and randomly assigned to either the intervention or control condition.

A multistage screening procedure (Lochman and CPPRG 1995) was used to identify children at "high-risk" for adolescent antisocial behavior. From 1991 to 1993, three cohorts of kindergartners (*n*=9594) were initially screened for classroom conduct problems by teachers. Children scoring in the top 40 % were then screened for home conduct problems by parents (91 % agreed to participate), using items drawn primarily from the Child Behavior Checklist (CBCL; Achenbach 1991). A severity-of-risk initial screen score was computed from the teacher and parent scores, and children were selected for the study moving from the highest score downward until desired sample sizes were reached within sites, cohorts, and conditions. The average externalizing *T* score on the kindergarten Teacher's Report Form of the CBCL was 66.4 (national *M*=50, *SD*=10).

The overall sample (*n*=891) was ethnically diverse (51 % African American, 47 % European American, 2 % Other ethnicity) and skewed toward socioeconomic disadvantage (i.e., 35 % of families were in the lowest Hollingshead's socioeconomic level, 58 % were single-parent families, and 29 % of parents were high school dropouts). Written consent from parents and oral assent from children were obtained, as was ethics approval from the Institutional Review Boards of participating universities. Parents received payment for completing assessments, and intervention parents were paid for attending groups.

Fast Track Intervention

The multimodal intervention was administered from Grades 1 to 10. During Grades 1 to 5, intervention families were offered parent groups with home visiting, child social-cognitive skills training, and academic tutoring. Two-hour family group meetings were held weekly for 22 sessions in Grade 1, biweekly for 14 sessions in Grade 2, and monthly for 9 sessions/year in Grades 3 to 5. More sessions were provided in Grades 1 and 2 than in later grades to support children's transition into elementary school. These meetings included "friendship groups" for children (e.g., training in social skills, self-control, and problem-solving skills) (Bierman et al. 1996), parenting groups (e.g., training in parent–child relationship and parenting skills), and "Parent–child Sharing Time" (e.g., practicing positive parenting skills with staff support) (McMahon et al. 1996). The individualized home visiting component helped parents generalize their new parenting skills to the home setting, and the level of support provided by staff was informed by ongoing assessments of family functioning. Children in the intervention schools also participated in the Promoting Alternative Thinking Strategies (PATHS; Kusche and Greenberg 1994) classroom-based social-emotional learning curriculum during Grades 1 to 5, to promote prosocial skills, self-control, and social problem-solving skills. During Grades 6 to 10, families attended group meetings focused on managing various adolescent developmental issues (see Slough et al. 2008, for more details).

Regarding families' participation in the intervention, on average across Grades 1 to 3, 88 % of parents and 92 % of children attended at least one or more group sessions during the year, and within these families, 79 % of parents and 87 % of children attended at least 50 % of all sessions in a given year. Rates of non-participation rose modestly across years, largely due to families moving. The majority of youth received services through Grade 10; however, by the middle school years 15 % of children in the intervention condition were deemed "low risk" and recommended for minimal services each year. To ensure intervention fidelity, program content and procedures were manualized, and there was regular training for and supervision of staff across sites.

Measures and Procedure

Parental Warmth During home visits in the summers following kindergarten (i.e., pre-intervention stage), and Grades 1 and 2, children and their mothers participated in the Parent–child Interaction Task (PCIT). The PCIT is a semi-structured family observation procedure involving free play (5 min); parent-led play (5 min); a Legos task (i.e., child makes a replica of a figure while being coached by the parent) (5 min); and clean-up (3 min). Frequency counts for parental positive attention (e.g., descriptive praise, non-verbal approval of child positive behavior) were coded sequentially in 30-s intervals for each task, using an adaptation of the Behavioral Coding System (BCS; McMahon and Estes 1994). Final scores are the proportions across the four PCIT tasks divided by the total length of the session. After each PCIT task, coders made global ratings of parent and child behavior using an adaptation of the Interaction Rating Scales (IRS; Crnic and Greenberg 1990), which includes 16 items scored along a 5-point system. Scores for parental IRS warmth were the mean of six items that were coded across the four tasks (Cronbach's α Grade 1= 0.90; α Grade 2=0.92). These items related to maternal gratification (e.g., enjoyment in the interaction), sensitivity (e.g., sensitive responding to child's cues), and involvement (e.g., time spent interacting with child). Upon completion of the BCS and IRS, coders made overall impressions of the parent, child, and their interactions across the entire PCIT, using the Coder Impressions Inventory (CII). The CII consists of 65 items and scores for the CII warmth subscale were the mean of 12 items (e.g., physically affectionate towards child, verbally affectionate towards child, distant/detached from child [reversed scored]) (α Grade 1=0.78; α Grade 2=0.86). Our overall measure of parental warmth involved both discrete positive parenting behavior and parents' global relational behavior and affect.

