



Fearlessness as an Underlying Mechanism Leading to Conduct Problems: Testing the Intermediate Effects of Parenting, Anxiety, and callous-unemotional Traits

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Abstract

This study investigates whether the longitudinal association between fearlessness and conduct problems (CP) is mediated by warm and harsh parenting, parent-child conflict, anxiety, and callous-unemotional (CU) traits. The constructs under investigation were assessed at five different time points, spanning a period of eight years. A multi-informant approach was followed, collecting data from parents and teachers ($N=2,121$; 47% girls). The structural equation model pointed to both direct and indirect pathways between fearlessness and CP. Specifically, findings suggested that Time 1 fearlessness (age 3–5 years) increased the likelihood of Time 2 (age 4–6 years) harsh parenting and Time 3 (age 5–7 years) parent-child conflict. Further, fearlessness was positively associated with Time 4 (age 8–10) callous-unemotional traits and Time 5 (age 11–13) CP. The total indirect effect from fearlessness to CP through these variables was significant, although the specific indirect effect from fearlessness to CU traits to CP accounted for most of the variance. Warm parenting and anxiety did not mediate the association between fearlessness and CP. In addition to the identified pathways connecting fearlessness to CP, findings pointed to the existence of multiple developmental pathways to future CP, as well as gender differences in longitudinal associations.

Keywords Fearlessness · Conduct problems · Parent-child conflict · Parenting · Callous unemotional traits

Introduction

Evidence from longitudinal studies has contributed greatly to better understanding the developmental mechanisms influencing the onset of conduct problems (CP; i.e., symptoms of conduct disorder and oppositional defiant disorder; Fanti et al., 2018; Schoorl et al., 2016). Both familial factors, including parent-child conflict and harsh or warm parenting, as well as child factors, such as fearlessness, anxiety, and callous-unemotional (CU; i.e. shallow affect,

lack of empathy, remorselessness) traits, have been linked with CP (Cunningham & Ollendick, 2010; Erath et al., 2009; Fairchild et al., 2019; Frick et al., 2014; Waller et al., 2018). However, it is not clear how these factors influence one another and eventually lead to CP. The identification of developmental antecedents and intermediate factors can greatly advance this line of research.

In the current study, we integrate existing theoretical conceptualizations and empirical findings to propose a developmental model that connects fearlessness to CP through familial and individual intermediate variables. We refer to this developmental model as **InterFear** to specify the importance of early childhood fearlessness as one of the major antecedents of CP during early adolescence, as well as the crucial role of familial and individual intermediate factors. According to the InterFear model (see Fig. 1), the association between fearlessness and CP is mediated by warm and harsh parenting, parent-child conflict, anxiety, and CU traits. We propose that fearlessness increases harsh parenting, but at the same time decreases warm parenting.

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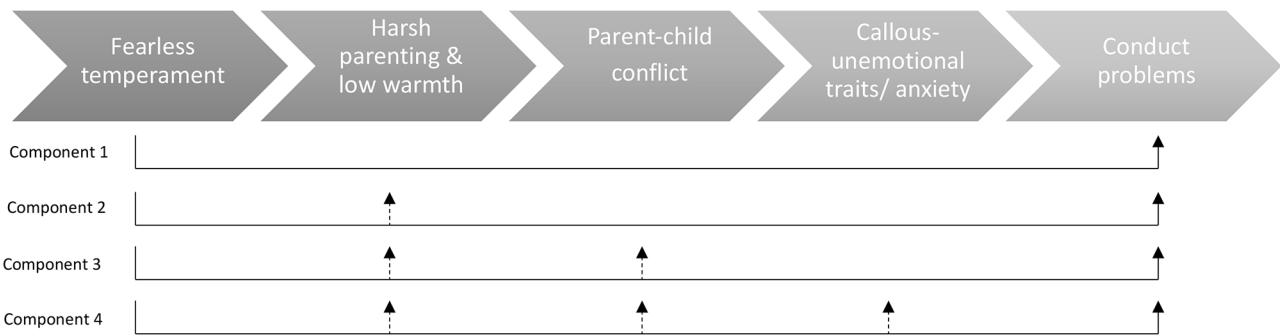


Fig. 1 The InterFear model

Note: Solid line in component 1 of the theoretical model represents the direct effect of fearless temperament to Conduct Problems. The rest of

Negativity in parenting is expected to lead to tensions in the dyad, increasing conflict between parents and children. These negative interactions within the family are hypothesized to result in increased anxiety and CU traits in children, driving the development of CP. This suggestion is based on evidence that ineffective parenting relates to deficits in emotion regulation, associated with anxiety (Callaghan & Tottenham, 2016), and social cognition, associated with decreased empathy and increased levels of CU traits (Frick & Viding, 2009). In addition to the InterFear model, we expect to provide evidence for additional direct and indirect longitudinal associations, pointing to several underlying developmental mechanisms leading to CP.

Fearlessness as the Starting Point

Fearlessness, which is related with low sensitivity to environmental experiences and limited physiological reactivity to aversive stimuli, has been at the center of several theoretical accounts aiming to explain the development of antisocial behavior (Fanti, 2018; Raine, 2002). The majority of studies suggest that fearless children's reduced response to stressful or threatening experiences increases their engagement in CP (see Fanti 2018, for a review). Specifically, the higher likelihood of fearless children to engage in aggressive and delinquent behaviors might be explained by their insensitivity to punishment and lower concern about the consequences of their behavior (Fanti et al., 2016; Frick & Morris, 2004; Raine, 1993). Since they are not concerned about the negative consequences of their antisocial acts, fearless children are less likely to regulate and control their behavior (see Frick & Viding 2009). As shown in Fig. 1, both direct (component 1) and indirect (components 2,3,4) effects from fearlessness to CP are expected to be identified.

the model components represent indirect effects in which this relationship is mediated by the intermediate familial and individual variables.

