Gender Differences in Co-developmental Trajectories of Internalizing and Externalizing Problems: A 7-Year Longitudinal Study from Ages 3 to 12

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María Álvarez-Voces[1], Beatriz Díaz-Vázquez[1], Laura López-Romero[1], Paula Villar[1] & Estrella Romero[1]

[1]UNDERISK Group. Institute of Psychology (IPsiUS).

Faculty of Psychology. University of Santiago de Compostela, Spain.

Corresponding author: María Álvarez-Voces (e-mail: mariaalvarez.voces@usc.es).

ORCID:

María Álvarez-Voces: 0000-0003-0675-5538

Beatriz Díaz-Vázquez: 0000-0003-3605-5575

Laura López-Romero: 0000-0003-0513-6698

Paula Villar: 0000-0001-5476-6720

Estrella Romero: 0000-0002-9239-2544

Statements and Declarations:

Funding Statement: This study was supported by the projects TED2021-130824B-C22 (funded by MICIU/AEI /10.13039/501100011033 and by the UE NextGenerationEU/PRTR), and PID2019-107897RB-I00 (funded by MICIU/AEI/10.13039/501100011033). In addition, this study was supported by two grants from the University Teacher Training Program FPU21/00552 (MAV) and FPU22/02200 (BVD) funded by MICIU/AEI/10.13039/501100011033 and by FSE+; and by Grant RYC2021-032890-I funded by MICIU/AEI/10.13039/501100011033 and by the UE "NextGenerationEU"/PRTR (LLR).

Competing Interests: The authors declare none.

Acknowledgements. This study is possible thanks to the participants of the ELISA project (children, families, and teachers) as well as to the staff who have worked on it throughout the years.

Abstract

The co-occurrence of externalizing and internalizing problems is acknowledged, but gender differences remain unclear. The present study examines gender differences in the longitudinal relationships between conduct and emotional problems throughout childhood. The sample, drawn from the ELISA project, included 2,368 children (48.1% girls; ages 3-12). Latent growth curve models were employed to analyze the trajectories of parent-reported conduct problems and emotional symptoms separately, while parallel process latent growth curve models were utilized to compare joint trajectories. The decrease in conduct problems was consistent for girls, but not for boys. High initial emotional symptoms predicted a slower increase in emotional symptoms over time for girls. Parental positivity was a protective factor for conduct problems in girls. Grandiose-deceitful traits were more related to conduct problems in girls, while callous-unemotional traits were related to emotional symptoms in boys. This study highlights the importance of considering gender in childhood conduct and emotional problems.

Keywords. Conduct Problems; Emotional Symptoms; Co-development; Gender Differences; Parallel-Process Latent Growth Curve Models.

Introduction

Externalizing problems comprise a range of behaviors, from oppositional actions like yelling and temper tantrums to more severe antisocial forms such as aggression or physical destructiveness. Internalizing problems, on the other hand, involve anxiety, depressive symptoms, withdrawal, and somatic symptoms (Achenbach, 1991; McMahon et al., 2021). A substantial body of research indicates that externalizing problems tend to decline over the course of childhood (Barker & Maughan, 2009; Gilliom & Shaw, 2004; Olson et al., 2017), while internalizing problems increase in childhood (Bongers et al., 2003) and adolescence (Bongers et al., 2003; Galambos et al., 2003). Additionally, recent evidence suggests that the circumstances encountered during the COVID-19 pandemic may have influenced the evolution of childhood mental health, with several studies reporting a decline in children's general well-being during this challenging period. Notably, there was an uptick in the incidence of CP and emotional problems between 2019 and 2021 (Ng & Ng, 2022). Internalizing and externalizing problems in early childhood are both significant risk factors for the emergence of psychopathology or adverse outcomes later in life (Tsotsi et al., 2023). Furthermore, numerous studies indicate that externalizing and internalizing problems frequently co-occur (Fanti & Henrich, 2010; Lilienfeld, 2003) and their correlation is estimated to be between r = .45-.54 (Achenbach et al., 2016). This co-occurrence is also known to have simultaneous impacts on individual functioning (Chen, 2016; Odgers et al., 2007) and appears to persist from early childhood to adolescence, indicating a consistent risk pattern across various developmental stages (Shi et al., 2020; Willner et al., 2016). However, previous research has focused largely on these two kinds of problems independently, neglecting their potential co-occurrence (Castagnini et al., 2016; Obradović et al., 2009), and there is a paucity of literature exploring the combined effects of these problems (Arslan et al., 2021).

Explanatory Models of Comorbidity Between Internalizing and Externalizing Problems

Two fundamental models have been proposed to explain the mechanisms behind comorbidity of internalizing and externalizing problems: direct models and the common vulnerability model (Jackson & Sher, 2003).

Direct explanatory models

Three potential pathways have been suggested in direct models: a) externalizing problems trigger internalizing problems; b) internalizing problems lead to externalizing problems; and c) internalizing and externalizing problems mutually reinforce each other (Lee & Bukowski, 2012). As an example of direct models, Patterson & Capaldi (1990) proposed the "failure model", suggesting that externalizing problems precede

internalizing ones. According to this model, social failures resulting from CP gradually lead to anxiety and depression. This pathway from externalizing to internalizing problems is supported by some community and clinical studies (Boutin et al., 2020; Boylan et al., 2007; Capaldi, 1992; Copeland et al., 2009; Fergusson et al., 2003; Nock et al., 2007). Conversely, the theory of mask depression posits that internalizing problems precede externalizing ones, suggesting that children express their depression through acting out (Glaser, 1967). Finally, studies involving childhood samples (Gilliom & Shaw, 2004), spanning childhood to adolescence (Keiley et al., 2003), and considering female community samples (Measelle et al., 2006), have provided support for the reciprocal relationship between internalizing and externalizing problems. Nevertheless, the most likely progression pattern has not been definitively identified or described (Lee & Bukowski, 2012).

The common vulnerability model

As for the common vulnerability model, it argues that the simultaneous occurrence of internalizing and externalizing problems stems from common underlying factors (Fergusson et al., 1996). For example, disruptive parenting, which includes lack of parental knowledge and attachment, has been associated both with both future externalizing (Dishion et al., 2003; Salzinger et al., 2007) and internalizing problems (Cicchetti & Toth, 1998). Childhood maltreatment and exposure to domestic violence have been linked to the development of internalizing and externalizing problems (Lansford et al., 2007; Davies & Windle, 2001). Thus, while it remains important to study the origins of internalizing and externalizing problems separately, it is equally important to examine the predictors of both types of problems when they occur in combination (Wolff & Ollendick, 2006).

