



Childhood psychopathic traits and mental health outcomes in adolescence: compensatory and protective effects of positive relationships with parents and teachers

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Abstract

We identified mental health outcomes associated with specific developmental trajectories of psychopathic traits across childhood and tested whether positive relationships with parents and teachers have compensatory or protective effects. Participants were 1401 children (52.82% girls) from the Quebec Longitudinal Study of Child Development with available data on teacher-reported psychopathic traits (ages 6–12 years) and self-reported mental health outcomes (ages 15–17 years). Parents and teachers reported their levels of positive relationship with the child (ages 6–8 and 10–12 years). Trajectories of psychopathic traits (High-stable, Increasing, Decreasing, and Low-stable) were included as predictors of mental health outcomes (e.g., conduct disorder, anxiety) in structural equation models controlling for child sex, family SES, and earlier psychopathology. Compensatory effects were tested via main effects of positive relationships and protective effects were tested via their interactive effects with trajectories memberships. When compared to the Low-stable trajectory of psychopathic traits, the High-stable, Increasing, and Decreasing trajectories were associated with distinct sets of mental health outcomes, with children from the Increasing trajectory being at higher risk for both externalizing and internalizing psychopathology. Positive relationships with parents and teachers only partially compensated for these effects. Findings suggest that clinicians cannot expect the detrimental effects associated with psychopathic traits to be entirely prevented by children's positive relationships with parents and/or teachers. This study reinforces the importance of providing intensive preventive interventions to elementary school children with high levels of psychopathic traits to prevent the long-term negative consequences associated with these traits.

Keywords Psychopathic traits · Mental health · Outcomes · Adolescence · Positive relationships

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Introduction

The impressive body of research conducted over the past few decades on callous-unemotional (CU) traits led to their inclusion in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, as a specifier to the diagnosis of conduct disorder that is intended to delineate a subgroup of children at high risk of severe and stable conduct problems [1]. In addition to the extensive empirical support the CU dimension has received in previous research [2], there is accumulating evidence suggesting that other dimensions of psychopathic traits (i.e., narcissism-grandiosity and impulsivity-irresponsibility traits) are also important to consider for clinicians who aim to identify children most at-risk of severe and stable conduct problems [3, 4].

Some of the recent studies in which psychopathic traits were conceptualized as a multifaceted construct further showed that the associations between these traits and future conduct problems remained significant when controlling for demographic confounders such as child sex and family income or SES [3, 5], as well as earlier levels of conduct problems [4, 6, 7]. In addition, significant associations between childhood psychopathic traits and other forms of psychopathology from the externalizing spectrum, including attention-deficit/hyperactivity and aggression [8–10], as well as with future delinquency and offending behaviors [11, 12], have been reported. These results highlight the importance of examining the associations between the multidimensional conceptualization of psychopathic traits and various mental health problems from the externalizing spectrum.

Comparatively less is known on the internalizing mental health outcomes that are associated with the multidimensional conceptualization of psychopathic traits. Still, in line with previous research conducted more specifically on the CU dimension [13, 14], significant associations between these constructs have been reported by a few studies, in which psychopathic traits were assessed during childhood [15] or adolescence [16, 17]. Furthermore, there is evidence, suggesting that internalizing problems (e.g., anxiety) are particularly high among a subgroup of children whose psychopathic traits are thought to gradually develop following early experiences of adversity such as maltreatment or abuse [18]. Taken together, these results underline the need to consider outcomes from the internalizing spectrum of psychopathology that are associated with psychopathic traits in childhood, but also highlight the importance of identifying the mental health outcomes that are associated with specific developmental trajectories of psychopathic traits in childhood, as these could differ.