Direct and Intermediate Effects of Parenting

Prior work provided evidence that warm and harsh parenting are important protective and risk factors of CP, respectively (Frick & Viding, 2009; Gershoff, 2002; Hipwell et al., 2008; Pasalich et al., 2011; Pinquart, 2017; Snyder et al., 2005; see Fig. 1, component 2). Harsh parenting refers to several negative acts that parents use to discipline their children, including punishment, high levels of control, coercion, as well as verbal and physical aggression (e.g., yelling or hitting; Chang et al., 2003). As such, harsh parenting is a risk factor for reduced prosocial behavior (Gershoff, 2002), and is considered as an important mechanism leading to the development of CP in children (Colins et al., 2021; Patterson, 2002; Paterson & Sanson, 1999). In contrast, warm parenting, characterized by support, sensitivity, and involvement, can enable children to regulate their emotions (e.g., lower anger and frustration) as well as their levels of arousal, increasing prosocial behaviors and reducing CP (e.g., Markie-Dadds & Sanders 2006; Nachmias et al., 1996; Waller et al., 2014; Walton & Flouri, 2010).

Importantly, one of the most influential theories for the development of CP, Patterson's coercion model (Dishion & Patterson, 2006; Patterson, 1982), suggests an indirect model in which ineffective parenting practices (i.e., harsh parenting and low warmth) can lead to coercive exchanges and conflict between parents and children. Parent-child conflict and coercive exchanges within the dyad negatively influence the child's emotion regulation and associated stress reactivity to emotional stimuli, leading to antisocial behavioral outcomes (Morris et al., 2017). Thus, parent-child interactions characterized by conflict could be detrimental for children's development (e.g., Conger et al., 2010).

A question that to a large extent remains unanswered is whether fearlessness indirectly influences CP through parental experiences. By introducing the InterFear model, we propose that fearlessness is a mechanism that increases

harsh parenting and decreases warmth, which in turn results in parent-child conflict and eventually elevated CP (see Fig. 1, components 2 & 3). Indeed, due to their low arousal levels, fearless children might show lower emotional sensitivity to parenting efforts and higher response perseveration (i.e., continue a behavior despite punishment; Frick & Viding 2009; Matthys et al., 2014; Waller & Wagner 2019). Thus, disciplinary practices typically employed by parents (e.g., prohibitions and sanctions) may not be effective and parents might result in parenting efforts characterized by low warmth and harsher methods to coerce their children into changing their behavior (Cornell & Frick, 2007). However, parental attempts to correct the CP of their children through harsh punishment, which is associated with low parental warmth, have been found to be ineffective among children characterized by physiological under-arousal and fearlessness (Erath et al., 2009). Thus, children characterized by low stress reactivity and fearlessness might be less likely to respond to parenting efforts to socialize them, which can lead to conflict within the dyad and eventually to CP (Buodo et al., 2013; Frick et al., 2014).

From Fearlessness to Negative Parenting to CU Traits and CP

CU traits are associated with low physiological reactivity to threatening stimuli, which is an indicator of fearlessness and insensitivity to punishment (e.g., Fanti 2018; Frick et al., 2014; Scarpa et al., 2008). Moreover, prior research has suggested that fearlessness predicted the development of CU traits and CP above and beyond parenting and other familial risk factors (Barker et al., 2011), pointing to a direct effect of fearlessness to both CU traits and CP. One possible explanation is that the fearless temperament of a child disturbs the development of empathy and guilt that inhibit typically developing children from committing misbehaviors (Frick et al., 2014; Frick & Morris, 2004; Kochanska, 1991).

In addition, we propose that the low levels of guilt and insensitivity to punishment associated with CU traits might reduce the effectiveness of parenting efforts among fearless children and result in CP (Erath et al., 2009). According to social learning theory, children typically exhibit fear in response to parental punishment and the resulting emotional distress and guilt, associated with fearful arousal, shapes their moral and conscience development as well as their socio-emotional learning (Blair et al., 2006; Emde et al., 1991; Kochanska, 1993). However, when there is a disruption to this process, CU traits might develop (Dadds & Frick, 2019; Frick & Viding, 2009; Waller & Wagner, 2019). Similar to children with low levels of arousal and fear, children with CU traits do not respond to parental distress or punishment and they find conflict with parents less aversive

than other children (Barker et al., 2011; Dadds & Salmon, 2003; Fanti & Centifanti, 2014). Their lower likelihood to respond to their parent's anger or distress might be associated with their emotion recognition deficits, which further hinders their socio-emotional development, decreasing prosocial behaviors, and increasing levels of CP behaviors (e.g. Blair, 2006; Dadds & Frick 2019).

Another possibility is that the deficient conscience development characterizing children with CU traits might be due to the limited emotional learning opportunities by harsh parents or the limited positive affective or warm experiences in families characterized by conflict (Cecil et al., 2018; Cleckley, 1976). Indeed, early childhood familial adversities might influence the development of neural structures implicated in social-emotional learning and morality (Yildirim & Derksen, 2013). As shown in component 4 (Fig. 1), the InterFear model proposes that CU traits might be one mechanism explaining the effect of ineffective parenting practices on CP among fearless children (Edens et al., 2008; Hipwell et al., 2007; Oxford et al., 2003; Pasalich et al., 2011; Wootton et al., 1997). This suggestion is in accordance with prior work finding that ineffective parenting and low warmth results in increased CU traits across time (Frick et al., 2003; Pardini et al., 2007; Waller et al., 2018).