Gender Differences

Gender differences in the co-development of internalizing and externalizing problems

In previous research looking at gender differences in relation to the co-occurrence of internalizing and externalizing problems, diverse patterns of results have emerged. One is that girls may exhibit fewer externalizing problems than boys, but when they do, they are at an elevated risk for more severe and concurrent problems (Euler et al., 2015; Polier et al., 2012). This aligns with the idea of the “gender paradox” and the “selective female affliction”, whereby when girls develop a gender-atypical disorder as a conduct disorder, they show more severe symptoms and greater overall impairment (Eme, 1992; Konrad et al., 2022; Loeber & Keenan, 1994). The gender paradox has garnered support in some studies focusing on late childhood and adolescence (Marmorstein, 2007; Maughan et al., 2004). However, it has also faced challenges, and it has been refuted elsewhere (Munkvold et al., 2011). Regarding studies in early childhood, some work has found that co-

occurrent patterns of externalizing and internalizing problems remain constant across genders in preschoolers (Martín et al., 2014; Wang & Yan, 2019), while others have indicated that boys are more likely to pertain to the subgroups with higher externalizing problems (including the co-occurrent group) (Basten et al., 2013, 2016; Shi et al., 2020). In terms of the sequence of onset, certain studies have indicated that internalizing problems consistently predict future externalizing ones for girls but not for boys (D'urso & Symonds, 2022). Conversely, a cascade effect of externalizing problems leading to subsequent internalizing problems has been observed in both males and females (D'urso & Symonds, 2022; van Lier & Koot, 2010).

Gender differences in the shared risk factors for internalizing and externalizing problems

Research has also yielded inconsistent findings regarding shared risk factors across genders for internalizing and externalizing problems. Some studies suggest that risk factors may be similar for gender, with invariance reports between boys and girls (Spoth et al., 2006). However, studies like Heaven et al. (2004) found that physical parenting practices affect delinquency differently in boys and girls, and that low parental warmth has a stronger impact on depressive symptoms in girls. Also, Leve et al. (2005) reported that maternal depression had an impact on boys' externalizing behaviors under certain conditions, while harsh discipline affected issues in girls under different circumstances. With respect to individual disposition variables, research has shown that psychopathic traits (callous-unemotional traits, grandiose-deceitful traits and impulsive-need for stimulation) and fearlessness are linked to more severe and persistent CP (Fanti et al., 2024; Salekin, 2017). In this sense, it is important to study callous-unemotional traits at an early age, as scores obtained by three-year-old children are already significant in obtaining correlations with deficits in emotional functioning that are considered psychopathy (Kimonis et al., 2016; Waller et al., 2016). In addition to callous-emotional traits, studies have shown that grandiose-manipulation and impulsive-need for stimulation traits can be reliably measured at early ages and serve as key predictors of future CP development, even when other variables are considered (Burke et al., 2022; López-Romero et al., 2021; López-Romero et al., 2022; López-Romero et al., 2024). However, there remains a knowledge gap regarding the relationship between these risk factors and CP across genders (Brennan & Shaw, 2013). This gap is most pronounced in the context of internalizing problems, where there is a paucity of understanding of the differential impact of gender on the relationship between psychopathic traits, fearlessness, and the development of internalizing problems. Therefore, further research is required to explore gender differences in terms of the determinants and development of externalizing and internalizing problems from early childhood (Bubier & Drabick, 2009; Isdahl-Troye et al., 2022).

Parallel-Process Latent Growth Curve Modeling

The Parallel Process of Latent Growth Curve Modeling (PP-LGCM) represents an optimal approach for investigating the co-trajectories of externalizing and internalizing problems. This strategy allows for the examination of the trajectories of two systems and the interrelationships between them (Cheong et al., 2003). Several aspects can be examined by means of this technique, including: a) the separate examination of each trajectory (i.e., initial levels and the change of a variable over time); b) the association between the initial levels (i.e., intercepts) of both variables; c) the rates of change (i.e., linear and nonlinear slopes) for each variable and the associations between them; d) the interplay between one variable's intercept and the other's linear or nonlinear rate of change; and e) the effect of covariables on the identified trajectories.

Research on gender differences in the co-occurrence of internalizing and externalizing problems remains limited. Existing studies show variability in their findings, and evidence regarding gender-specific risk factors is inconsistent. As a result, there is a strong need for further investigation into how gender influences the co-development of these psychological problems in children. This study aims to fill these gaps by using the methodological strengths of PP-LGCM to explore the co-development of internalizing and externalizing problems from early childhood. We place a particular focus on gender-related patterns to determine whether CP predict ES, or vice versa, or if they occur simultaneously in boys and girls. Additionally, we will examine whether gender-specific relationships exist between growth factors, as well as between risk factors and growth factors for CP and ES. By identifying developmental patterns and predicting who is most likely to follow each trajectory, we can better understand the mechanisms that drive changes in psychological problems. Including gender considerations in these trajectories will help identify which individuals, at what times, and in what ways prevention efforts can be most effective.

The present study

The current study uses six longitudinal data collections from the ELISA project (*Estudio Longitudinal para una Infancia Saludable*) to deepen our understanding of co-developmental patterns of externalizing and internalizing problems in both girls and boys from early childhood to preadolescence. The main objective is to identify gender-specific co-trajectories via PP-LGCM to assess a) whether trajectories of CP, which are central to externalizing problems (American Psychiatry Association, 2013), and ES, a pivotal indicator of internalizing problems (Cooley et al., 2022), are similar and similarly related in girls and boys, and b) whether early risk factors (family and individual dispositions) for baseline levels and changes in CP and ES remain consistent

across genders. We hypothesize that ES will increase over time in both genders, as supported by most studies. Additionally, we expect CP to show a general age-related decline throughout childhood as suggested by previous studies, despite the potential impact of the COVID-19 pandemic on recent data collections. Nevertheless, discrepancies between previous studies prevent the anticipation of further gender differences in the co-trajectories of internalizing and externalizing problems and their associated risk factors.

Method

Setting and Sample

The sample was drawn from the longitudinal ELISA project carried out in Galicia (northwestern region of Spain) (n = 2,471). The principal objective of the ELISA project is to gain insight into the diversity of profiles and developmental trajectories in children. Additionally, the project seeks to elucidate the fundamental mechanisms underlying stability and change in behavioral, emotional and psychosocial difficulties. To date, the ELISA study encompasses six data collection points so far, from T1 (2017) to T6 (2023). The ELISA project was approved by the Spanish Ministry of Economy and Competitiveness and by the Bioethics Committee of the University of Santiago de Compostela. Initially, we contacted 126 schools (public, charter and private) in Galicia, and 72 of these agreed to participate. Subsequently, the families of pupils from these schools were invited to participate and approximately 25-50% of the families from each school opted to take part. The child's primary caregiver (i.e., father, mother, or primary caregiver) completed a questionnaire in the spring (from March to June) in every data collection point; most respondents were mothers (87.3%). Teachers were responsible for supervising the distribution and collection of the questionnaires. Data confidentiality was guaranteed, and prior informed consent was obtained from each child's primary caregiver. There was no reward for participation. We sought to standardize the administration of the questionnaires (from the order of presentation of the scales to the time and place where the questionnaires were administered) as far as possible considering the variety of schools included. See http://www.personalitydevelopmentcollaborative.org/project-page-elisa/ for details.