Psychopathic traits and children's positive relationships with parents and teachers

Theoretical conceptions of personality traits highlight the importance of contextual factors both in the development of personality traits as well as in the understanding of their associations with one's future adaptation [19, 20]. Yet, only a few studies have been conducted on the effects of psychopathic traits on youth's future adaptation in conjunction with key environmental factors [21–23]. For example, although there is increasing evidence supporting the role of positive parenting (e.g., parental warmth) as a predictor of the CU dimension of psychopathic traits [24], results from a few studies also suggest that positive parenting could moderate the effect of CU traits on conduct problems [21] and future delinquency [22]. Likewise, previous research has linked CU traits to student–teacher relationships of poorer quality [23, 25, 26], but the joint effects of student–teacher relationship with psychopathic traits in predicting later psychopathology have yet to be addressed.

Consistent with previous research conducted on factors involved in the development of delinquency, one could expect positive relationships to either *compensate* or *protect* against the effects of psychopathic traits on children's future psychopathology [27, 28]. Protecting factors are viewed as moderating factors that mitigate the contribution of risk factors on the outcome (through interactions), whereas compensatory factors are conceived as factors that produce a beneficial, direct effect on the outcome opposite to risk factors. Furthermore, compensatory or protective effects of children's positive relationships with their parents and teachers could be more salient at specific ages, as their relative contributions could vary depending on the context. For instance, evidence suggests that the quality of the student–teacher relationship during the school transition and first elementary school years is particularly important in predicting children's later externalizing problems [29–31]. Results from one study further showed that, during this specific period, this relationship significantly contributed to future externalizing problems over and above the effects attributable to parenting behaviors (i.e., harsh/restrictive child rearing) [31]. It therefore appears important to verify if the relative contributions of positive relationships with parents and teachers differ across ages to determine if one should be prioritized over the other at specific periods among children with high levels of psychopathic traits in order to reduce the effects of these traits on later psychopathology.

The current study

This study was designed to fill the following research gaps. First, although approximately 20% of children from the community have been shown to follow unstable trajectories of

psychopathic traits [32], most studies conducted on the mental health outcomes associated with the multidimensional conceptualization of psychopathic traits used cross-sectional assessments of these traits. Second, little is currently known on the compensatory or protective effects of children's positive relationships with their parents and teachers in the associations between psychopathic traits and future mental health outcomes. Given the implications of this question for the clinical treatment of children with high levels of these traits, it appears important to test the extent to which positive relationships with parents and teachers have the potential to attenuate the mental health outcomes associated with psychopathic traits. We therefore aimed to identify the mental health outcomes during adolescence that are associated with distinct developmental trajectories of psychopathic traits in childhood, and to determine whether positive relationships with parents and teachers act as compensating or protecting factors in these associations. We hypothesized that children following high-stable and increasing trajectories of psychopathic traits would be at higher risk of most mental health outcomes from the externalizing spectrum, including conduct disorder and aggression. In addition to these outcomes, we hypothesized that children showing an increase in psychopathic traits during childhood would also be at higher risk of internalizing mental health problems such as anxiety. Finally, on the basis of previous research conducted more specifically on the CU dimension of psychopathic traits [22], we expected positive relationships with parents and teachers to have compensatory or protective effects on most mental health outcomes.

Method

Participants and procedures

The Quebec Longitudinal Study of Child Development (QLSCD) is a representative sample initially consisting of 2120 youths from the province of Quebec (Canada) who were recruited through a stratified procedure based on the area of living and birth rate using the Quebec Birth Registry [33]. Informed consent was obtained from all participants, and the study protocol was approved by the Quebec Institute of Statistics and the Sainte-Justine Hospital Research Centre ethics committees. From the initial sample, 1401 children (52.82% girls) had available data on both psychopathic traits (ages 6–12 years) and mental health outcomes (ages 15–17 years), and were therefore included in the current analyses. Compared to children from the QLSCD that were excluded from the study sample, children included in this study were girls in greater proportion, $\chi^2(1) = 23.40$, $p < 0.001$, Cramer's $V = 0.11$ (small effect size), and came from families with slightly higher socioeconomic status at

study intake, $t(1333.98) = 4.86$, $p < 0.001$, Cohen's $d = 0.23$ (small effect size).