On the other hand, there is another line of work which contradicts the association between parenting practices and CU traits, suggesting that children with high CU traits develop CP regardless of parental practices (Hawes & Dadds, 2005; Hipwell et al., 2007; Wootton et al., 1997). **A monozygotic twin differences study suggested that the association between negative parenting and CU traits identified in prior work could be a product of passive or evocative gene-environment correlation (Viding et al., 2009).** Finally, it has also been suggested that the absence of warm parenting is more important for children with CU traits than the presence of negative parenting (e.g., Pasalich et al., 2011). However, it remains unclear whether the effect of CU traits on CP is mainly explained by prior positive or negative interactions between the child and his/her parents or by the child's fearless temperament, an aim of the current study.

From Fearlessness to Negative Parenting to Anxiety: The role of CU Traits

Although often used interchangeably in the literature, fear and anxiety relate to distinct emotional states (Perusini & Fanelow, 2015; Sylvers et al., 2011). Fear refers to the evaluation of an emotional situation as threatening, which results in lower likelihood of taking risks and avoidance of the imminent threat. In contrast, anxiety is the aversive emotional response when approaching a threatening situation, associated with sustained hyper-arousal and

hypervigilance. Thus, anxiety refers to an ongoing negative affective state, whereas fear might be more context-specific. Further, Kochanska (1991) argues that typically developing children learn to inhibit misbehaviors because of the negatively valenced arousal associated with such behaviors (i.e., “deviation anxiety”). This learning process is hypothesized to be disrupted in fearless children who experience less discomforting arousal when faced with potential social consequences, suggesting that fearless children might be characterized by lower anxiety. However, although both of these constructs increase the risk for CP (Fanti, 2018), prior work suggested that fearlessness is either non-significantly (Frick et al., 1999) or moderately correlated (Sylvers et al., 2011) with anxiety. Furthermore, it is not clear if fearless temperament and aberrant levels of anxiety are implicated in the same or distinct pathways towards CP. Thus, it is important to understand the mechanisms behind the association between fearlessness, anxiety and CP, which might either involve parenting experiences or additional individual characteristics, such as CU traits.

Importantly, negative familial experiences are likely to influence the propensity of children to process social cues, inhibiting the development of critical socio-emotional milestones that underlie the emergence of normative levels of threat or anxiety (Viding & McCrory, 2020). It is possible that hostile parenting and parent-child conflict trigger developmental vulnerabilities associated with a higher likelihood to attend to threatening experiences (e.g., biased attention to threat), which place children in a developmental pathway leading to anxiety and CP behaviors. These suggestions are based on evidence that links social adversity with impaired cognitive and emotional functioning related to fearlessness, anxiety and CP (Callaghan et al., 2016; McCrory et al., 2012). Based on this evidence, we expect the longitudinal association between fearlessness, anxiety and CP to be mediated by negative familial experiences (see Fig. 1, component 4). However, findings from a meta-analysis indicated that negative and positive parenting only modestly predicted anxiety (McLeod et al., 2007), arguing against such an association.

Another important line of research indicates that the CU traits that emerge in children that have experienced social adversity typically co-occur with high anxiety, which is defined as “secondary CU traits” (Kahn et al., 2013; Kimonis et al., 2013). According to this line of work, the disrupted conscience development of children high on CU traits might be due to deprived early environments, and their low emotional responsiveness might be a coping mechanism to manage the emotional distress associated with social adversity (Karpman, 1941; Waller et al., 2018). In addition, secondary CU traits are distinguished from “primary CU traits,” which are initiated from temperamental instead of environmental

difficulties, and are typically associated with low anxiety and fearlessness. However, both secondary and primary variants are at high risk for CP. Thus, based on this work, the InterFear model takes both CU traits and anxiety into account. Following additional work suggesting that harsh parenting influences CU traits, irrespective of levels of anxiety (Craig et al., 2021), we propose that even after controlling for anxiety, ineffective parenting triggered by fearlessness will increase levels of CU traits resulting in CP.

Current Study

To provide support for the InterFear model, the current study examines both direct and indirect longitudinal associations between individual (fearlessness, anxiety, and CU traits) and familial (harsh/warm parenting and parent-child conflict) factors with future CP. Firstly, we expect that early childhood fearlessness is an important antecedent of early adolescent CP (Fig. 1, component 1). Secondly, we expect that fearlessness will result in increased harsh parenting and decreased parental warmth, explaining the development of CP (Fig. 1, component 2). Thirdly, changes in parental warmth and harsh parenting are expected to result in increased parent-child conflict, which can further explain the association between fearlessness with CP (Fig. 1, component 3). Thus, we expect that children’s low susceptibility to fearful experiences exacerbates both parental negativity (i.e., low warmth and harsh parenting) and parent-child conflict, increasing levels of CP. Finally, we expect to identify an indirect model from fearlessness to harsh/warm parenting, to parent-child conflict, to individual factors associated with anxiety and CU traits, to CP (Fig. 1, component 4). In addition to the hypothesized associations, findings might point to the existence of multiple developmental pathways to future CP. For example, we might find a temperamental pathway which starts with fearlessness that predicts future CU traits and CP, irrespective of negative familial interactions and anxiety. We might also find an environmental pathway that starts with harsh and low warmth parenting, resulting in increased child-parent conflict and future CP, irrespective of individual factors.

Following established guidelines for indirect effects, each of these variables was assessed at different time points, spanning from early childhood to adolescence. Such findings can add to existing theoretical accounts aiming to explain developmental pathways leading to CP and can also inform future prevention and intervention efforts designed to reduce the development of these problems. Given gender differences in levels of CP, anxiety, CU traits and fearlessness, as well as responses to parental discipline (Colins et al., 2021; Fanti et al., 2016; Kerr et al., 2004), we test whether the theoretical model differs between boys and girls using a multi-group

structural equation model. Because boys are at higher risk for CU traits (Fanti et al., 2016) and lower risk for anxiety (Bender et al., 2012) compared to girls, findings might suggest that indirect pathways involving CU traits may be more important for boys, whereas pathways involving anxiety may be more important for girls.

