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PSYCHOPATHY IN CHILDHOOD, VALIDATION OF THE CHILD PROBLEMATIC TRAITS INVENTORY AND RELATIONSHIP WITH OTHER CLINICAL ENTITIES

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Carmen Arvale

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List of abbreviations

AB: Aggressive Behavior

ADHD: Attention Deficit Hyperactivity Disorder

APA: American Psychiatric Association

APD: Antisocial Personality Disorder

BP: Behavioral Problems

BRI: Behavioral Regulation Index

BRIEF and BRIEF-2: Behavioral Rating Inventory of Executive Function

CBCL: Child Behavior Checklist

CD: Conduct Disorder

CFA: Confirmatory Factor Analyses

CP: Conduct Problems

CPRS-R:S: Conners' Parent Rating Scale- Short Form

CPTI: Child Problematic Traits Inventory

CPTI total score: Child Problematic Traits Inventory Total Score

CTRS-R:S: Conners' Teacher Rating Scale- Short Form

CU: Callous-Unemotional

DB: Delinquent Behavior

EC: Emotional Control

ED: Externalizing Disorders

EF: Executive Function

GD: Grandiose-Deceitful

I: Initiate

ID: Internalizing Disorders

INH: Inhibit

INS: Impulsive-Need for stimulation

K-SADS/PL: Present and Lifetime version of the Kiddie Schedule for Affective Disorders and Schizophrenia

LPE: Limited Prosocial Emotions

MI: Composite Metacognition Index

ODD: Oppositional Defiant Disorders

OM: Organization of Materials

OP: Other Psychopathology

PO: Plan/Organize

RMSEA: Root-Mean-Square Error of Approximation

S: Shift

SDQ: Strengths and Difficulties Questionnaire

SEM: Structural Equation Models

SES: Socioeconomic Status

SRMR: Root-Mean-Square Residual

TRF: Teacher's Report Form

WHO: World Health Organization

WLSMV: Robust Weighted Least Squares Used as Estimator

WM: Working Memory

YSR: Youth Self- Report

Summary in English

Behavioral Problems (BP) - that include problems of aggressiveness, negativism, and impulsivity-, constitute the most prevalent psychopathology in children and adolescents, and may be the precursors of other psychiatric disorders. BP are a highly heterogeneous condition, with different profiles and trajectories, and therefore, there are children with a higher risk of more serious and persistent BP. Due to the symptom heterogeneity of BP, the investigation of the underlying pathways may help to delimit a more homogeneous group with unique etiological mechanisms at risk of presenting more severe and persistent BP in adulthood. The etiology of BP is complex, with contributions of both genetic and environmental risk factors. Research suggests that two important factors involved in the development and maintenance of BP may be the presence of psychopathic traits and executive dysfunction in childhood. However, research has yielded inconclusive and sometimes contradictory results, and in this regard, expanding our knowledge is needed.

Psychopathic traits in childhood could be conceptualized as a multidimensional construct, with at least three dimensions (i.e., interpersonal, callous-unemotional, and behavioral), that somehow resembles the construct in adulthood. On the other hand, neurocognitive and neurobiological differences between juveniles with and without callous-unemotional traits have been found and they seem to be in concordance with the findings in adult psychopathy. There is a large body of evidence (e.g., neurocognitive and neurobiological correlates) suggesting that callous-unemotional traits are associated with more persistent and severe BP with greater resistance to conventional treatments which has even led to the creation of the specifier "*with limited prosocial emotions*" (LPE) for BP in the international classification systems of mental disorders. Nevertheless, not all children with callous-unemotional traits exhibit BP. Although research on the other two dimensions suggests that may be relevant in the explanation of children and adolescent BP, the literature is scarce and, more evidence on these dimensions is needed.

The instruments for assessing psychopathic traits in childhood are either not applicable to early childhood or have focused on callous unemotional traits. In this sense, the *Child Problematic*

Traits Inventory (CPTI) is a relatively new tool for measuring the aforementioned psychopathic traits in early development, as well as contemplating the three dimensions of the construct. The CPTI primarily developed to be a teacher-reported measure, but some surveys have also tested its psychometric properties when reported by parent/primary caregiver. Furthermore, only one survey tested its psychometric properties in a referred sample.

Executive Functions (EF) are some of the most-studied constructs in neurosciences. EF encompasses higher order cognitive processes, playing a crucial role in complex cross-temporal behavior, adaptation to novel situations, problem solving, and decision-making. There are also related to maladaptive behavior. Moreover, EF follow a relatively protracted developmental course, maturing throughout childhood and beyond into adulthood. No "gold standard" for EF measurement is available. The measurement of EF could be by the used performance tasks or assessment scale, providing different and complementary types of information. However, performance task may not reflect the day-to-day situations.