Measures

Psychopathic traits

Psychopathic traits were assessed at ages 6, 7, 8, 10, and 12 years using ten items from the teacher-reported questionnaires of the QLSCD. Three items refer to the CU dimension (e.g., "Was unconcerned about the feelings of others"), four refer to the narcissism-grandiosity dimension (e.g., "Used or conned others"), and three to the impulsivity-irresponsibility dimension (e.g., "Engaged in risky or dangerous activities"). All items were rated on a 3-point ordinal scale (0 = *never or not true*, 1 = *sometimes or somewhat true*, and 2 = *often or very true*) and were averaged to create a composite scale at each assessment. Psychometric properties of the scale have been thoroughly described elsewhere [32]. Briefly, reliability indices were satisfying (alphas¹ ranged from 0.93 to 0.95), and factor analyses supported the unidimensional structure of the scale at all assessment ages as well as its invariance across sexes and longitudinally. The scale was also associated with external criterion variables cross-sectionally and longitudinally (e.g., positively associated with physical aggression, and negatively associated with prosocial behaviors).

Mental health outcomes

Mental health outcomes were assessed using the Mental Health and Social Inadaptation Assessment for Adolescents (MIA) [35], a well-validated self-reported instrument designed to dimensionally assess mental health and social adaptation problems in community-based samples. For the current study, the following scales were selected on the basis of the literature reviewed in the introduction: attention-deficit/hyperactivity problems (16 items; e.g., "I had trouble keeping my mind on what I was doing for more than a few minutes"), conduct problems (16 items; e.g., "I used a weapon in order to steal"), aggression (17 items; e.g., "I beat up someone who hadn't done anything to me"), delinquency and contact with police (5 items; e.g., "I was arrested by the police for doing something wrong"), anxiety (9 items; e.g., "I had worries that interfered with my everyday life"), and depression (8 items; e.g., "I lost interest in things I usually like"). Scales were administered at ages 15 and 17 years. As the two assessments of all outcomes were highly correlated

¹ Ordinal alphas are provided throughout the article as they provide a more accurate estimation of internal consistency with ordinal items [34].

(all $r_s > 0.48$, $p < 0.001$), scores at 15 and 17 years were averaged. All items were answered on a 3-point ordinal scale ranging from “never true” to “always true”. The internal consistency of the MIA scales was satisfying, with alphas ranging from 0.84 to 0.95 across scales and ages. In addition to the MIA scales, youths were asked about their suicidal thoughts (“In the past 12 months, did you ever think about suicide?”; *Never* coded 0, *rarely* or higher coded 1) and attempts (“In the past 12 months, how many times did you attempt suicide?”; *Never* coded 0, *once* or more coded 1). Children reporting suicidal thoughts/attempts at age 15 and/or 17 were coded as having presented suicidal thoughts/attempts during adolescence.

Positive relationships with parents and teachers

Children’s positive relationships with their parents and teachers were assessed at ages 6, 8, 10, and 12 years. Scores at ages 6 and 8 years as well as scores at ages 10 and 12 years were averaged, which resulted in four positive relationship variables: positive parenting at ages 6–8 and 10–12 years, and positive relationship with teachers at ages 6–8 and 10–12 years. This was done to investigate the effects of these variables at two specific developmental stages (i.e., early and late childhood) and to obtain more accurate measures of positive relationships (averaged over 2 years). Positive parenting was assessed by parents using 5 items based on an adaptation of the Parent Practices Scale [36] (e.g., “How often did you and your child talk or play with each other, focusing attention on each other for five minutes or more, just for fun?”) answered on a 7-point ordinal scale. Positive relationship with teachers was assessed by teachers using 4 items based on an adaptation of the Student–Teacher Relationship Scale [37] (e.g., “I share a close and warm relationship with this child”) answered on a 5-point ordinal scale. Across assessment ages, alphas ranged between 0.64 and 0.70 for the positive parenting scale and between 0.81 and 0.83 for the positive relationships with teachers scale.