Coders received training on the observation systems by a lead observer at each of the sites. Coders met weekly to control for coder drift, and lead observers were trained annually and participated in regular conference calls to minimize cross-site coder drift. Interrater agreement on the BCS and IRS was assessed on 15 % of the PCIT sessions. Mean intraclass correlation coefficients for the BCS and IRS parenting behaviors were 0.94 and 0.74, respectively.

Parental Harsh Discipline Harsh discipline was assessed at the end of kindergarten and Grades 1 to 3. As part of the Life Changes interview measure (Dodge et al. 1990), parents were given six brief written vignettes involving various episodes of child misbehavior (e.g., hitting another child, noncompliance). Parents were asked what they would do in these situations and their responses were coded into one of several mutually exclusive categories (e.g., reasoning, withdrawal of privileges, physical punishment). The Physical Punishment scale was used in this study, with the overall physical punishment score computed by averaging parents' responses across the six vignettes. The kappa coefficient for interrater agreement was 0.93.

Conduct Disorder Criterion counts for *DSM-IV* symptoms of CD were assessed at the end of Grade 6 using Version IV of the Parent Interview of the NIMH Diagnostic Interview Schedule for Children (DISC) (e.g., Shaffer et al. 1996). Lay interviewers, uninformed about intervention status, were trained until they reached reliability. Assessments were completed by the primary parent, typically the mother. CD criteria were solicited for the past 12 months, and scores (range=0–9) were based on 15 criteria derived from 23 symptom items.

Callous-Unemotional Traits CU traits were assessed at the end of Grade 7 using parent ratings on the 6-item CU scale (α=0.64) of the Antisocial Process Screening Device (APSD; Frick and Hare 2001). Items are rated as 0 (*Not at all true*), 1 (*Sometimes true*), or 2 (*Definitely true*). Example items (reverse-scored) include: "Is concerned about the feelings of others" and "Feels bad or guilty when he/she does something wrong." The APSD has demonstrated good reliability and validity (e.g., Frick et al. 2000).

Analysis Plan

To examine the hypotheses outlined above, a series of latent variable growth models were estimated using Mplus version 7.11 (Muthén and Muthén 2010). All models were estimated using full information maximum likelihood with robust standard errors, which provides estimates of the variance-covariance matrix for all available data, including those individuals who have incomplete data on some measures. Adhering to an intent-to-treat model, all families assigned to the intervention condition were included in analyses regardless of their level of participation in, or the amount received of, the intervention. Model fit of all models was evaluated by $\chi 2$ values, the Root Mean Square Error of Approximation

(RMSEA), and the Comparative Fit Index (CFI). Models with non-significant $\chi 2$, RMSEA less than 0.06, and CFI greater than 0.90 were considered an adequate fit to the data (Hu and Bentler 1999).

Preliminary Analyses First, unconditional models of harsh discipline and warmth were estimated separately without covariates. The single indicator of harsh discipline (overall physical punishment score) measured across Grades 1 to 3 was modeled using latent growth curve analyses. We used latent growth curves to model change in harsh discipline across the three grades and capture individual heterogeneity in parents' growth factors, intercept (harsh discipline score in Grade 1) and slope (linear and/or quadratic growth in harsh discipline each year) (McArdle and Epstein 1987). The three indicators of warmth (BCS positive attention, IRS warmth, and CII warmth averaged across Grades 1 and 2) were modeled as a confirmatory factor model because with only two time points we were not able to estimate a growth curve model of warmth. Second, we estimated an unconditional conjoint model of warmth and harsh discipline.

Next, we examined associations between intervention condition (control=0 and Fast Track=1), warmth, and harsh discipline. Pre-intervention levels of warmth and harsh discipline, as well as socioeconomic status (SES), gender (female=1), initial risk screen score, site, cohort, urban/rural status (urban=1), and race (black=1) were also included as covariates in all analyses.