Participants

The present study uses data from 2,368 children (48.1% girls) from preschool to school years. Six waves of the ELISA project were considered: T1 (2017), T2 (2018), T3 (2019), T4 (2021), T5 (2022) and T6 (2023). Children ranged in age from 3-6 at T1 (M = 4.26, SD = 0.91), 4-7 at T2 (M = 5.35, SD = 0.92), 4-8 at T3 (M = 6.33, SD = 0.92), 6-10 at T4 (M = 8.41, SD = 0.95), 7-11 at T5 (M = 9.37, SD = 0.93) and 9-12 at T6 (M = 10.44, SD = 0.94). Most of the children were Spanish (approximately 95%).

At the first data collection point, 92.4% of fathers and 77.2% of mothers worked outside the home. In terms of the parents' level of education, 14% of mothers and 28.2% of fathers had attained the highest level of compulsory school education, 9.1% and 9.7% had completed a higher level of non-compulsory education, 28.9% and 29% had completed vocational training studies, 39.6% and 25% had university studies, and 7.9% and 6.1% had postgraduate studies.

As in any longitudinal study, sample attrition is inevitable. The main reason for attrition here was the COVID-19 pandemic, but concerted attempts were subsequently made to recover participants. The level of attrition in the sample was 10.9% between T1-T2, 19.8% between T1-T3, 50% between T1-T4, 37.4% between T1-T5 and 48.2% between T1-T6. Comparisons between children who participated in all waves and those who missed a follow-up revealed no statistically significant differences in age ($F(5, 2362) = 0.54$, $p = .750$), gender ($\chi^2(5) = 6.03$, $p = .303$), initial levels of CP ($F(5, 2224) = 0.57$, $p = .720$), or early ES ($F(5, 2225) = 0.87$, $p = .500$). However, in terms of socioeconomic status (SES), statistically significant differences were found ($F(5, 2233) = 17.29$, $p < .001$); children who participated in all waves had higher levels of SES, a pattern also found in previous longitudinal studies (Young et al., 2006).

Measures

All measures used were parent-reported. All questionnaires had been translated, used and tested in previous studies within the Spanish context

Identification of co-developmental trajectories (T1-T6)

Conduct problems. CP levels were assessed using the Conduct Problem Scale (Colins et al., 2014) based on DSM-IV criteria for oppositional defiant disorder and conduct disorder. This scale is designed to measure the core externalizing problems as defined by the DSM. This scale consists of 10 items (e.g., "Has conflicts with adults"; "For no apparent reason, hits, slaps, pushes or pokes, or takes something away from others") and has a 5-point Likert response scale ranging from 1 (*never*) to 5 (*very often*). The Spanish translation of this scale has been employed in previous studies with children of similar age and has demonstrated good psychometric properties (e.g., López-Romero et al., 2022). In the present sample, Cronbach's α ranged from .86 to .88 in the six waves.

Emotional symptoms. ES were measured at all waves through the "emotional symptoms" subscale of the Strengths and Difficulties Questionnaire-Parent Report [SDQ] Spanish version (Goodman, 1997). This subscale of the SDQ is a widely utilized measure of emotional problems including somatic problems, anxiety and low mood. This subscale is composed of five items (e.g., "Often complains of headaches, stomach-aches or

sickness"; "Many worries, often seems worried") with a 3-point Likert response scale ranging from 0 (*not true*) to 2 (*certainly true*). In the current sample, ordinal α ranged from .77 to .82 in all waves.

Examination of covariables (T1)

Socioeconomic status. The SES of parents was evaluated by means of ad hoc items related to family income, parental level of education, and family's financial solvency in facing daily overheads. Family economic income was obtained by means of one item with a 4-point response scale ranging from 1 (*serious problems to make ends meet*) to 4 (*well off*). Parental educational level was assessed by considering the average educational level of both parents, measured by one item with a 6-point response scale ranging from 1 (*without basic education*) to 6 (*postgraduate*). In cases where the participant had only one primary caregiver, only the reported score was used. The family's financial solvency in facing daily overheads was assessed by means of one item with a response scale ranging from 1 (*never worried*) to 5 (*worried basically every day*). Through these measures, the mean of each *Z*-transformed variable was calculated to represent a composite of SES (α = .65). This measure has reported good psychometric properties in previous studies (e.g., López-Romero et al., 2022).

Positive parenting and inconsistency. Positive parenting and inconsistency were assessed through items drawn from the Spanish version of the Alabama Parenting Questionnaire for Preschoolers [APQ-Pr] scale (de la Osa et al., 2014). Two of its subscales were used in the present study: one to measure positive parenting, this composed of 12 items (e.g., "Friendly talk with your child" α = .75), and another to measure parental inconsistency, composed of seven items (e.g., "Getting your child to obey is more trouble than worth" α = .69). The response scale of the instrument ranged from 1 (*never*) to 5 (*always*).

Parental stress. Parental stress was assessed using a scale based on the Spanish adaptation of the Berry & Jones (1995) Parental Stress Scale [PSS] (Oronoz et al., 2007). The instrument had nine items (e.g., "I feel overwhelmed by the responsibility of being a parent"; α = .76) with a 5-point Likert-type response scale from 1 (*never*) to 5 (*always*).

Psychopathic traits. Psychopathic traits (i.e., grandiose-deceitful, callous-unemotional, and impulsive-need for stimulation) were assessed through the Child Problematic Traits Inventory [CPTI] (Colins et al., 2014). Specifically, we use the officially authorized Spanish translation (Lopez-Romero et al., 2019). This instrument consists of 28 items with a 4-point Likert response scale ranging from 1 (*does not apply very well*) to 4 (*applies very well*). Eight items are used to measure grandiose-deceitful traits (e.g., "Often superior and arrogant towards others"; α = .81), 10 to measure callous-unemotional traits (e.g., "Often does not seem to care what others feel

and think"; α = .84) and 10 to measure impulsive-need for stimulation (e.g., "Gets tired of things quickly and wants new things to happen all the time"; α = .81).

Fearlessness. Fearlessness was measured using The Child Fearlessness Scale (Colins et al., 2014). This instrument consists of six items (e.g., "He/she never seems to get scared when someone is mad at him/her" α = .85) with a 4-point Likert response scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*). The Spanish translation was utilized, as it has been employed in previous studies and has demonstrated excellent psychometric properties (e.g., Fanti et al., 2024).

Statistical Analysis

Preliminary step. Descriptive analyses. First, preliminary descriptive analyses were calculated to observe differences between girls and boys across the sample.

In order to perform the PP-LGCM, the steps indicated by Muthén & Muthén (2010) were followed. These comprised the following: (1) estimation of a growth model for each process separately (i.e., univariate LGCM) for the determination of the shape of the curve, the fitting of the model, and the modification if necessary; (2) joint analysis of both processes (i.e., unconditional PP-LGCM); and (3) addition of covariates (i.e., conditional PP-LGCM).