Covariates

Child sex, family SES, and baseline levels of psychopathology were included as covariates. Family SES was computed based on education levels of the two parents, prestige levels of their occupations, and total household income [38]. Baseline levels of psychopathology (i.e., baseline levels of each outcome with the exception of delinquency and suicidal thoughts, because they were not available at baseline) were assessed at age 6 years using mother reports: attention-deficit/hyperactivity problems (9 items, $\alpha = 0.90$), conduct problems (5 items, $\alpha = 0.80$), aggression (10 items, $\alpha = 0.89$), anxiety (4 items, $\alpha = 0.79$), and depression (4 items, $\alpha = 0.71$).

Data analysis

Analyses were conducted using Mplus 8.6 [39] and IBM SPSS Statistics 26 [40]. Trajectories of psychopathic traits were drawn from a previous investigation using this sample in which latent class growth models with 2–5 classes were conducted using all available psychopathic traits data and compared based on conventional fit indices [32]. Based on these indices, a 4-trajectory model was selected: High-stable (4.48%, 17.81% girls), Increasing: (8.77%, 34.27% girls), Decreasing (11.47%, 34.22% girls), and Low-stable (75.29%, 58.14% girls). Proportions of girls were significantly different from one trajectory group to another, $\chi^2(3) = 94.22$, $p < 0.001$.

For the current investigation, children were assigned to their most likely class membership,² and class memberships were entered in structural equation models predicting each outcome controlling for child sex, family SES, and baseline levels of psychopathology (same constructs as the outcomes), with robust estimation of standard errors accounting for non-normality. In a second set of models, positive relationships variables (at ages 6–8 years in one model and at ages 10–12 years in another model) were added as covariates to test for their compensatory effects (i.e., main effects). In a third set of models, the interaction terms between positive relationships and class memberships were also included as covariates to examine the protective effects (i.e., interactive effects) of children’s positive relationships. Variables assessing positive relationships and mental health outcomes were standardized into Z-scores prior to analyses for interpretation purposes.

Results

Descriptive statistics of all study variables among total sample as well as among each of the trajectory groups are shown in Table 1, and correlations among all study variables are presented in Table 2. As expected, children from the Low-stable group showed the lowest levels of most mental health outcomes in adolescence. Of note, as frequencies of suicide attempts were low, no further analysis was conducted with this variable.

Results from analyses predicting mental health outcomes from group memberships controlling for child sex, family SES, and baseline levels of psychopathology are presented in Table 3. Taking all confounders into account, membership to the High-stable, Increasing, and Decreasing trajectory were associated with significantly higher levels of

² Entropy of the retained model was high (0.87) and suggested clear classification of participants across trajectory groups.