Method

Participants and Procedure

This study used data from the SOFIA (*Social and Physical Development, Interventions and Adaption*) project, an ongoing prospective longitudinal study aiming to advance knowledge on social adjustment, psychological well-being, and health. All families with children born between 2005 and 2007 attending preschools during the spring of 2010 (2,542 children) in a midsized (approximately 85,000 citizens) Swedish municipality were invited to participate in the study. In total, 2,121 (85.7% of target population; 47% girls) of the children's parents gave active consent to their child's participation. The demographics of the municipality are largely proportional to the rest of Sweden in terms of sex, age, educational level, level of employment, and the mixture of urban and rural areas. In terms of origin, 18.4% of the families reported that at least one parent was born in another country rather than Sweden. Regarding education levels, 6% of the parents reported that they received only elementary school education. The household yearly income per parent (categorized into six levels) differed greatly in the study sample: 4.9% received 0–100,000 SEK (1 SEK = 0.096 USD), 5.6% received 101,000–200,000 SEK, 36.9% received 201,000–300,000 SEK, 37.6% received 301,000–400,000 SEK, 12.6% received 401,000–500,000 SEK, and 2.4% received above 500,000 SEK.

Data Collection

The first data collection (Time 1) was conducted in 2010 (when children were ages 3–5), the second in 2011 (Time 2; ages 4–6), the third in 2012 (Time 3; ages 5–7), the fourth in 2015 (Time 4; ages 8–10), and the fifth data collection in 2018 (Time 5; ages 11–13). At Time 1, teacher- and/or parent-ratings were available for 2,113 (99.6%) and 2,008 (94.7%) children, respectively. For the following data collections these numbers (and percentages) were: Time 2 = 2,014 (96.2%) and 1,929 (90.9%), Time 3 = 1,934 (91.2%) and 1,829 (86.2%), Time 4 = 1,829 (86.2%) and 1,654 (78%), and Time 5 = 1,735 (81.8%) and 1,420 (66.8%), based on parent and teacher reports respectively. Both parents and teachers answered questionnaires for each child, and the

questionnaires took about 20–30 min to complete. Parent ratings were primarily done by the biological mother (ranging between 80.9 and 82.2%), followed by the biological father. A small proportion (0.7–1.1%) of parent ratings were completed by others (i.e., adoptive, or foster parent). All procedures were evaluated and approved by a research ethics committee (Times 1–3: #2009/429, Time 4: #2015/024, and Time 5: #2017/486). For more details, see Colins et al. (2014, 2021).

Attrition Analyses

To investigate whether dropout families differed on important dimensions from the participating families, 30 randomly chosen parents (from 15 girls and from 15 boys) were interviewed via telephone using a smaller number of questions from the parents'/ caregivers' questionnaire. The analyses showed that it was significantly more common in the non-participating group that the mother was born outside Sweden (Cohen's $d=0.71$) and that parents reported significantly less affection and praise toward their children (Cohen's $d=0.46$). However, the non-participating group did not differ significantly from the participating group concerning important dimensions such as conduct problems, internalizing problems, socio-economic status of the caregivers, or the country of origin of the father and the child. Moreover, no significant differences between the groups were found concerning different aspects of dimensions of negative parenting.

Measures

A multi-informant approach was followed asking parents and teachers to report on the child's CP during the past 6 months. To avoid shared method variance, individual risk factors were based on teacher reports, whereas parenting factors were based on parental reports.

Time 1 Fearlessness

This construct was assessed via the Child Fearlessness Scale (Colins et al., 2014), which includes six teacher rated items assessing the child's behavior for the last six months. Examples of items are: "He/she does not seem to be afraid of anything" and "He/she never seems to get scared when someone is mad at him/her." Items were scored using a Likert scale ranging from 1 (*Does not apply at all*) to 4 (*Applies well*). Similar to prior work (e.g., Colins et al., 2014; Domínguez-Álvarez et al., 2021), the Child Fearlessness Scale exhibited good internal consistency ($\alpha=0.89$) in the current data and was rendered by calculating the mean of the six items.

Time 2 Harsh and Warm Parenting

Parent-reported items assessing harsh and warm parenting were developed for the needs of the SOFIA study, and were successfully validated by prior work (e.g., Colins et al., 2021). The measure included eight items related to negative parenting strategies such as yelling, name-calling, and verbal and physical aggression. Examples items are: “You call your child names, such as “mean” or “stupid” when he/she has done something wrong” and “You hit your child when he/she has done something wrong”. Parents also rated seven items that tap warm parenting, relating to positive parenting strategies such as engaging in activities with the child, praising the child, and expressing their love for the child. Example items are: “You show with words and gestures that you like the child” and “You laugh together with your child”. All items were rated on a Likert scale ranging from 1 (*Never*) to 5 (*Almost every time*). To create the scales, we calculated the mean across the eight and seven items to index harsh parenting ($\alpha=0.70$) and warm parenting ($\alpha=0.71$), respectively.

Time 3 Parent-Child Conflict

Conflicts between parents and children were based on parent reports, and included three items rated on a Likert scale ranging from 1 (*Never*) to 5 (*Very often*). The items are “You find your child hard to handle”, “You disagree and quarrel with your child”, and “You are very angry with your child”. The Parent-Child Conflict scale ($\alpha=0.76$) used in this study was calculated by averaging the three items. This scale was based on items from the parent-child conflict subscale of the Parental Environment Questionnaire (PEQ; Elkins et al., 1997).