Structural and Indirect Effect Models Involving Antisocial Outcomes Next we added antisocial outcomes (CU traits in Grade 7 and CD criterion count in Grade 6) as endogenous variables predicted by the covariates, intervention condition, warmth, and harsh discipline. We also included an initial risk screen score-by-intervention interaction in predicting antisocial outcomes. Figure 1 shows all the paths that were included in the final model. We then examined whether warmth and harsh discipline accounted for direct/indirect associations between intervention condition and antisocial outcomes (CU traits in Grade 7 and CD criterion count in Grade 6) using the product of coefficients method with bootstrapping to obtain 95 % confidence intervals of the mediated effect (MacKinnon et al. 2002). Analyses were conducted with 1000 bootstrapped estimates of the indirect effect. Bootstrapping is a nonparametric approach to statistical inference that does not make a priori assumptions about a sampling distribution (e.g., does not necessitate a normal distribution of scores for a given variable), and empirically derives its sampling distribution from the study's data (Davison and Hinkley 1997). The product of coefficients method provides an estimate of the indirect effect by multiplying regression coefficients for the regression of the intervening variable (i.e., warmth/harsh discipline) on the independent variable (i.e., intervention) and for the regression of the outcome (i.e., CD/CU traits) on the intervening variable with the independent variable and baseline measures included in the model. The indirect effects are deemed significant if the 95 % confidence interval of the indirect effect does not include 0. Bootstrapping avoids problems associated with calculating standard errors for product of coefficients, because it relies on confidence intervals for testing indirect effects as opposed to point estimates of the indirect effects (Hayes 2009). We also computed the completely standardized indirect effect (Preacher and Kelley 2011) by multiplying standardized regression coefficients for the direct effects between the independent and intervening variables, and the independent and outcome variables. Based on Cohen's (1988) standards regarding the interpretation of effect sizes, small effect size=0.01, medium effect size=0.09, and large effect size=0.25 (an indirect effect is a product of two effects, thus Cohen's typical effect size standards are squared).

The product of coefficients approach with bootstrapped confidence intervals is recommended for testing indirect effects, and researchers are encouraged to use this approach when examining intervening effects of parenting on intervention outcomes to enable comparison among findings across different studies (Forehand et al. 2014). In contrast to requirements in traditional mediation analysis (Baron and Kenny 1986), proponents of the product of coefficients method have noted that a significant association between the independent and outcome variable is not a prerequisite for establishing an indirect effect (e.g., Fairchild and MacKinnon 2014; MacKinnon et al. 2002; Shrout and Bolger 2002).

Results

Bivariate Associations

Table 1 shows correlations (Pearson's r) between covariates with continuous scores (i.e., socioeconomic status, initial risk scores, pre-intervention parenting variables), parenting variables, and antisocial outcomes. There were significant associations between the three different observational measures of warmth averaged across Grades 1 and 2 (all r's$\geq$0.51, p's$<$0.01) and between the physical punishment measures across Grades 1 to 3 (all r's$\geq$0.34, p's$<$0.01), supporting the use of latent variables for these parenting dimensions. CD count in Grade 6 was positively correlated with levels of CU traits in Grade 7 (r=0.25, p<0.01); however, CD count did not demonstrate significant bivariate associations with the parenting variables. Higher levels of CU traits were significantly associated with lower scores on the three warmth measures (all r's=−0.22, p's<0.01) and higher scores on the three physical punishment measures (all r's$\geq$0.09, p's<0.05).