Table 1 Reliability indices and descriptive statistics of study variables

Variables	α	Reliability indices (α) and descriptive statistics (mean, s.d.)				
		Total sample	High-stable	Increasing	Decreasing	Low-stable
Mental health outcomes						
AD/H	0.89–0.90	3.14 (1.45)	3.33 (1.67)	3.47 (1.43)	3.40 (1.57)	3.05 (1.42)
Conduct problems	0.95–0.93	0.74 (0.87)	1.22 (1.50)	1.00 (0.87)	0.88 (0.88)	0.66 (0.80)
Aggression	0.95–0.95	0.73 (0.76)	1.13 (1.49)	1.01 (0.88)	0.88 (0.85)	0.65 (0.65)
Delinquency	0.91–0.94	0.25 (0.79)	0.84 (1.82)	0.46 (0.97)	0.37 (0.94)	0.19 (0.61)
Anxiety	0.86–0.85	4.24 (1.97)	3.50 (1.68)	4.28 (1.92)	4.15 (2.16)	4.29 (1.96)
Depression	0.90–0.90	3.63 (2.08)	2.99 (1.83)	3.52 (2.05)	3.65 (2.27)	3.68 (2.06)
Suicidal thoughts (%)	–	32.28%	27.59%	32.03%	42.67%	31.09%
Suicide attempts (%)	–	4.46%	5.17%	3.91%	6.00%	4.27%
Positive rel. (6–8 years)						
Positive parenting	0.64–0.68	6.12 (1.12)	6.09 (0.99)	5.96 (1.20)	6.06 (1.07)	6.15 (1.12)
With teachers	0.81–0.82	8.07 (1.66)	6.77 (1.54)	7.50 (1.85)	7.44 (1.73)	8.31 (1.56)
Positive rel. (10–12 years)						
Positive parenting	0.65–0.70	5.33 (1.25)	5.14 (1.09)	5.14 (1.38)	5.38 (1.23)	5.35 (1.25)
With teachers	0.84–0.83	7.45 (1.87)	6.38 (2.10)	6.61 (1.83)	7.05 (1.94)	7.66 (1.80)
Baseline						
AD/H	0.90	3.69 (2.03)	5.26 (2.24)	4.26 (1.97)	4.94 (2.15)	3.33 (1.86)
Conduct problems	0.80	1.43 (1.24)	2.28 (1.44)	1.71 (1.33)	2.30 (1.52)	1.22 (1.08)
Aggression	0.89	1.92 (1.60)	3.17 (1.84)	2.31 (1.76)	2.75 (1.81)	1.67 (1.43)
Anxiety	0.79	2.64 (2.00)	2.87 (1.88)	2.89 (2.07)	2.93 (1.49)	2.56 (1.96)
Depression	0.71	2.21 (1.53)	2.32 (1.33)	2.39 (1.65)	2.34 (1.49)	2.16 (1.54)

For each variable, alphas are provided separately for the two averaged assessments (mental health outcomes: ages 15–17 years, positive relationships: ages 6–8 and 10–12 years). For each scale, items scores were averaged, and total scores were converted on a 0–10 scale

α ordinal alpha, *s.d.* standard deviation, *AD/H* attention-deficit/hyperactivity problems, *rel.* relationships

mental health outcomes in adolescence when compared to membership to the Low-stable trajectory. Specifically, when compared to membership to this lower risk group, following a High-stable trajectory of psychopathic traits during childhood was associated with significantly higher levels of conduct problems ($\beta=0.12$, S.E. = 0.05, $p=0.011$) and delinquency ($\beta=0.14$, S.E. = 0.06, $p=0.016$) during adolescence. Children following the Increasing trajectory of psychopathic traits showed higher levels of most mental health outcomes when compared to those following the Low-stable trajectory, with membership to this trajectory being associated with higher levels of attention-deficit/hyperactivity problems ($\beta=0.09$, S.E. = 0.03, $p=0.002$), conduct problems ($\beta=0.10$, S.E. = 0.03, $p=0.001$), aggression ($\beta=0.12$, S.E. = 0.03, $p<0.001$), delinquency ($\beta=0.09$, S.E. = 0.03, $p=0.009$), and anxiety ($\beta=0.06$, S.E. = 0.03, $p=0.030$). Children from the Decreasing trajectory group also appeared to be at-risk of presenting with higher levels of some mental health outcomes in comparison to those from the Low-stable trajectory group. These children showed higher levels of depression ($\beta=0.06$, S.E. = 0.03, $p=0.030$) and suicidal thoughts ($\beta=0.11$, S.E. = 0.03, $p<0.001$). While their levels of several mental health outcomes significantly differed

from the Low-stable trajectory group, children following the High-stable, Increasing and Decreasing trajectories of psychopathic traits did not show significantly different levels of mental health outcomes from each other during adolescence.