Time 4 Callous-Unemotional (CU) Traits and Anxiety

CU traits were assessed by teachers, using the Child Problematic Traits Inventory (CPTI; Colins et al., 2014). The CPTI was developed for use among 3- to 12-year-old children, and primarily for teacher-rated assessments (for details, see Colins et al., 2014). The instrument contains 28 items scored on a 4-point Likert scale, ranging from 1 (*Does not apply at all*) to 4 (*Applies very well*). In addition to CU traits, the CPTI assesses Grandiose-Deceitful and Impulsive, Need for Stimulation dimensions. For the purposes of the current study, only the CU dimension was used from the teacher-rated CPTI ($\alpha=0.96$), consisting of 10 items (e.g. “*Seldom expresses sympathy for others*”). The proposed factor structure and the internal consistency and external validity of the CPTI scores have been supported in Swedish, Dutch, Spanish, Italian, and Chinese samples (Colins et al., 2014; López-Romero et al., 2019; Somma et al., 2016;

Wang et al., 2018). Symptoms of anxiety were assessed by teachers using six items (e.g., “Worries”) from the Teacher report form (Achenbach & Rescorla, 2001). Teachers rated the frequency of the item on a response scale ranging from 0 (Not true) to 2 (Very true or often true). The anxiety scale used in the current study ($\alpha=0.69$) was developed to reflect DSM generalized anxiety disorder.

Time 5 Conduct Problems

Parents and teachers independently rated 10 conduct problem items closely based on DSM criteria for oppositional defiant disorder and conduct disorder (Colins et al., 2014). Examples of items are: “He/She has been very angry”, and “He/she has hit, scratched, pushed, kicked, or thrown something at others without a reason (for details see Colins et al., 2021).” Items were scored using a Likert scale ranging from 1 (*Never*) to 5 (*Very often*). The internal consistency of this scale was excellent for both teachers ($\alpha=0.93$) and parents ($\alpha=0.86$).

Analysis plan

The hypothesized model shown in Fig. 1 was tested with a structural equation path model investigating longitudinal associations (five time points) between all variables of interest. As shown in Fig. 2, CP (Time 5) represented a latent variable based on teacher and parent reports, and all other constructs were observed variables (Times 1–4). The model tested both direct and indirect associations. Specifically, we investigated all possible indirect pathways in the model following the approach of MacKinnon et al. (2002). In short, indirect effects were examined by testing the joint significance of the paths leading from fearlessness through the examined familial (i.e., harsh/warm parenting and parent-child conflict) and individual (i.e., CU traits and anxiety) variables to CP. Additional longitudinal associations were also examined. This method, which is known as intervening effect, has the best balance of Type I error and statistical power (MacKinnon et al., 2002). To test for significant indirect effects we used the Model Indirect command in Mplus. To evaluate model fit of the structural equation model (SEM), three standard fit indices were used in addition to the Chi-square statistic: The Root Mean-square Error of Approximation (RMSEA), Standardized Root Mean Residual (SRMR), and the Comparative Fit Index (CFI). Cut-off values close to 0.06 for RMSEA, 0.08 for SRMR, and 0.95 for CFI were considered a good fit. The Full Information Maximum Likelihood Estimator in Mplus 8, which accommodates missing data by estimating the full model using all available information from all participants, was utilized for all analyses. Finally, following Little’s (1997) statistical