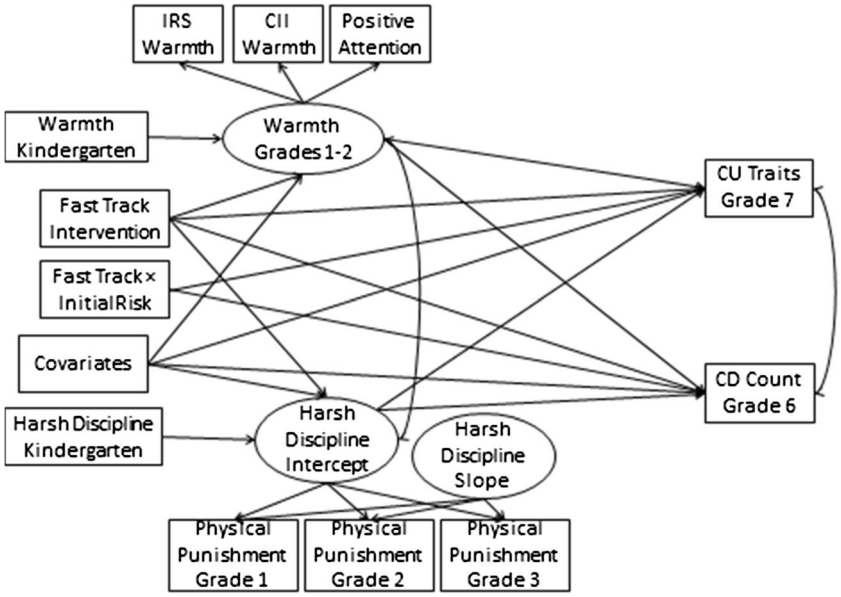

Fig. 1 Structural model of indirect effects of the Fast Track intervention on antisocial outcomes through changes in parenting dimensions. All the paths examined in the model are shown. Covariates include SES, gender, race, urban/rural status, site, cohort, and initial risk

Preliminary Analyses

The model of warmth was "just identified" (meaning the number of observed parameters was equal to the number of estimated parameters with degrees of freedom=0) and thus model fit could not be assessed. The growth model of harsh discipline, with a random intercept and fixed linear and quadratic slopes (in other words, we freely estimated variance around the intercept, but fixed the variances of the slopes at 0), provided the best fit to the observed data based on a non-significant $\chi 2$ (2)=1.52, p=0.47, CFI=1.00, RMSEA=0.00, 90 % CI [0.00, 0.06]. The model of warmth and harsh discipline, estimated conjointly, also provided a reasonable fit to the data, χ^2 (10)=13.31, p=0.21, CFI=0.995, RMSEA=0.019, 90 % CI [0.00, 0.04] and indicated a significant association between warmth and harsh discipline (β=−0.26; B (SE)=−0.01 (0.004), p=0.001).

A model of the parenting dimensions was then examined including intervention condition, pre-intervention levels of warmth and harsh discipline, as well as the covariates, as predictors of the latent warmth and harsh discipline latent growth factors. This first model provided an adequate fit to the data based on the RMSEA and CFI, χ^2 (64)=115.80, p<0.001, CFI=0.97, RMSEA=0.031, 90 % CI [0.022, 0.040]. Intervention condition significantly predicted both warmth (β=0.30; B (SE)=0.16 (0.03), p<0.001) and the intercept of harsh discipline (β=−0.23; B (SE)=−0.02 (0.008), p=0.003). In addition, the warmth latent factor was

Table 1 Correlations between covariates, parenting variables, and antisocial outcome measures

	1	2	3	4	5	6	7	8	9	10	11
1. Warmth K											
2. Harsh discipline K	0.00										
3. SES	−0.01	−0.01									
4. Initial risk score	−0.04	−0.02	0.00								
5. IRS warmth average G1-2	−0.04	0.02	0.32**	0.00							
6. CII warmth average G1-2	0.00	0.02	0.33**	−0.02	0.68**						
7. Positive attention G1-2	−0.01	0.02	0.28**	0.09*	0.51**	0.63**					
8. Physical punishment G1	−0.02	0.00	−0.09**	0.00	−0.12**	−0.13**	−0.14**				
9. Physical punishment G2	−0.01	−0.01	−0.04	0.02	−0.09**	−0.10**	−0.14**	0.36**			
10. Physical punishment G3	−0.04	−0.04	0.00	−0.02	−0.13**	−0.18**	−0.22**	0.34**	0.38**		
11. CD criterion count G6	0.00	−0.03	−0.03	0.18**	0.01	0.00	0.02	0.06	0.06	0.06	
12. CU traits G7	0.01	−0.03	−0.24**	0.14**	−0.22**	−0.22**	−0.22**	0.09*	0.11**	0.15**	0.25**

K kindergarten; *G* grade; *SES* socioeconomic status; *IRS* Interaction Rating Scale; *CII* Coder Impressions Inventory; *CD* conduct disorder; *CU* callous-unemotional

*$p<0.05$, **$p<0.01$

significantly associated with pre-intervention warmth (β=0.43), SES (β=0.24), and race (β=−0.21). The harsh discipline intercept was significantly associated with pre-intervention harsh discipline (β=0.63), race (β=0.13), and cohort (β=0.27).