Compensatory and protective effects of children's positive relationships with parents and teachers

Table 4 shows results from models conducted on the compensatory effects of children's positive relationships. High levels of positive relationships compensated the effects of psychopathic traits trajectories on many mental health outcomes in adolescence. Specifically, positive relationships with teachers at ages 6–8 years were associated with significantly lower levels of conduct problems and delinquency in adolescence. Assessed at ages 10–12 years, positive parenting was associated with lower levels of attention-deficit/hyperactivity problems, conduct problems, aggression, anxiety, depression, and suicidal thoughts at ages 15–17. Of note, although the β values decreased, the associations between trajectories of psychopathic traits and the outcomes all remained significant when positive relationships variables were added in the models (results not shown but available

Table 2 Correlation matrix of main study variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Outcomes (15–17 years)														
1. AD/H														
2. Conduct problems	0.55**													
3. Aggression	0.53**	0.70**												
4. Delinquency	0.27**	0.59**	0.53**											
5. Anxiety	0.53**	0.28**	0.22**	0.08**										
6. Depression	0.63**	0.37**	0.29**	0.12**	0.77**									
Positive relationships														
7. Pos. par. (6–8 y.)	-0.06*	-0.05	-0.07*	-0.01	-0.04	-0.07*								
8. With tea. (6–8 y.)	-0.04	-0.12**	-0.11**	-0.14**	0.06*	0.02	-0.02							
9. Pos par. (10–12 y.)	-0.08**	-0.11**	-0.10**	-0.03	-0.06*	-0.09**	0.57**	-0.02						
10. With tea. (10–12 y.)	-0.00	-0.08**	-0.05	-0.09**	0.03	-0.00	0.03	0.33**	0.03					
Baseline assessments														
11. AD/H	0.17**	0.13**	0.16**	0.10**	-0.01	0.03	-0.02	-0.15**	-0.05	-0.07*				
12. Conduct problems	0.11**	0.17**	0.16**	0.12**	-0.01	0.02	-0.07**	-0.10**	-0.09**	-0.07*	0.44**			
13. Aggression	0.10**	0.10**	0.15**	0.10**	-0.02	0.01	-0.11**	-0.12**	-0.12**	-0.08**	0.44**	0.52**		
14. Anxiety	0.05	0.03	0.03	0.02	0.06*	0.05	-0.00	0.02	-0.02	-0.03	0.34**	0.25**	0.30**	
15. Depression	0.06*	0.03	0.01	0.00	0.05	0.07*	-0.06*	0.02	-0.07*	-0.04	0.31**	0.26**	0.25**	0.53**

y. years, AD/H attention-deficit/hyperactivity problems, Pos. par. positive parenting, tea. teachers

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

Table 3 Structural equation models predicting mental health outcomes at ages 15–17 from trajectories of psychopathic traits across childhood

Outcomes	Covariates (β)			Group membership (β)					
	Sex (girls)	SES	Baseline	High-stable vs low-stable	Increasing vs low-stable	Decreasing vs low-stable	High-stable vs decreasing	Increasing vs decreasing	High-stable vs increasing
AD/H	0.14**	-0.01	0.17**	0.04	0.09**	0.05	0.01	0.04	-0.02
Conduct problems	0.06	-0.05	0.14**	0.12*	0.10**	0.05	0.10	0.05	0.06
Aggression	-0.06	-0.03	0.10**	0.10	0.12**	0.06	0.07	0.06	0.02
Delinquency	-0.08**	-0.08**		0.14*	0.09**	0.05	0.11	0.04	0.08
Anxiety	0.42**	0.00	0.05*	0.00	0.06*	0.04	-0.02	0.02	-0.37
Depression	0.40**	-0.02	0.07**	0.01	0.03	0.06*	-0.03	-0.03	-0.01
Suicidal thoughts	0.21**	0.02		0.03	0.04	0.11**	-0.04	-0.07	0.00

Each model was conducted three times with a different reference category to obtain all pairwise comparisons. Baseline level was not controlled for in the delinquency and suicidal thoughts models

β standardized beta coefficient, *SES* socioeconomic status at study intake, *Baseline* mother-reported assessments when the child was 6 years old, *AD/H* attention-deficit/hyperactivity problems

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

Table 4 Compensatory effects of children’s positive relationships with parents and teachers