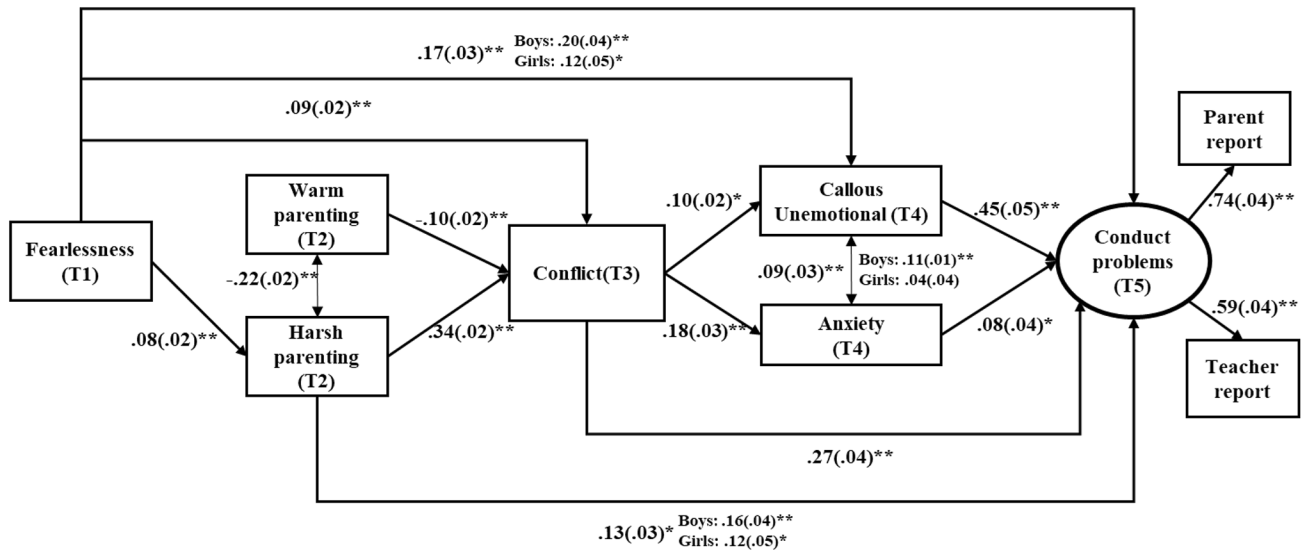


Fig. 2 Structural Equation model

Table 1 Descriptive Statistics and Correlations among the Main Study Outcomes

	Fearlessness (T1)	Warm parenting (T2)	Harsh parenting (T2)	Conflict (T3)	Anxiety (T4)	CU traits (T4)	CP (parent) (T5)	CP (teacher) (T5)
Warm parenting (T2)	-0.02							
Harsh parenting (T2)	0.08**	-0.23**						
Conflict (T3)	0.12**	-0.17**	0.37**					
Anxiety (T4)	0.03	-0.06*	0.08*	0.19**				
CU traits (T4)	0.19**	-0.05	0.14**	0.15**	0.10**			
CP (parent) (T5)	0.20**	-0.11**	0.30**	0.40**	0.20**	0.32**		
CP (teacher) (T5)	0.24**	-0.04	0.12**	0.12**	0.07*	0.39**	0.40**	
<i>Descriptive:</i>								
Mean	1.42	4.25	1.41	2.09	1.13	1.25	1.45	1.29
SD	0.55	0.44	0.33	0.66	0.21	0.49	0.44	0.54

Note. T=Time; ** = $p < .001$; * = $p < .05$

guidelines, we employed a multi-group path model to investigate potential moderating effects for gender and test the equality of the structural associations. Specifically, a model in which structural paths and correlations were constrained to be equal across groups was compared to a model in which these associations were freely estimated across gender. To compare the models, we used the chi-square difference test: If the chi-square change was significant, it was concluded that there were group differences in the regression paths and correlations.

Results

Descriptive Statistics

Table 1 shows the means and standard deviations of each of the variables under investigation, as well as the bivariate

correlations. With the exception of warm parenting and anxiety, Time (T) 1 fearlessness was correlated with all future outcomes with stronger correlations identified for Time 4 CU traits and Time 5 CP. Warm parenting (T2) was negatively correlated with harsh parenting, parent-child conflict, anxiety, and parent-reported CP. Parent-child conflict (T2) and harsh parenting (T3) were moderately intercorrelated, and both variables were associated with anxiety, CU traits, and CP. CU traits were moderately correlated with both parent and teacher reported CP, which were also moderately correlated.

Direct Effects

The SEM under investigation fitted the data well, $\chi^2_{(5, N = 2119)} = 75.44, p < .001$; $RMSEA = 0.07$ ($RMSEA\ CI: 0.05|0.09$), $SRMR = 0.03$, $CFI = 0.95$. The factor loadings of the observed indicators on the CP latent factor were 0.59

and 0.74. Only the significant associations are shown in the model. As shown in Fig. 2, T1 fearlessness positively predicted T2 harsh parenting, T3 parent-child conflict, T4 CU traits, and T5 CP, with the largest effect sizes identified for CU traits and CP. Fearlessness was not significantly associated with warm parenting (T2) and anxiety (T4). T2 harsh parenting positively predicted T3 parent-child conflict and T5 CP, whereas T2 warm parenting only negatively predicted T3 conflict. Harsh and warm parenting were negatively correlated. T3 parent-child conflict positively predicted T4 CU traits and anxiety, as well as T5 CP. Finally, T4 CU traits and anxiety were positively correlated and both predicted T5 CP, although the effect of CU traits was stronger.

Indirect Effects

The above described results provide support that fearlessness, measured at T1, was directly associated with the main outcome (i.e., CP). Further, all mediators, except warm parenting, were directly associated with CP. The total indirect effect from fearlessness to CP through harsh parenting, conflict, and CU traits was significant, $\beta=0.13$, $SE=0.02$, $p<.001$. Importantly, the specific indirect effect from fearlessness to CU traits to CP accounted for most of the variance, $\beta=0.08$, $SE=0.01$, $p<.001$, followed by the indirect path from fearlessness to conflict to CP, $\beta=0.03$, $SE=0.01$, $p<.01$. In addition, the total indirect effect of parent-child conflict to CP through anxiety and CU traits was significant, $\beta=0.08$, $SE=0.01$, $p<.001$. Both specific indirect effects from parent-child conflict to CU traits to CP, $\beta=0.05$, $SE=0.01$, $p<.01$, and from parent-child conflict to anxiety to CP, $\beta=0.03$, $SE=0.01$, $p<.001$, were significant. Moreover, the indirect effect from harsh parenting to conflict to CU traits and anxiety to CP was also significant, $\beta=0.14$, $SE=0.02$, $p<.001$, with the stronger indirect pathway being from harsh parenting to conflict to CP ($\beta=0.09$, $SE=0.02$, $p<.001$). Finally, a significant indirect pathway from warm parenting to conflict to CU traits to CP was identified ($\beta=-0.06$, $SE=0.02$, $p<.001$). The 95% confidence intervals of these paths did not contain 0 and are thus considered significant indirect effects (MacKinnon et al., 2002). Therefore, the results suggest that both direct and indirect pathways explain the development of CP. Finally, 52% of the variance in CP was explained by the model under investigation.

Gender Differences in Structural Associations: multi-group path Model

In the first stage of the analysis, we compared a model that freely estimated (i.e., unconstrained model) the structural paths and correlations separately for boys and girls to a constrained model. Findings suggested that the unconstrained

model fit the data better than the constrained model, $\Delta\chi^2_{(21, N=2119)}=40.57$, $p<.01$, with correlations and structural paths constrained to be equal. These findings suggest cross-group differences in structural associations. Identified differences in direct associations are depicted in the model. T1 fearlessness was more strongly associated with T4 CU traits for boys than girls. Similarly, Time 2 harsh parenting was more strongly associated with T5 CP for boys than girls. The correlation between CU traits and anxiety was stronger for boys compared to girls. In terms of indirect effects, the pathway from warm parenting to conflict to CU traits to CP was significant for girls ($\beta=-0.06$, $SE=0.02$, $p<.01$), but not for boys ($\beta=-0.02$, $SE=0.02$, $p=.15$). Finally, the indirect pathway from conflict to anxiety to CP was significant for girls ($\beta=0.05$, $SE=0.01$, $p<.001$), but not for boys ($\beta=0.01$, $SE=0.01$, $p=.37$).