Structural and Indirect Effect Models Involving Antisocial Outcomes

The model of warmth and harsh discipline was expanded to include antisocial outcomes (CU traits in Grade 7 and CD criterion count in Grade 6) and provided an adequate fit to the data, χ^2 (82)=121.38, $p<0.001$, CFI=0.97, RMSEA=0.024, 90 % CI [0.014, 0.033]. Significant paths are shown in Fig. 2. To summarize, the intercept of harsh discipline was significantly positively associated with CD count (β=0.12; B (SE)=1.69 (0.80), $p=0.03$) but not CU traits (β=−0.16; B (SE)=0.35 (0.19), $p=0.07$), whereas warmth was significantly negatively associated with CU traits (β=−0.16; B (SE)=−0.11 (0.02), $p<0.001$) but not CD count (β=0.08; B (SE)=0.19 (0.11), $p=0.08$). Intervention condition was not a significant predictor of either CD count (β=0.14; B (SE)=0.41 (0.25), $p=0.11$) or CU traits (β=0.09; B (SE)=0.07 (0.06), $p=0.25$). Regarding associations with the covariates, CU traits were significantly negatively associated with SES (β=−0.16) and positively associated with initial risk (β=0.19), whereas CD count was significantly negatively associated with gender (β=−0.25) and rural vs urban status (β=−0.05), and positively associated with initial risk (β=0.23).

In the final set of analyses, we examined our main hypotheses pertaining to whether the Fast Track intervention would be indirectly associated with the antisocial outcomes, via the parenting dimensions. Indirect effects testing indicated that warmth significantly accounted for indirect effects of the intervention on CU traits in Grade 7, B (SE)=−0.02 (0.006), 95 % CI [−0.03, −0.007], completely standardized indirect effect [CSIE]=−0.048. In addition, harsh discipline significantly accounted for indirect effects of the intervention on CD count in Grade 6, B (SE)=−0.04 (0.02), 95 % CI [−0.10, −0.001], CSIE=−0.0276. Warmth did not significantly account for the indirect effects of intervention on CD count, B (SE)=0.03 (0.02), 95 % CI [−0.003, 0.07], CSIE=0.024, and harsh discipline did not significantly account for the indirect effects of intervention on CU traits, B (SE)=−0.008 (0.005), 95 % CI [−0.02, 0.001], CSIE=0.0368.

Discussion

This study's findings support a model wherein unique parenting mechanisms in childhood account for the indirect effects of the Fast Track preventive intervention on reducing risk for CD symptoms versus CU traits in early adolescence. As hypothesized, we found indirect effects of the intervention on decreased CD symptoms through harsh discipline, and indirect effects of the intervention on reduced CU traits via warmth. Against predictions, however, harsh discipline did not account for indirect effects of the intervention on CU traits. By experimentally manipulating change in parenting dimensions, via the Fast Track intervention, and examining these effects on change in antisocial outcomes, our findings are the most compelling to date regarding unique relationships between harsh discipline and warmth and CD and CU traits, respectively.

These results partially replicate and extend those from prior research in important ways. Previous findings demonstrate that harsh discipline and warmth predict later conduct problems (albeit more consistently for harsh discipline) (e.g., Dodge et al. 1994; Pardini et al. 2007), and in separate studies, that these parenting dimensions are related to change in CU traits (Waller et al. 2013). Moreover, in a longitudinal study that included a generally low-risk sample of children, Barker