Step 1. Univariate Latent Growth Curve Models [LGCM]. Two univariate LGCM stratified by gender were fitted to examine: a) the initial levels of externalizing and internalizing problems separately (i.e., intercepts), b) the rates of change (i.e., slopes) and the shapes of the average growth curves (i.e., linear, or quadratic), and c) the association between the baseline of the outcome and its rate of change (Brailean et al., 2017). To examine which model best fit the data the following fit indicators were considered: Comparative Fit Index [CFI] and Tucker-Lewis index [TLI] with cut-off values close to 0.95, Root Mean Square Error of Approximation [RMSEA] with cut-off values close to 0.06, and maximum likelihood based Standardized Rootmean Squared Residual [SMRS] with cut-off values close to 0.08 (Hu & Bentler, 1999). To decide between equally well-fitting models, we used the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC), and the model with the lower value according to these two indices was selected (Zhang et al., 2011). In the case of discrepancies between AIC and BIC, priority was given to lower levels of BIC (Chakrabarti & Ghosh, 2011).

Step 2. Unconditional PP-LGCM. The first option was to perform a multigroup analysis, but this approach requires that the shape of the slope of each variable be the same across groups, and in this case the slope of the CP differed across genders (i.e., quadratic for boys and linear for girls). Therefore, the analyses

were conducted separately (i.e., two PP-LGCM). Subsequently, with the univariate best-fit model, different dual trajectories of internalizing and externalizing problems were identified by applying gender separated unconditional PP-LGCM. To this end, CP and ES scores from the six waves were used. PP-LGCM have several advantages. One of them is that direct paths between the latent factors of both variables (i.e., intercept and slope) can be specified in a variety of ways (e.g., regressions, correlations) to address specific research inquiries about these processes (Felt et al., 2017; Schulenberg & Maggs, 2001). This study considers the correlations between a) initial levels of CP and initial levels of ES, and b) rates of change of CP and ES. It also accounts for regressions: a) regression of ES slope on CP intercept; b) regression of CP slope on ES intercept.

Step 3. Conditional PP-LGCM. Next, conditional PP-LGCM were applied by adding covariables to the models. This was done by regressing the CP and ES parameters (i.e., intercept and slope) on the covariables.

Missing cases were managed using a full information maximum likelihood estimation. This method has been shown to provide unbiased parameters compared to listwise detection, especially in the case of random missing data and when there is a high number of cases of missing data (Enders & Bandalos, 2001).

Since the participants were not of the same age at the beginning of the study (ages ranged from 3 to 6 years), the effect of age was assessed using Mehta & West's (2000) method. With this approach, age was found to have a negligible effect. Analyses were conducted using IBM SPSS Statistics 25, MPlus 7 and R.

Results

Descriptive statistics

Table S1 of the Supplementary Material presents the zero-order correlations between the variables examined in the entire sample. Descriptive statistics for the variables in both boys and girls were analyzed and Table 1 presents the scale range, sample size, means, standard deviations, medians, Student's *t*-test for comparisons of means across genders, and the effect sizes (Cohen's *d*) for each variable studied. Boys consistently exhibit significantly higher levels of CP. By contrast, girls scored higher on ES at T2. Regarding covariables, boys scored significantly higher than girls in callous-unemotional traits, impulsive-need for stimulation, and fearlessness.

Table 1

Descriptive statistics and gender differences in study variables

Measures	Scale range	Boys			Girls			*t* (*df*)	Cohen's *d*
		n	Mean (*SD*)	Median	*n*	Mean (*SD*)	Median		
Conduct problems									
Conduct problems T1[a]	1-5	1,144	1.83 (0.54)	1.80	1,086	1.68 (0.48)	1.60	7.17 (2216.3)***	0.30
Conduct problems T2[a]		1,010	1.83 (0.54)	1.80	965	1.67 (0.47)	1.60	7.17 (1958.64)***	0.32
Conduct problems T3[a]		910	1.69 (0.54)	1.60	874	1.50 (0.43)	1.40	8.19 (1716.07)***	0.39
Conduct problems T4[a]		575	1.61 (0.52)	1.50	538	1.47 (0.42)	1.40	4.90 (1089.97)***	0.29
Conduct problems T5[a]		708	1.50 (0.49)	1.40	671	1.39 (0.40)	1.30	4.58 (1353.06)***	0.25
Conduct problems T6[a]		567	1.42 (0.45)	1.30	566	1.32 (0.38)	1.20	4.35 (1093.12)***	0.26
Emotional symptoms									
Emotional symptoms T1	0-2	1,147	0.24 (0.30)	0.20	1,084	0.26 (0.31)	0.20	-1.49 (2229)	
Emotional symptoms T2		1,010	0.28 (0.32)	0.20	961	0.31 (0.34)	0.20	-2.10 (1969)*	-0.09
Emotional symptoms T3		906	0.27 (0.33)	0.20	874	0.28 (0.32)	0.20	-1.25 (1778)	
Emotional symptoms T4[a]		576	0.45 (0.42)	0.40	539	0.48 (0.42)	0.40	-1.27 (1108.62)	
Emotional symptoms T5		712	0.49 (0.44)	0.40	676	0.49 (0.41)	0.40	-0.19 (1386)	
Emotional symptoms T6		571	0.48 (0.42)	0.40	568	0.49 (0.42)	0.40	-0.40 (1137)	
Covariables									
Socioeconomic status	-	1,149	0 (0.72)	0.09	1,090	-0.01(0.70)	0.11	0.55 (2237)	
Positive	1-5	1,143	4.44 (0.36)	4.50	1,085	4.45 (0.35)	4.50	-0.73 (2226)	
Inconsistency	1-5	1,143	2 (0.51)	2	1,085	1.99 (0.51)	2	0.59 (2226)	
Parental stress	1-5	1,148	2.08 (0.54)	2.11	1,089	2.08 (0.54)	2.11	0.09 (2235)	
Grandiose-Deceitful	1-4	1,151	1.42 (0.46)	1.25	1,090	1.39 (0.43)	1.25	1.49 (2238)	
Callous-Unemotional[a]	1-4	1,151	1.47 (0.47)	1.33	1,090	1.38 (0.42)	1.30	4.78 (2229.84)***	0.20
Impulsive-Need for stimulation[a]	1-4	1,151	2.38 (0.56)	2.40	1,090	2.29 (0.55)	2.30	3.88 (2239)***	0.16
Fearlessness	1-4	1,151	1.84 (0.68)	1.83	1,090	1.74 (0.64)	1.67	3.61 (2239)***	0.15

Note. [a]Welch *t*-test is reported because Leven's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances. *$p < .05$; **$p < .01$; ***$p < .001$.