The link between psychopathic traits and EF in childhood, is an understudied area. However, the study of this relationship may help to better understand the inconsistencies in surveys centered on the relationship between psychopathic traits and BP, and it may be hypothesized to be influenced by executive functioning. In addition, the emerging research in childhood, by these three topics (i.e., BP, psychopathic traits, and EF), is scarce, mainly focusing on the study of CU traits.

The current dissertation was designed aimed to expand the knowledge to the above-mentioned topics through two different studies, in a large community sample and an at-risk for psychopathology subsample of children aged 5 to 12 years. We use a multidimensional approach to assess psychopathic traits and choose to evaluate EF by reported assessment scales. The main objectives were a) testing psychometric properties of the Spanish parent- reported version of the CPTI, b) analyzing the association between psychopathic traits and risk for psychopathology, and c) studying the relationship between psychopathic traits, EF, and BP. Overall, Study 1 provide further validation of the Spanish parent-reported version of the CPTI, regarding the factor

structure, reliability, validity, and their ability to discriminate between normative and at-risk for psychopathology samples. Study 2 show unique, main effects of psychopathic traits and EF on their relationship with BP, and remarkably, that EF mediate the relationship between psychopathic traits, considering the global construct and its underpinning dimensions, and BP. In conclusion, the results of this doctoral thesis show, on one hand, that the CPTI is a robust and comprehensive psychometric assessment tool for research on psychopathic traits in children and on the other hand, it seems to provide solid evidence of the usefulness of the CPTI for subtyping children with behavioral disorders. Furthermore, these results show unique, main effects of psychopathic traits and EF on the relationship with BP, likewise the mediating role of EF (i.e., those related to behavioral and emotional control) in the relationship between psychopathic traits and BP. This could lead to a better typification of children with BP and even open up a possible treatment pathway. In addition, this doctoral thesis extend knowledge about correlates of psychopathy associated with each dimension, and may have implications for both prediction and prevention of BP.

Resum en Català

Els Problemes de Comportament (PC) - que inclouen problemes d'agressivitat, negativisme i impulsivitat -, constitueixen la psicopatologia més prevalent en nens i adolescents, i poden ser precursors d'altres trastorns psiquiàtrics. Els PC són un quadre molt heterogeni, amb diferents perfils i trajectòries, existint, per tant, nens amb major risc de presentar PC més greus i persistents. A causa de l'heterogeneïtat simptomàtica dels PC, la recerca de les vies subjacents pot ajudar a delimitar un grup més homogeni amb mecanismes etiològics únics amb el risc de presentar PC més greus i persistents en l'edat adulta. L'etiologia dels PC és complexa, amb contribucions de factors de risc tant genètics com ambientals. La recerca suggereix que dos factors importants implicats en el desenvolupament i manteniment dels PC poden ser la presència de trets psicopàtics i la disfunció executiva en la infància. No obstant això, la recerca ha llançat resultats poc concloents, a vegades contradictoris, i en aquest sentit és necessari ampliar els nostres coneixements.

Els trets psicopàtics en la infància podrien conceptualitzar-se com un constructe multidimensional, amb almenys tres dimensions (és a dir, interpersonal, duresa i insensibilitat afectiva, i conductual), que d'alguna manera s'assembla al constructe en l'edat adulta. D'altra banda, s'han trobat diferències neurocognitives i neurobiològiques entre els joves amb i sense trets de duresa i insensibilitat afectiva (DIA) i semblen estar en concordança amb les troballes en la psicopatia adulta. Existeix una gran quantitat de proves (per exemple, correlats neurocognitius i neurobiològics) que suggereixen que els trets DIA s'associen a PC més persistents i greus amb major resistència als tractaments convencionals, la qual cosa ha portat fins i tot a la creació de l'especificador "*amb emocions prosocials limitades*" (LPE) per als PC en els sistemes internacionals de classificació dels trastorns mentals. No obstant això, no tots els nens amb trets DIA presenten PC. Encara que la recerca sobre les altres dues dimensions suggereix que poden ser rellevants en l'explicació dels PC en nens i adolescents, la literatura és escassa i, es necessita més evidència sobre aquestes dimensions.

Els instruments per a avaluar els trets psicopàtics en la infància no són aplicables a la primera infància o s'han centrat en els trets DIA. En aquest sentit, el *Child Problematic Traits Inventory* (CPTI) és una eina relativament nova per a mesurar els trets psicopàtics esmentats en el desenvolupament primerenc, així com per a contemplar les tres dimensions del constructe. El CPTI es va desenvolupar principalment per a ser una mesura informada per professors, però alguns estudis també han provat les seves propietats psicomètriques quan és informada pels pares/cuidadors principals. A més, només un estudi ha avaluat les seves propietats psicomètriques en una mostra clínica.