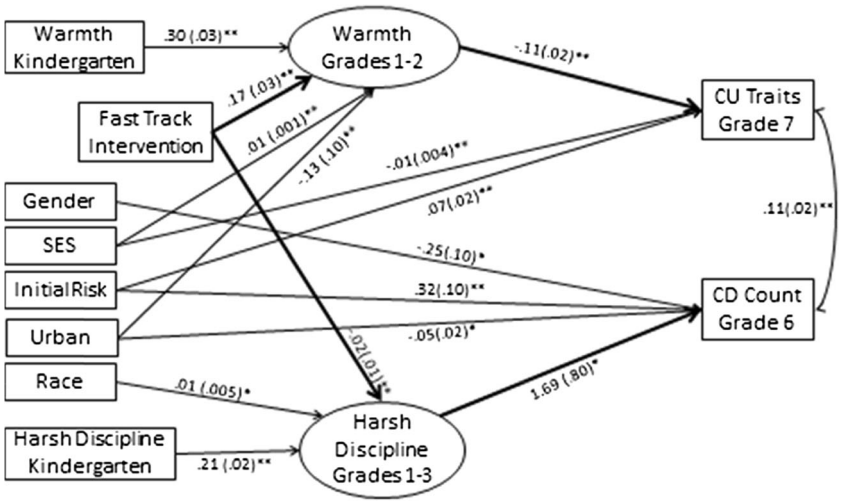

Fig. 2 Results for the structural model of indirect effects of the Fast Track intervention on antisocial outcomes through changes in parenting dimensions. Only the significant path coefficients are shown. Cohort, site, and residuals are not shown. Path estimates are unstandardized and standard errors are shown in parentheses. Indirect effect paths are shown in bold. * $p<0.05$. ** $p<0.01$

et al. (2011) found that harsh parenting predicted both later conduct problems and CU traits, whereas warmth was associated with CU traits. Here we report similar findings using a high-risk and ethnically diverse sample; however, we only found a trend-level association between harsh discipline and CU traits.

Most importantly, this study provides evidence for the differential role of parenting dimensions in accounting for indirect intervention effects on adolescent antisocial outcomes. Interestingly, harsh discipline and warmth were not significantly correlated in our final model. This finding further supports the idea that these parenting dimensions may function as independent intervening mechanisms in reducing risk for CD versus CU traits, which has novel implications for conceptualization of the development and prevention of youth antisocial behavior. From a social learning theory perspective, parents' harsh discipline maintains coercive parent–child interactions and trains children to become increasingly aggressive (Patterson et al. 1992). A reduction in harsh discipline prevents and/or breaks these coercive traps and subsequently decreases risk for escalating conduct problems. By contrast, developmental theories focused on relational processes suggest that a positive affective parent–child relationship—typically initiated by parents' warm responding—can facilitate children's willingness to embrace parental morals and values, and foster the emergence of empathy and conscience (Kochanska 2002; MacDonald 1992). This developmental process may be most proximal to the promotion of healthy emotional responding and the prevention of CU traits.

Our findings also extend prior research demonstrating effects of the Fast Track intervention on proximal and distal intervention outcomes. Previous Fast Track studies found that the intervention improved harsh discipline after Grades 1 and 3 and warmth after Grade 1 (CPPRG 1999, 2002a). This study expands on these findings by showing positive intervention effects on these parenting dimensions over slightly longer periods (i.e., harsh discipline across Grades 1 to 3, and warmth across Grades 1 and 2). Moreover, here we demonstrate that the Fast Track intervention impacted each parenting dimension while controlling for its effects on the other one, suggesting that the intervention had equal benefits on improving two distinct dimensions of parenting. This study also provides initial results showing that Fast Track can indirectly reduce risk for CU traits in early adolescence, by way of impacting parents' warmth during childhood. Although the Fast Track intervention began shortly after children started school (i.e., Grade 1), findings from other prevention programs (e.g., Family Check-Up; Dishion et al. 2008) suggest that child behavior problems can be reduced by targeting parenting prior to school entry. Indeed, harsh discipline and warmth in early childhood are linked to levels of conduct problems and CU traits in early adolescence (e.g., Barker et al. 2011; Waller et al. 2015b). Thus, prevention efforts beginning in early childhood may hold promise for reducing risk for these antisocial outcomes during the transition to adolescence.

Consistent with previous Fast Track findings, we did not find evidence for main effects of the intervention on antisocial outcomes in middle school/early adolescence (e.g., CPPRG 2010). Although prior research indicates that Fast Track reduced CD symptoms in elementary and high school in children with high initial risk levels (CPPRG 2011), this interaction effect did not approach significance in our model, which assessed CD symptoms in Grade 6. However, results from the current analyses suggest that changes in parenting may help to explain why some of the children do improve with respect to CD symptoms and CU traits during this difficult developmental period. Considering that Fast Track is a multicomponent intervention, there also may be additional pathways by which the intervention potentially improves youth outcomes. For instance, prior findings suggest that intervention-induced improvements in various dimensions of children's social information processing partially account for the effects of Fast Track on antisocial behavior in Grade 9 (Dodge et al. 2013). Future studies might examine whether particular social-cognitive processes also mediate the positive effects of Fast Track on CU traits.