Univariate LGCM for boys and girls

Before exploring multivariate PP-LGCM, univariate LGCA were applied to the data, separately examining the gender-specific development of CP and ES. The linear and quadratic fit index can be found in Table S1 of the Supplementary Material. For CP scores, the quadratic model improved the linear model in boys (χ^2 = 58.91 (11), p = <.001; RMSEA = .06; CFI = .98; TLI = .98; SRMR = .03; AIC = 4536.36; BIC = 4618.12) and the linear model improved the quadratic model in girls (χ^2 = 83.14 (15), p <.001; RMSEA = .06; CFI = 98; TLI = 98; SRMR = .05; AIC = 2912.00; BIC = 2972.44). In the case of ES, the linear model proved a better fit than the quadratic model for both boys (χ^2 = 182.35 (13), p <.001; RMSEA = .10; CFI = .91; TLI = .90; SRMR = .07; AIC = 1944.89; BIC = 2016.46) and girls (χ^2 = 170.29 (13), p <.001; RMSEA = .10; CFI = .91; TLI = .90; SRMR = .06; AIC = 1980.28; BIC = 2050.82). The selected models overall demonstrated a good fit, except for RMSEA in ES for both boys and girls. This discrepancy could be attributed to the small degrees of freedom of the models; in such cases, RMSEA might falsely indicate a poor fit (Kenny et al., 2015). Figure 1 shows the estimated growth trajectories for CP and ES for boys and girls. Table 2 presents the estimated parameters and standard errors of the univariate models for boys and girls. Regarding CP, the intercept and linear slope were significant for both genders. The significant and positive sign in the intercept indicates that the initial CP level is higher than zero. The negative sign in the linear slopes indicates that CP tend to decrease over time across genders. The negative quadratic slope in boys indicates an acceleration of the CP decline towards the end of the study. In relation to ES, the intercept and the linear slope were positive and significant across genders. This indicates that both boys and girls have scores higher than zero at the beginning of the study and that these scores increase over time. The significant variation in the intercepts and slopes for CP and ES for both genders indicate individual differences in initial levels as well as changes in these variables. The CP intercept was found to negatively predict the linear slope of CP in both genders. Thus, the higher initial levels of CP, the faster declines in CP over time. In boys, the CP intercept negatively predicted the quadratic slope of CP. Thus, the higher the initial levels of CP, the faster the decline in CP at the end of the study. A negative correlation between the linear and quadratic slope of CP was found in boys, so that the greater the decrease in the CP, the lower the acceleration of this decrease at the end of the study. Finally, the intercept on ES negatively predicted the linear slope of ES only in girls. This indicates that in girls with higher initial ES, the increase in ES over time is lower.

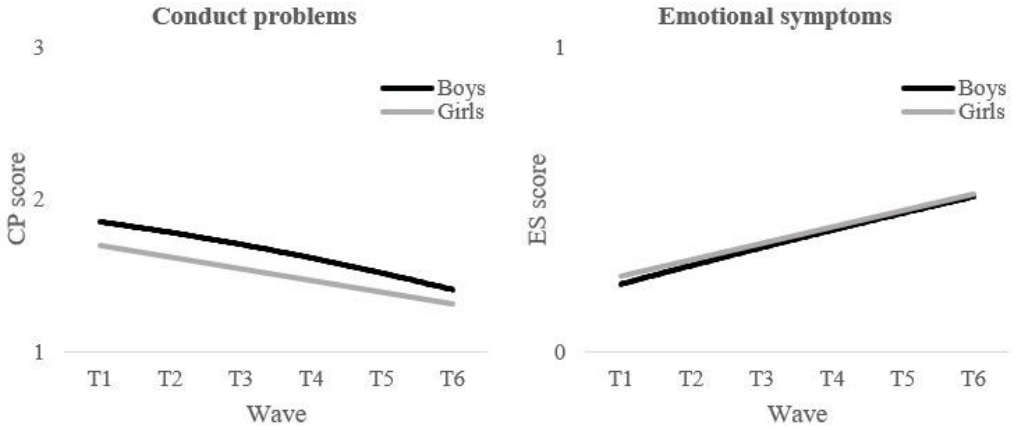

Fig. 1. Estimated growth trajectories for conduct problems and emotional symptoms for boys and girls.

Table 2

Unstandardized parameter estimates for univariate LGCM for boys and girls

	Parameter	Boys		Girls	
		Estimate	*SE*	Estimate	*SE*
Conduct problems	**Means**				
	Intercept	1.85***	0.02	1.69***	0.01
	Linear slope	-0.06***	0.01	-0.08***	0.003
	Quadratic slope	-0.01*	0.01	-	-
	Variances				
	Intercept	0.30***	0.03	0.18***	0.01
	Linear slope	0.04***	0.01	0.003***	0
	Quadratic slope	-0.01***	0		
	$I_{(CP)} \rightarrow Ls_{(CP)}$	-0.08*	0.03	-0.10***	0.01
	$I_{(CP)} \rightarrow Qs_{(CP)}$	-0.002	0.01		
	$Ls_{(CP)} \leftrightarrow Qs_{(CP)}$	-0.01**	0.001		
Emotional symptoms	**Means**				
	Intercept	0.23***	0.01	0.26***	0.01
	Linear slope	0.05***	0.003	0.05***	0.003
	Variances				
	Intercept	0.05***	0.01	0.06***	0.01
	Linear slope	0.01***	0	0.01***	0
	$I_{(ES)} \rightarrow Ls_{(ES)}$	-0.02	0.02	-0.04*	0.02

Note. Doubled headed arrows (↔) represent correlations and single headed arrows (→) represent regression effects. $I_{(CP)}$ = intercept of conduct problems; $I_{(ES)}$ = intercept of emotional symptoms; $Ls_{(CP)}$ = linear slope of conduct problems; $Ls_{(ES)}$ = linear slope of emotional symptoms; $Qs_{(CP)}$ = quadratic slope of conduct problems. *p <.05; **p <.01; ***p <.001.

Unconditional PP-LGCM for boys and girls

Figure 2 depicts the unconditional PP-LGCM (i.e., CP and ES) for boys and girls. Fit indices of the models are shown in Table 3 and the estimated PP-LGCM coefficients in Table 4. A significant and positive correlation was found between the CP intercept and the ES intercept in both boys and girls, suggesting that participants with high initial CP scores also had high initial ES scores in both genders. Additionally, a positive and significant correlation was found between the linear slope of CP and the linear slope of ES for both genders. This suggests that a greater increase in ES over time was associated with a smaller decrease in CP over time. A positive and significant relation was found between the initial level of CP and the linear slope of ES in both boys and girls. This indicates that high initial levels of CP predicted an increase in ES over time.