Les Funcions Executives (FE) són un dels constructes més estudiats en neurociències. Les FE abasten processos cognitius d'ordre superior, exercint un paper crucial en el desenvolupament conductual, l'adaptació a situacions noves, la resolució de problemes i la presa de decisions. També estan relacionades amb el comportament inadaptat. A més, les FE segueixen un curs de desenvolupament relativament prolongat, madurant al llarg de la infància i més enllà fins a l'edat adulta. No es disposa d'una mesura estàndard per a mesurar les FE. L'avaluació de les FE pot realitzar-se mitjançant tasques de rendiment o escales d'avaluació, que proporcionen tipus d'informació diferents i complementaris. No obstant, les tasques de rendiment poden no reflectir les situacions quotidianes.

La relació entre els trets psicopàtics i les FE en la infància és una àrea poc estudiada. No obstant, el seu estudi pot ajudar a comprendre millor les inconsistències en els estudis centrats en la relació entre trets psicopàtics i els PC, i es pot hipotetitzar que està influïda pel funcionament executiu. A més, la recerca emergent en la infància, centrada en aquests tres temes (és a dir, PC, trets psicopàtics, i FE), és escassa, centrant-se principalment en l'estudi dels trets DIA.

La present tesi va ser dissenyada amb l'objectiu d'ampliar el coneixement als temes abans esmentats a través de dos estudis diferents, en una gran mostra de comunitària i una submostra de nens de 5 a 12 anys en risc de psicopatologia. Utilitzem un enfocament multidimensional per a avaluar els trets psicopàtics i optem per avaluar la FE mitjançant escales d'avaluació informades per pares. Els objectius principals van ser a) provar les propietats psicomètriques de la versió espanyola del CPTI informada pels pares, b) analitzar l'associació entre trets psicopàtics i el risc

de psicopatologia, i c) estudiar la relació entre trets psicopàtics, FE i PC En general, l'Estudi 1 proporciona una major validació de la versió espanyola del CPTI informada pels pares, en relació amb l'estructura factorial, la fiabilitat, la validesa i la seva capacitat per a discriminar entre mostres normatives i en risc de psicopatologia. L'Estudi 2 mostra efectes únics i principals dels trets psicopàtics i de les FE en la seva relació amb els PC i, de forma destacada, que les FE medien la relació entre els trets psicopàtics, considerant el constructe global i les seves dimensions subjacents, i els PC. En conclusió, els resultats d'aquesta tesi doctoral mostren, d'una banda, que el CPTI és una eina d'avaluació psicomètrica robusta i exhaustiva per a la recerca de trets psicopàtics en nens i, d'altra banda, sembla aportar proves sòlides de la utilitat del CPTI per a subtipificar a nens amb PC. A més, aquests resultats mostren efectes únics i principals dels trets psicopàtics i de les FE en la relació amb els PC, així com el paper mediador de les FE (és a dir, les relacionades amb el control conductual i emocional) en la relació entre els trets psicopàtics i els PC. Això podria conduir a una millor classificació dels nens amb PC i fins i tot obrir una possible via de tractament. A més, aquesta tesi doctoral amplia el coneixement sobre els correlats de la psicopatia associats a cada dimensió, i pot tenir implicacions tant per a la predicció com per a la prevenció dels PC.

Resumen en Castellano

Los Problemas de Comportamiento (PC) - que incluyen problemas de agresividad, negativismo e impulsividad -, constituyen la psicopatología más prevalente en niños y adolescentes, y pueden ser precursores de otros trastornos psiquiátricos. Los PC son un cuadro muy heterogéneo, con diferentes perfiles y trayectorias, existiendo, por tanto, niños con mayor riesgo de presentar PC más graves y persistentes. Debido a la heterogeneidad sintomática de los PC, la investigación de las vías subyacentes puede ayudar a delimitar un grupo más homogéneo con mecanismos etiológicos únicos con riesgo de presentar PC más graves y persistentes en la edad adulta. La etiología de los PC es compleja, con contribuciones de factores de riesgo tanto genéticos como ambientales. Las investigaciones sugieren que dos factores importantes implicados en el desarrollo y mantenimiento de los PC pueden ser la presencia de rasgos psicopáticos y la disfunción ejecutiva en la infancia. Sin embargo, la investigación ha arrojado resultados poco concluyentes, a veces contradictorios, y en este sentido es necesario ampliar nuestros conocimientos.