It is important to note that the magnitude of the direct and indirect effects were small; thus, caution is warranted. Notwithstanding, the modest effect sizes in the current study are generally in line with effect sizes in prior studies examining preventive interventions for child and youth antisocial outcomes (e.g., see Matjasko et al. 2012, and Wilson and Lipsey 2007). Furthermore, it is important to consider our findings in light of this study's rigorous methodology (e.g., multisite RCT, multiple covariates, observational parenting measures) and the practical value of the Fast Track intervention for high-risk children. Regarding the latter point, the Fast Track program is considered a cost-effective intervention for reducing adolescent antisocial outcomes in the most high-risk individuals (Foster et al. 2006). Moreover, in addition to improving adolescent outcomes, Fast Track has a lasting impact on reducing antisocial and criminal behavior in adulthood (Dodge et al. 2015). Overall, careful consideration should be given to how our findings might be used to guide theory and practice in the prevention of youth antisocial behavior.

Limitations and Conclusion

This study has several limitations. First, CU traits were only assessed in Grade 7; thus, we were unable to control for pre-intervention levels of CU traits. Children's initial risk scores in kindergarten, however, showed modest correlations with both CU traits and CD in early adolescence and were included as a covariate in analyses. Second, due to limited statistical power we were unable to examine the robustness of our model across various demographic subgroups (e.g., gender, ethnicity, urban

vs. rural). Third, although we included direct observations of warmth, our measures of harsh discipline and antisocial outcomes were based on parent reports, which may have inflated the association between harsh discipline and CD. Fourth, the different approaches to modelling parental harsh discipline (latent growth curve analysis) and warmth (confirmatory factor analysis) may have contributed to their differential associations with antisocial outcomes. Fifth, the variance of the growth factor for harsh discipline could not be predicted by intervention condition as it was not significant and was fixed to zero in the final analysis. This suggests that parents' harsh discipline in the control and intervention groups were decreasing at very similar rates; however, harsh discipline was significantly more elevated in the control versus intervention group in Grade 1. One potential explanation for the lack of variance of the growth factor might be due to restricted range in the harsh discipline measure, considering the low mean score for parents' harsh discipline in the intervention group at the first assessment point (i.e., Grade 1). Sixth, as mentioned above, there may be alternate child (e.g., social-cognitive processes; Dodge et al. 2013) or family-based mechanisms associated with parenting dimensions that more strongly account for the indirect effects observed in this study. Seventh, in the context of a unified model of prevention, some participants in the Fast Track intervention group received individualized intervention components (e.g., academic tutoring, peer pairing) based on criterion-referenced assessments of child and family functioning. Thus, we were unable to calculate the effects of dosage on parent and child outcomes as dosage was confounded with severity of child and/or family problems. Finally, while our model is relatively comprehensive, it does not consider more complex sequential effects of the Fast Track program. Our initial model will help inform the design of future models examining more detailed and longer-term cascading effects of the intervention.

In conclusion, our findings provide novel insight into the relative importance of harsh discipline versus warmth in the prevention of conduct problems and CU traits, and have significant implications for developmental and intervention models of youth antisocial behavior. Conduct problems appear most strongly linked to harsh discipline and associated parent–child coercive cycles, thereby requiring intervention to coach parents in using consistent non-violent, sensitive discipline strategies. By contrast, CU traits appear to be more strongly associated with warmth and the affective quality of the parent–child relationship, and may require intervention to improve parents' warm responding to child emotion and behavior (Pasalich et al. 2014). Our results add to a growing body of research suggesting that CU traits are amenable to psychosocial intervention (see Hawes et al. 2014, for a review), and will help inform the development of more personalized interventions for children with, or at risk for, CU traits.

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Conflict of Interest Drs. Bierman, Coie, Dodge, Greenberg, Lochman, McMahon, and Pinderhughes are the Principal Investigators on the Fast Track Project and have a publishing agreement with Guilford Publications, Inc. Royalties from that agreement will be donated to a professional organization. They are also authors of the PATHS curriculum and donate all royalties from Channing-Bete, Inc. to a professional organization. Dr. Greenberg is a developer of the PATHS curriculum and has a separate royalty agreement with Channing-Bete, Inc. Bierman, Coie, Dodge,Greenberg, Lochman, and McMahon are the developers of the Fast Track curriculum and have publishing and royalty agreements with Guilford Publications, Inc. Dr. McMahon is a coauthor of Helping the Noncompliant Child and has a royalty agreement with Guilford Publications, Inc.

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