Outcomes	Ages 6–8 years (β)		Ages 10–12 years (β)	
	Positive parenting	Positive rel with teachers	Positive parenting	Positive rel with teachers
AD/H	-0.04	-0.01	-0.08*	0.03
Conduct problems	-0.02	-0.08*	-0.09**	-0.04
Aggression	-0.05	-0.05	-0.07**	0.01
Delinquency	-0.02	-0.07**	-0.03	-0.04
Anxiety	-0.01	0.01	-0.06*	0.01
Depression	-0.05	-0.03	-0.10**	-0.01
Suicidal thoughts	-0.04	-0.04	-0.07**	-0.05

All models include the following covariates in addition to the two positive relationship variables: sex (girls), socioeconomic status at study intake, mother-reported assessments when the child was 6 years old (except for the delinquency and suicidal thoughts models), memberships to the High-stable, Increasing, and Decreasing trajectories of psychopathic traits

AD/H attention-deficit/hyperactivity problems, *rel.* relationships

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

on request from the first author). Therefore, these variables only partially compensated for these associations.

The investigation of the protective effects of positive relationships revealed only one significant interaction effect. This significant result concerned the interaction between membership to the Decreasing trajectory of psychopathic traits and positive parenting at ages 10–12 years in the prediction of delinquency ($b = -0.07$, $S.E. = 0.03$, $p = 0.011$). Simple slope analyses revealed that membership to the Decreasing trajectory was associated with significantly higher levels of delinquency at lower levels of positive parenting (-1 standard deviation on positive parenting: $b = 0.29$, $S.E. = 0.13$, $p = 0.019$), but not at mean ($b = 0.12$, $S.E. = 0.08$, $p = 0.141$) or higher levels of positive parenting

(+1 standard deviation on positive parenting: $b = -0.05$, $S.E. = 0.08$, $p = 0.485$). Results of all interaction effects are presented in the Supplementary materials, Table S1.

Discussion

The aim of this study was to identify mental health outcomes during adolescence that are associated with specific developmental trajectories of the multidimensional construct of psychopathic traits during middle childhood. Furthermore, in line with prior evidence highlighting the importance of these factors in understanding the consequences associated with CU traits [22, 23], the study aimed to test if children’s

positive relationships with parents and teachers could act as compensating or protective factors.

Results indicated that children following a High-stable, Increasing, and Decreasing trajectory of psychopathic traits across childhood had distinct mental health outcomes during adolescence when compared to children following a Low-stable trajectory. First, children following a High-stable trajectory of psychopathic traits were at-risk of having behavior problems mainly from the externalizing spectrum, such as conduct and delinquency problems at ages 15–17 years. These results are in line with those from previous studies [3, 4]. The fact that children from this trajectory did not differ from the lower risk group in terms of attention-deficit/hyperactivity problems is also consistent with previous studies, suggesting that these two constructs, although they can co-occur in some children, may be associated with different developmental mechanisms [41]. Second, children following an Increasing trajectory of psychopathic traits in childhood appeared to be at-risk for both externalizing and internalizing psychopathology in adolescence. In addition to showing higher levels than the low-risk group on all externalizing psychopathology variables, this subgroup also showed higher levels of anxiety problems at ages 15–17. These results support conclusions drawn from previous work, showing that youth with high levels of CU traits can be divided into two subgroups (i.e., *variants*) based on levels of co-occurring anxiety (i.e., low in the primary variant, high in the secondary variant) [18]. As levels of psychopathic traits of children from the secondary variant are thought to develop gradually following experiences of adversity such as abuse and maltreatment, and because these children have been shown to present with a more severe clinical profile than those from the primary variant [25], it is possible that the Increasing trajectory over-represented this specific subgroup of children. Third, it is important to note that children following the Decreasing trajectory of psychopathic traits were also at-risk of having psychopathological problems later in life. Although their levels of psychopathic traits decreased during childhood, children from this subgroup were at-risk of having higher levels of depression and suicidal thoughts during adolescence. These results support findings from longitudinal research on conduct problems in children, which showed that youths who engaged in severe antisocial behavior only during childhood (a subgroup sometimes labeled “childhood-limited”) tend to show high levels of depression later in life [42, 43]. Of importance, our results suggest that a decline in psychopathic traits should not be interpreted as an indicator of recovery by clinicians. In fact, these children could require services aimed at preventing depression problems and addressing suicidal risks, at least until the end of adolescence.