Discussion

The current study examined the direct and indirect effects of fearlessness on CP. Results provided evidence that fearlessness in early childhood (age 3–5) increased the likelihood of CP eight years later in early adolescence (age 11–13). Apart from the direct effect of fearlessness to CP, the findings also pointed to an indirect pathway through harsh parenting (Time 2), parent-child conflict (Time 3), and CU traits (Time 4). These findings partially confirm the proposed InterFear model, since warm parenting and anxiety did not mediate the association between fearlessness and CP. Moreover, it is important to note that most of the variance in the identified pathway was explained by indirect associations from fearlessness to CU traits to CP, and from fearlessness to conflict to CP. As expected, additional pathways starting from environmental risk factors rather than fearlessness were identified. Harsh parenting and conflict predicted future CP through CU traits and anxiety, while warm parenting predicted only girls' future CP via conflict and CU traits. Moreover, the path from conflict to anxiety to CP was only significant for girls.

The Importance of Fearlessness

Current findings support the fearlessness hypothesis (Raine, 1993), as well as theories of moral socialization (Kochanska, 1993), that were proposed to explain the development of antisocial behavior. According to these theoretical perspectives, fearless children are less sensitive to punishment cues and thus are less likely to regulate their behavior based on the expected negative consequences following their antisocial acts (Frick & Viding, 2009). Additionally, the large direct effect of fearlessness on CU traits and the explanatory

power of the “fearlessness–CU–CP pathway” provide support for developmental models that consider fearlessness as an early antecedent of CU traits and CP (e.g., Frick & Widling 2009; Waller & Wagner, 2019). Furthermore, the role of fearlessness as an early risk factor in our model highlights the importance of research that aims to unravel the patterns of autonomic arousal and reactivity associated with CP (see Fanti 2018, for a review), especially studies that test fearlessness as a childhood antecedent (Fanti et al., 2022; Wagner et al., 2018).

Taken together, our findings suggest that by measuring individual differences in fear early in childhood we may be able to identify children at high risk for future behavioral problems. Although early life fearlessness, assessed with questionnaires, is an important antecedent of individual and behavioral problems, future studies should also incorporate multi-method assessments of autonomic arousal and reactivity to fear in order to replicate our findings in high risk children (Fanti, 2018). Research that aims to operationalize threat sensitivity as a biobehavioral latent construct (e.g., Yancey et al., 2016) could be utilized in the design of assessment protocols that include not only self- or other-report measures of fear but also neurophysiological indices. An initiative like this would also be in line with the Research Domain Criteria framework (Insel et al., 2010), which conceptualizes Acute Threat (Fear) as a fundamental system that explains adjustment difficulties.

From Fearlessness to Harsh Parenting to Conflict to CP

Overall, our findings are in line with transactional models that conceptualize development as the product of a dynamic interaction between children and their environment (e.g., Sameroff 2009). In such models, children are portrayed as “agents” who shape their environment and not as passive recipients of external influences. Viewed within this theoretical framework, our findings suggest that fearless children tend to evoke harsh parenting practices, which in turn increase parent-child conflict, placing the child at risk for CP. This is in line with theoretical perspectives that emphasize the key role of under-arousal, which is hypothesized to drive parents of fearless children to use harsher methods in order to match the arousal levels needed for a child to internalize a message (Cornell & Frick, 2007; Kochanska et al., 1994). Although the association between fearlessness and harsh parenting has been investigated by prior work (Hawes et al., 2011; Trentacosta et al., 2019; Waller & Wagner, 2019), this is the first study to provide empirical evidence of the longitudinal pathway from fearlessness to harsh parenting to parent-child conflict to CP.

A specific transactional model that aligns with our findings is the coercion model (Patterson, 1982), which suggests that CP develop through a cycle of negative interactions between the dyad. One of the ways in which this cycle can be initiated is through the resistance of children to change their behavior according to their parents’ requests. As mentioned earlier, this could be a characteristic of fearless children who are less sensitive to aversive cues (Raine, 1993). Children’s misbehaviors then provoke hostility in parents who may respond punitively, triggering more anger and oppositionality to the child. The coercive exchanges between children and their parents “teach” children to use coercive behaviors to shape their own environment, reinforcing the child’s disruptive behavior (Dishion & Patterson, 2006). Our model appears to fit in this theoretical framework, suggesting that one of the conditions contributing to the initiation of this coercive cycle is the child’s fearless temperament that leads to harsher parenting, conflict, and increased CP.

Indirect Associations Through CU Traits

In addition to replicating prior work suggesting that fearlessness and negative parenting constitute risk for the development of both CU traits and CP (Braker et al., 2011; Fanti 2018; Waller & Wagner, 2019), this is one of the few studies providing evidence that the effects of fearlessness and familial risk factors on CP are partially mediated by CU traits. Importantly, the indirect effect from fearlessness to CP via CU traits supports theories which propose that fearlessness increases the risk for CP by interfering with the normal development of empathy and guilt (core characteristics of CU traits; see Blair 1995; Frick & Morris, 2004; Kochanska, 1993). Furthermore, the current study sheds new light on the role of CU traits in the relationship between ineffective parenting styles and CP. Whereas prior cross-sectional work focused on the moderating role of CU traits (Edens et al., 2008; Hipwell et al., 2007; Oxford et al., 2003; Pasalich et al., 2011; Wootton et al., 1997), we utilized a longitudinal design to provide evidence that CU traits might be an important mechanism through which poor parenting results in future CP.