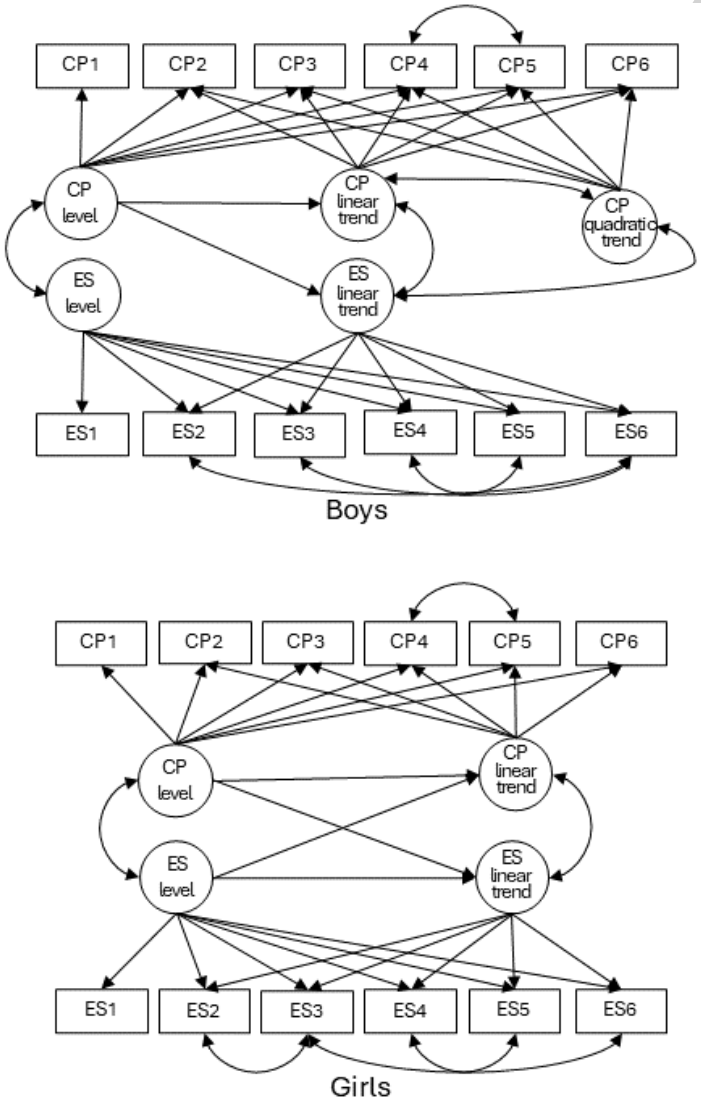

Fig. 2. Parallel Process Latent Growth Curve Analysis for conduct problems and emotional symptoms for boys and girls. Only statistically significant relationships are shown. ES=Emotional symptoms; CP=Conduct problems.

Table 3

Fit indexes for the proposed PP-LGCM

LGC Model		χ^2			RMSEA	CFI	TLI	SRMR
		value	*df*	*p*				
Unconditional PP-LGCM: CP and ES	Boys	322.43	54	<.001	.06	.95	.94	.05
	Girls	329.37	60	<.001	.06	.94	.94	.05
Conditional PP-LGCM: CP, ES and covariables	Boys	352.60	110	<.001	.04	.96	.94	.03
	Girls	402.75	124	<.001	.05	.95	.93	.04

Note. PP-LGCM = Parallel Process Latent Growth Curve Model; CP = Conduct Problems; ES = Emotional symptoms. RMSEA = Root Mean Squared Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker–Lewis index; SRMR = Standardized Rootmean Squared Residual.

Table 4

Estimates for unconditional PP-LGCM

	Boys				**Girls**			
	β	CI (95%)		*SE*	β	CI (95%)		*SE*
		Lower	Upper			Lower	Upper	
$I_{(CP)}$↔$I_{(ES)}$	0.28***	0.22	0.35	0.04	0.21***	0.14	0.27	0.04
$Ls_{(CP)}$↔$Ls_{(ES)}$	0.29***	0.14	0.44	0.09	0.33***	0.23	0.42	0.06
$I_{(CP)}$→$Ls_{(ES)}$	0.14**	0.05	0.23	0.06	0.11*	0.02	0.19	0.05
$I_{(ES)}$→$Ls_{(CP)}$	0.05	-0.08	0.18	0.08	0.07	0	0.15	0.05
$I_{(ES)}$→$Qs_{(CP)}$	-0.08	-0.23	0.07	0.09				
$Ls_{(ES)}$↔$Qs_{(CP)}$	-0.15	-0.31	0.02	0.10				

Note. Doubled headed arrows (↔) represent correlations and single headed arrows (→) represent regression effects. $I_{(CP)}$ = intercept of conduct problems; $I_{(ES)}$ = intercept of emotional symptoms; $Ls_{(CP)}$ = linear slope of conduct problems; $Ls_{(ES)}$ = linear slope of emotional symptoms; $Qs_{(CP)}$ = quadratic slope of conduct problems. Values are standardized coefficients and standard errors. **p* <.05; ***p* <.01; ****p* <.001. CP = Conduct problems; ES = Emotional Symptoms.

Conditional PP-LGCM: the effect of predictors on CP and ES

After fitting the final models, eight predictors (i.e., SES, parental positivity and inconsistency, parental stress, grandiose-deceitful traits, callous-unemotional traits, impulsive-need for stimulation, and fearlessness) were included in the growth parameters. The impact of the covariables on the change in CP and ES over the course of the study was examined. The model obtained adequate fit indices (see Table 3). The estimated parameters and standard errors of the covariate effects can be found in Table 5.

Table 5

Standardized parameter estimates and standard errors of the conditional PP-LGCM for girls and boys

	Boys			Girls	
Covariates	Intercept (*SE*)	Linear slope (*SE*)	Quadratic slope (*SE*)	Intercept (*SE*)	Linear slope (*SE*)
Conduct Problems					
Socioeconomic status	-0.02 (0.03)	-0.12 (0.07)	0.11 (0.09)	0.04 (0.03)	-0.09 (0.04)*
Positive parenting	-0.03 (0.03)	-0.01 (0.06)	-0.03 (0.08)	-0.11 (0.03)***	-0.05 (0.04)
Inconsistency	0.14 (0.03)***	-0.06 (0.07)	0.04 (0.09)	0.10 (0.03)**	-0.07 (0.04)
Parental stress	0.23 (0.03)***	-0.01 (0.08)	-0.01 (0.10)	0.14 (0.03)***	0.08 (0.04)
Grandiose-Deceitful	0.19 (0.03)***	-0.14 (0.09)	0.17 (0.11)	0.29 (0.03)**	-0.14 (0.05)**
Callous-Unemotional	0.18 (0.03)***	-0.06 (0.08)	-0.03 (0.10)	0.08 (0.03)**	0.05 (0.05)
Impulsive-Need for stimulation	0.26 (0.03)***	-0.17 (0.10)	0.25 (0.13)*	0.20 (0.03)***	-0.02 (0.05)
Fearlessness	0.15 (0.03)***	-0.12 (0.09)	0.11 (0.11)	0.18 (0.03)***	-0.04 (0.05)
Emotional symptoms					
Socioeconomic status	-0.20 (0.04)***	0 (0.05)		-0.15 (0.04)***	-0.07 (0.05)
Positive parenting	0.10 (0.04)**	0.02 (0.05)		0.03 (0.04)	0.03 (0.05)
Inconsistency	0.13 (0.04)**	-0.06 (0.05)		0.12 (0.04)**	-0.07 (0.05)
Parental stress	0.14 (0.04)**	0.06 (0.05)		0.12 (0.04)**	0.20 (0.05)***
Grandiose-Deceitful	0.11 (0.04)*	0.07 (0.06)		0.06 (0.04)	-0.07 (0.06)
Callous-Unemotional	0.10 (0.05)*	-0.20 (0.06)**		0.07 (0.04)	-0.04 (0.06)
Impulsive-Need for stimulation	0.16 (0.04)**	0.13 (0.06)*		0.24 (0.04)***	0.08 (0.06)
Fearlessness	-0.34 (0.04)***	0.01 (0.06)		-0.28 (0.04)***	-0.02 (0.06)

Note. Standardized parameters estimates are shown. Standard errors are shown in brackets. *p <.05; **p <.01; ***p < .001.