Results from this study also support the importance of positive relationships with parents and teachers in children

with higher levels of psychopathic traits. For instance, we observed that positive parenting at child age 10–12 years had a protective effect, instead of a compensatory effect, on the development of delinquency problems among children whose psychopathic traits declined during childhood (see, however, the Strengths, Limitations, and Conclusions section for a possible limitation regarding this result). Among this subgroup of children, only those who had experienced lower levels of positive parenting appeared to show elevated levels of delinquency problems in adolescence. Despite this specific protective effect, however, our study globally shows that children’s positive relationships act more as compensatory factors, rather than protective factors, in the associations between psychopathic traits and mental health outcomes during adolescence. Our results suggest that positive relationships with parents and teachers mostly do not combine interactively with psychopathic traits in predicting mental health outcomes. Instead, the two variables seem to operate independently and to produce opposite effects on the risk of presenting negative outcomes in adolescence.

This study also sheds light on the importance of positive relationships’ timing (i.e., in earlier versus later childhood) to better understand their compensatory effects on later psychopathology. In line with previous evidence, showing that the quality of the student–teacher relationship during the first elementary school years is particularly important in the prediction of children’s future externalizing problems [29–31], our results suggest that the compensating effects of experiencing positive relationships with teachers are more salient in earlier childhood, while the compensating effects of positive parenting appear to be stronger in later childhood. These results therefore support the importance of promoting these two positive relationships at these specific ages to maximize their compensating effects on the mental health outcomes associated with children’s psychopathic traits. Importantly, however, our results indicate that these positive relationships during earlier and later childhood do not entirely rule out the risks associated with specific developmental trajectories of psychopathic traits. One way to interpret this finding is that children following trajectories of higher levels of psychopathic traits are likely to benefit from positive relationships, but they nevertheless remain at higher risk of presenting with psychopathological problems in adolescence when compared to children with consistently low levels of psychopathic traits across childhood. Therefore, our study supports the importance of promoting positive relationships between children with higher levels of psychopathic traits and their parents and teachers during childhood. However, the study also highlights the pressing need to identify children at-risk of developing psychopathic traits as early as possible and to provide them with tailored interventions [44] to prevent the long-term negative consequences associated with these traits.

Strengths, limitations, and conclusions

Despite important strengths of the current study, such as its longitudinal design and the use of parents, teachers, and self-reported measures, limitations must be acknowledged. First, the relatively low number of girls from the High-stable and Increasing trajectories of psychopathic traits who also had available data on mental health outcomes prevented us from analyzing sex interactions. Second, a large number of analyses were conducted in the investigation of positive relationships as protective factors for mental health problems associated with psychopathic traits trajectories ($n = 42$). Given the exploratory nature of this study, however, we purposely did not apply a correction for multiple testing. This could have inflated the risk of a type I error. Third, given its design and analytic approach, this study does not allow to disentangle the direction of influences between psychopathic traits and positive relationships with parents and teachers. Finally, mechanisms that could help explain the link between psychopathic traits or positive relationships and mental health problems were not investigated in this study. Future research using a different methodology (e.g., cross-lagged panel model) and including putative mediators could better target these last two questions.

In conclusion, this study highlights the importance of assessing psychopathic traits longitudinally across childhood to obtain a more precise estimate of the mental health outcomes that might arise during adolescence. Clinicians could take advantage of conducting multiple assessments of these traits across childhood to tailor their treatments to the specific risks these children incur. In addition, tailored treatments should promote positive relationships between children who have high levels of psychopathic traits, and their parents and teachers, as these relationships appear to partially compensate the negative mental health outcomes associated with these traits, and are therefore likely to maximize the treatment's success.

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Declarations

Conflict of interest We have no conflict of interest to disclose.

Ethical standards The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008.

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