In general, our findings suggest that fear learning and moral socialization do not happen in a contextual vacuum and that parental practices are not independent of the child’s temperamental fearlessness. These findings can be used as evidence for the proposed InterFear model, which incorporates both individual and familial factors to explain CP. Specifically, harsh parenting driven by the child’s fearlessness increases the likelihood of parent-child conflict. In turn, the limited socialization experiences and the negative interactions with parents might hinder the child’s moral development resulting in CU traits, placing the child at risk for CP

behaviors. However, the direct effects of fearlessness on CU traits and CP, as well as the variance explained by the fearlessness-CU-CP pathway suggest that fearlessness plays a significant role in the development of CP through CU traits, even “outside” the negative parent-child interaction context.

Additional Pathways to CP: The role of Anxiety and warm Parenting

In addition to pathways related to the InterFear model, other pathways to CP also emerged. Although anxiety did not fit in the indirect model starting with fearlessness, an indirect pathway from harsh parenting to parent-child conflict to both CU traits and anxiety to CP was identified. This pathway is in line with the secondary CU traits conceptualizations (Kahn et al., 2013), which assume that a subgroup of children develop callousness not due to temperamental deficits (e.g., fearlessness), but rather as a coping mechanism to early adverse experiences (e.g., harsh parenting). Furthermore, we found a specific indirect effect of parent-child conflict to CP through anxiety. This finding agrees with work which views anxiety as a distinct mechanism leading to CP even among children with low CU traits (Fanti, 2018; Fanti & Kimonis, 2017).

Warm parenting was not directly associated to past fearlessness or future CP and did not mediate the effect of fearlessness on CP. These findings are in line with prior work which suggests that only harsh, but not warm parenting, mediate the pathway of fearless children to antisocial behavior (Waller et al., 2021). As such, its role within the InterFear model is not supported by current findings. However, warm parenting was negatively associated with parent-child conflict and it predicted CP through CU traits, but not through anxiety. This finding agrees with existing work which supports that parental warmth is especially important for a subgroup of children with CP that also score high on CU traits (Clark & Frick, 2018; Pasalich et al., 2011).

Gender Differences

The pathway starting from fearlessness to predict CP through harsh parenting, parent-child conflict and CU traits was not moderated by gender. Hence, the InterFear model appears to be applicable in both boys and girls. Nevertheless, specific direct and indirect effects of familial variables on future CP were moderated by gender. For instance, the direct effect of harsh parenting on future CP was stronger for boys than girls, confirming prior work which reported similar findings (Gershoff, 2002; Kerr et al., 2004; Rothbaum & Weisz, 1994). Additionally, we found that anxiety was more strongly correlated with boys' CU traits compared to girls. This finding agrees with work showing that boys are

at higher risk to be identified in the secondary psychopathy subgroup compared to girls, scoring high on both anxiety and CU traits (Fanti et al., 2013).

Regarding indirect associations, we found that the indirect effect of warm parenting on CP through conflict and CU traits was only significant for girls, which is a novel finding of the current study. Prior work that tested effects of warm parenting on CU traits and CP did not find moderations by gender (Clark & Frick, 2018). Therefore, parent-child conflict might be the key construct which differentiates the effect of warm parenting on future CU traits and CP among girls compared to boys. Finally, the indirect effect of parent-child conflict to anxiety to CP was also only significant for the girls in our the sample. This finding might be explained by the higher likelihood of girls to develop internalizing problems due to experiences of conflict within the family (Rudolph & Hammen, 1999). Taken together, our findings suggest that future research should further investigate the role of gender regarding the effects of parental practices on future CP, as well as how CU traits mediates these associations.

Strengths, Limitations, and Conclusions

The main strengths of the present developmental investigation are its five time point longitudinal design with low attrition rate, the inclusion of familial and child variables, and the use of both parent- and teacher-reports. Notwithstanding the study's contributions, our findings should be interpreted in the context of some limitations. The parents' ratings relied mostly on biological mother reports, which introduces potential method and information variance as well as social desirability bias. Also, clinical assessments of behavioral problems as well as physiological assessments of fearlessness might have contributed to the validity of our findings. Further, our sample was based on a community population, and replication of current findings within a clinical sample with oppositional defiant or conduct disorder symptoms might be theoretically important. Finally, future work should also investigate additional factors that may mediate the relationship between fearlessness and CP, as well as additional developmental pathways leading to CP. For example, prior work identified longitudinal subtypes based on CU traits, which are differentiated on risk factors (Fontaine et al., 2010; Goulter et al., 2017; Klingzell et al., 2016). However, the identification of CU trajectories was beyond the scope of this study.

In conclusion, current findings add to an existing line of longitudinal work which examines the development of antisocial behavior in children using fearlessness as a starting point (Barker, 2011; Klingzell et al., 2016). The identified indirect effects, viewed within the person-environment

interplay perspective, suggest that early temperamental factors (i.e., fearlessness) may increase the likelihood for certain responses in the environment (i.e., harsh parenting and conflict), which possibly increase CU traits and anxiety that further reinforce antisocial behaviors. Although findings were used to support the InterFear model, we also acknowledge that there might be multiple pathways leading to CP. For example, our findings suggest that while the fearlessness pathway to CP is driven by CU traits, additional pathways might be driven by anxiety (e.g., parent-child conflict to anxiety to CP) or experiences of positive and negative interactions with parents, which are moderated by gender. In addition to informing developmental models of antisocial behavior, results may have implications for clinical practice. Specifically, our findings support the incorporation of measures of threat sensitivity in screening protocols that aim to assess risk for future behavioral problems. Moreover, parenting interventions could be applied for fearless children in order to mitigate their risk for future CP. These findings may also be informative for prevention efforts, by pointing to the importance of interventions designed to alter children's fearlessness to minimize the risk of developing CP.

Declarations

Competing Interests The authors declare that they have no conflict of interest.

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