Family predictors

Higher SES was linked to lower initial levels of ES in both genders, along with a more rapid decline in CP exclusively among girls. Parental positivity was associated with reduced initial CP levels only in girls and increased ES initial levels solely in boys. Parental inconsistency and parental stress were predictors of elevated initial levels of both CP and ES across genders. Furthermore, parental stress was found to predict a quicker acceleration of ES over time specifically in girls.

Children's predictors

Grandiose-deceitful and callous-unemotional traits predicted higher baseline levels of CP across genders and increased initial levels of ES exclusively in boys. Grandiose-deceitful traits were associated with a swifter decrease in CP solely in girls, while callous-unemotional traits were associated with a slower rise in ES among boys. Impulsive-need for stimulation predicted higher initial levels of both CP and ES across genders; notably, it predicted a slower decline in CP towards the end of the study and a quicker escalation in ES just in boys. Finally, fearlessness was linked to higher initial CP levels and lower initial ES levels across genders.

Discussion

The present longitudinal study sought to understand the co-developmental trajectories of externalizing and internalizing problems in girls and boys from early childhood to preadolescence. The first specific aim was to assess whether the trajectories are similar between genders. The results indicate that there are some similarities and some differences both in pure CP and ES trajectories and in co-evolution trajectories.

As anticipated, the results demonstrated a decline in CP over time in both boys and girls, which is consistent with previous research (Alink et al., 2006; Barker & Maughan, 2009; Fanti & Henrich, 2010; Gilliom & Shaw, 2004; Olson et al., 2017). Therefore, considering the overall developmental trends, the age-related declines in CP appear to outweigh the adverse effects of the pandemic (Ng & Ng, 2022). It is nevertheless important to acknowledge that the full impact of the pandemic on child development remains unclear. Further studies conducted over extended periods and with diverse cohorts at different time points will be essential to elucidate the extent to which the ongoing pandemic may have influenced child development trajectories. With respect to gender differences, it is noteworthy that the slope of the decrease in CP exhibits a distinctive shape in boys and girls. The most appropriate CP LCGM in boys suggested a small quadratic slope (-0.01), whereas the most appropriate model in girls suggested a linear slope only. This means that the decline of CP in girls is more constant than in boys, who show an acceleration of the decline towards the end of the study coinciding with the onset of pre-adolescence. Also, it was found that the higher levels of CP at the beginning of the study predicted

a faster decrease of CP over time in both boys and girls. Perhaps this may be because parents and society in general, when observing high CP in children, make greater efforts to reverse such behavior. It is also possible that children with high initial levels of CP reduce their CP more than children with normative behavior because they have more room for improvement in a regression toward the mean process (Furby, 1973). This may explain why high levels of CP are often followed by a faster decline, although it does not necessarily mean that they will fall to low levels. ES was found to increase over time in both genders. This finding was also expected, in that it is consistent with studies showing that internalizing problems tend to increase in childhood (Bongers et al., 2003) and during adolescence (Bongers et al., 2003; Galambos et al., 2003). This result is also consistent with studies conducted during COVID-19 which showed a decrease in children's well-being associated to the pandemic (Ng & Ng, 2019). As stated above, the impact of the COVID-19 conditions could not be isolated from the age effects in our study; further longitudinal research would be needed to determine how the pandemic affected the progression of ES throughout childhood and adolescence. The growth trend of ES in this study was linear in both genders, indicating a constant growth. This contrasts with Bongers et al. (2003), where a curvilinear trend was reported. Perhaps the reason is that Bongers et al.'s study covers a longer period of development (4-18 years) than the present one (4-12 years), and it is possible that the adolescent years contribute to the curvilinear shape of the slope. The main gender difference in ES found in the present study was that the initial level of ES predicted a slower increase in ES only in girls.

In terms of co-developmental trajectories, initial ES and CP were positively correlated, which is consistent with previous research (Fanti & Henrich, 2010; Gilliom & Shaw, 2004; Yoon et al., 2017) and supports the existence of a high comorbidity between internalizing and externalizing problems. On the same lines, a positive and significant relationship was found between the tendencies for change in CP and ES, again consistent with previous studies (Gilliom & Shaw, 2004; Yoon et al., 2017). This positive relationship may be due to a covariate model in which escalation of either CP or ES leads to an escalation of the other (Yoon et al., 2017). It is important to note that higher initial levels of CP were found to positively predict changes in ES over time (i.e., the higher the initial levels of CP, the greater the increase in ES over time). Conversely, initial levels of ES did not predict changes in CP over time. This result partially agrees with Lee and Bukowski's (2012) findings that externalizing problems predict internalizing problems in both genders. However, we did not find evidence to support their claim that internalizing problems predict externalizing problems in boys. Therefore, according to the present study, the potential mechanisms that could explain the comorbidity between internalizing and externalizing behaviors are more consistent with studies suggesting that externalizing behaviors can trigger

internalizing problems (Boutin et al., 2020; Boylan et al., 2007; Capaldi, 1992; Copeland et al., 2009; Fergusson et al., 2003; Nock et al., 2007; Patterson & Capaldi, 1990). The underlying mechanisms for this connection may align with the "Dual Failure model" (Capaldi, 1992); thus, externalizing problems may precipitate setbacks in both the social (e.g., peer and parent rejection, peer victimization) and academic (e.g., academic difficulties) realms, culminating in adverse self-evaluations, diminished self-esteem, and ultimately contributing to anxiety and depression (Patterson & Stoolmiller, 1991).

The second specific aim of the present study was to examine whether the risk factors for the baseline level and changes in CP and ES remained consistent or varied across genders. There was no binary answer here; similarities and differences were found between different risk factors and the parameters of CP and ES trajectories.

Regarding family variables, low SES was related to higher initial levels of ES in both boys and girls, which is consistent with previous studies that have shown that SES is a risk factor for internalizing problems in both genders (Reiss et al., 2019). Positive parenting was related to a lower initial level of CP in girls and a higher initial level of ES in boys. The first finding is partially consistent with the study by Paclikova et al. (2019), which shows that family communication (a characteristic element of positive parenting) is associated with low CP only for girls. However, these authors also found that family communication is related to lower levels of ES in girls, something that we did not find in the present study. Thus, further research is needed to investigate whether differences are robust and why they occur. Parental inconsistency was related to higher initial levels of CP and ES in both genders. This is aligned with research that has found a relationship between inconsistent discipline and higher levels of externalizing problems (Hoeve et al., 2009). Also, it is in line with a growing body of evidence that suggests a link between inconsistent discipline and internalizing problems in children (Yap & Jorm, 2015). Parental stress was found to be associated with higher baseline levels of CP and ES in both genders. Additionally, it was associated with an increase in ES overtime only in girls. These results are consistent with previous research that supports the idea that parental stress increases the risk of internalizing and externalizing problems (e.g., Stone et al., 2016).

Regarding risk factors associated with individual dispositions, gender differences were found in psychopathic traits. Grandiose-deceitful, callous-unemotional traits, impulsive-need for stimulation, and fearlessness were related to higher initial levels of CP across genders. This finding supports previous research suggesting that psychopathic traits are predictive of CP (Ezpeleta et al., 2013; Frick et al., 2014; Klingzell et al.,

2016). Nevertheless, grandiose-deceitful traits were related to a faster decrease in CP only in girls. Surprisingly, callous-unemotional and grandiose-deceitful traits exhibited associations exclusively with ES in boys. Both traits were linked to heightened initial ES levels, with callous-unemotional traits specifically tied to a decelerated increase in ES over time. This paradoxical outcome implies that callous-unemotional traits acted as a risk factor for initial ES but served as a protective factor for ES development over time. The latter finding is consistent with some studies linking callous-unemotional traits to a reduction in internalizing symptoms over time (Pardini & Fite, 2010). In turn, the association between CU traits and higher baseline levels of ES can be explained in terms of the hypotheses of Mahendran et al. (2021), which posits that internalizing symptoms may appear callous or unemotional at an early age. Following this assumption, a sensitive and withdrawn child may present as indifferent to social needs, but this may be related to social aversion (callous-unemotional traits) or social anxiety (internalizing problems). To the best of our knowledge, no studies have examined gender differences in the relationship between callous-unemotional or grandiose-deceitful traits and internalizing problems. Further research is needed, especially on the interpersonal aspect of psychopathy, since it has received less attention than other components (Salekin, 2017). This is important because grandiose-deceitful traits may play a crucial role in girls, as some studies have warned that the interpersonal component of psychopathy, associated with manipulation and grandiosity, is a common expression of psychopathic traits in girls (Álvarez-Voces & Romero, 2024; Garcia et al., 2023). Impulsive-need for stimulation and fearlessness predicted similar outcomes in ES across genders. Impulsive-need for stimulation was associated with higher initial levels of ES and fearlessness with lower initial levels of ES. It should be noted that impulsive-need for stimulation was associated with a faster increase in ES only in boys, again suggesting the need for more in depth research into the differential impact of psychopathic traits as a function of gender.

This study has demonstrated the usefulness of exploring gender-specific co-developmental trajectories of CP and ES from early childhood to preadolescence. It has used longitudinal data with six waves of internalizing and externalizing problems. Additionally, although the family and individual predictors included in this study have been previously explored in terms of gender, their roles in developmental trajectories have been less studied. Second, separate co-developmental trajectories were analyzed for boys and girls, enabling us to identify the different patterns of CP and ES more precisely.

Despite the strengths of this study, it is important to note its limitations for future research. One such limitation is that it relied solely on parent-reported measures. This may have led to an overestimation of the magnitude and significance of the relationship due to shared method variance. Even though parental measures

are considered optimal for reporting child behavior (Frick et al., 2010) future research would benefit from the use of multiple measures. Another limitation of the study is attrition, which is common in longitudinal studies. In this case, the attrition rate was higher among participants with lower SES, as is often observed in longitudinal studies (Young et al., 2006). This may introduce bias and potentially limit the generalizability of the findings to lower SES children. Therefore, it would be advisable for future studies to make a greater effort to retain participants from disadvantaged settings, who are more likely to drop out from community longitudinal studies. Additionally, the participation of children of varying ages makes it difficult to make direct comparisons with other studies that focus on age-specific changes. However, we tested the hypothesis that the age range did not affect the results and found it to be well-supported by our data. It is also important to consider the potential impact of the coronavirus pandemic on the data collection process. While the trajectories of CP and ES were consistent with previous findings, the emergence of the SARS-CoV-2 virus represents a significant factor that may have influenced the co-development of the issues under study. This will require further investigation in subsequent research. Finally, it should be noted that the measure of CP is limited in that it does not consider relational aggression, which is a form of CP that is typically associated with girls. It would be beneficial for future studies to incorporate measures of relational aggression to gain a more comprehensive understanding of its impact on the results.

Summary

Gender similarities and differences in the co-developmental trajectories of CP and ES were found. Gender similarities included: 1) patterns of change in CP and ES (CP tends to decrease while ES tends to increase across genders); 2) the relationship between initial CP level and change; 3) the relationship between the initial level of CP and the initial level of ES, as well as the relationship between the change in CP and the change in ES; 4) the association between initial CP levels and ES change; and 5) some predictors of initial levels of CP (i.e., grandiose-deceitful), ES (i.e., SES) and both (i.e., parental inconsistency, parental stress, impulsive-need for stimulation and fearlessness). In terms of gender differences, these included: 1) the shape of the change in CP and in the relationship between baseline and slope in ES; 2) certain predictors of baseline levels of CP (i.e., positive parenting) and ES (i.e., positive parenting, grandiose-deceitful, callous-unemotional traits); 3) certain predictors of change in CP (i.e., SES, grandiose-deceitful traits) and ES (i.e., parental stress, callous-unemotional traits, impulsive-need for stimulation). On a theoretical level, these results indicate that a more comprehensive understanding of the co-developmental patterns of CP and ES and the development of explanatory models requires a deeper exploration of gender differences. From a practical standpoint, this study

may contribute to improvements in the prevention and identification of CP and ES in both genders. In this line, the high associations between CP and ES reinforce the need to adopt a transdiagnostic approach to prevent future mental health problems (Murray et al., 2021). This is particularly important because the period from middle childhood to early adolescence is crucial for the screening of internalizing and externalizing problems and the prevention of escalation into adolescence (Gong et al., 2023). Furthermore, this study has identified significant family and individual risk factors that should be considered in comprehensive examinations of children. It is recommended that investment be made in multicomponent programs that address ineffective family practices, parental stress, and individual disposition variables such as impulsiveness, as these continue to play a major role in predicting CP and ES. Finally, it is important to adapt and refine multicomponent programs to be gender-sensitive, considering the differences found in this study. Aligned with the need to tailor interventions to the heterogeneous needs of individuals (e.g., Glenn et al., 2019), taking gender-specific results into account will aid in developing fine-tuned interventions, potentially more efficacious for addressing CP and ES in young people.

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