Los rasgos psicopáticos en la infancia podrían conceptualizarse como un constructo multidimensional, con al menos tres dimensiones (es decir, interpersonal, dureza e insensibilidad afectiva, y conductual), que de algún modo se asemeja al constructo en la edad adulta. Por otra parte, se han encontrado diferencias neurocognitivas y neurobiológicas entre los jóvenes con y sin rasgos de dureza e insensibilidad afectiva (DIA) y parecen estar en concordancia con los hallazgos en la psicopatía adulta. Existe una gran cantidad de pruebas (por ejemplo, correlatos neurocognitivos y neurobiológicos) que sugieren que los rasgos DIA se asocian a PC más persistentes y graves con mayor resistencia a los tratamientos convencionales, lo que ha llevado incluso a la creación del especificador "*con emociones prosociales limitadas*" (LPE) para PC en los sistemas internacionales de clasificación de los trastornos mentales. Sin embargo, no todos los niños con rasgos DIA presentan PC. Aunque la investigación sobre las otras dos dimensiones sugiere que pueden ser relevantes en la explicación de los PC en niños y adolescentes, la literatura es escasa y, se necesita más evidencia sobre estas dimensiones.

Los instrumentos para evaluar los rasgos psicopáticos en la infancia no son aplicables a la primera infancia o se han centrado en los rasgos DIA. En este sentido, el *Child Problematic Traits Inventory* (CPTI) es una herramienta relativamente nueva para medir los rasgos psicopáticos mencionados en el desarrollo temprano, así como para contemplar las tres dimensiones del constructo. El CPTI se desarrolló principalmente para ser una medida informada por profesores, pero algunos estudios también han probado sus propiedades psicométricas cuando es informada por los padres/cuidadores principales. Además, sólo un estudio ha evaluado sus propiedades psicométricas en una muestra clínica.

Las Funciones Ejecutivas (FE) son uno de los constructos más estudiados en neurociencias. Las FE abarcan procesos cognitivos de orden superior, desempeñando un papel crucial en el desarrollo conductual, la adaptación a situaciones novedosas, la resolución de problemas y la toma de decisiones. También están relacionadas con el comportamiento inadaptado. Además, las FE siguen un curso de desarrollo relativamente prolongado, madurando a lo largo de la infancia y más allá hasta la edad adulta. No se dispone de una medida estándar para medir las FE. La medición de las FE puede realizarse mediante tareas de rendimiento o escalas de evaluación, que proporcionan tipos de información diferentes y complementarios. Sin embargo, las tareas de rendimiento pueden no reflejar las situaciones cotidianas.

La relación entre los rasgos psicopáticos y las FE en la infancia es un área poco estudiada. Sin embargo, su estudio puede ayudar a comprender mejor las inconsistencias en los estudios centrados en la relación entre rasgos psicopáticos y los PC, y se puede hipotetizar que está influida por el funcionamiento ejecutivo. Además, la investigación emergente en la infancia, centrada en estos tres temas (es decir, PC, rasgos psicopáticos, y FE), es escasa, centrándose principalmente en el estudio de los rasgos DIA.

La presente tesis fue diseñada con el objetivo de ampliar el conocimiento a los temas antes mencionados a través de dos estudios diferentes, en una gran muestra de comunitaria y una submuestra de niños de 5 a 12 años en riesgo de psicopatología. Utilizamos un enfoque multidimensional para evaluar los rasgos psicopáticos y optamos por evaluar la FE mediante escalas de evaluación informadas por padres. Los objetivos principales fueron a) probar las

propiedades psicométricas de la versión española del CPTI informada por los padres, b) analizar la asociación entre rasgos psicopáticos y el riesgo de psicopatología, y c) estudiar la relación entre rasgos psicopáticos, FE y PC En general, el Estudio 1 proporciona una mayor validación de la versión española del CPTI informada por los padres, en relación con la estructura factorial, la fiabilidad, la validez y su capacidad para discriminar entre muestras normativas y en riesgo de psicopatología. El Estudio 2 muestra efectos únicos y principales de los rasgos psicopáticos y de las FE en su relación con los PC y, de forma destacada, que las FE median la relación entre los rasgos psicopáticos, considerando el constructo global y sus dimensiones subyacentes, y los PC. En conclusión, los resultados de esta tesis doctoral muestran, por un lado, que el CPTI es una herramienta de evaluación psicométrica robusta y exhaustiva para la investigación de rasgos psicopáticos en niños y, por otro lado, parece aportar pruebas sólidas de la utilidad del CPTI para subtipificar a niños con PC. Además, estos resultados muestran efectos únicos y principales de los rasgos psicopáticos y de las FE en la relación con los PC, así como el papel mediador de las FE (es decir, las relacionadas con el control conductual y emocional) en la relación entre los rasgos psicopáticos y los PC. Esto podría conducir a una mejor clasificación de los niños con PC e incluso abrir una posible vía de tratamiento. Además, esta tesis doctoral amplía el conocimiento sobre los correlatos de la psicopatía asociados a cada dimensión, y puede tener implicaciones tanto para la predicción como para la prevención de los PC.

CHAPTER 1:

Introduction

1.1 Behind Psychopathology: The Fit of Behavioral Problems

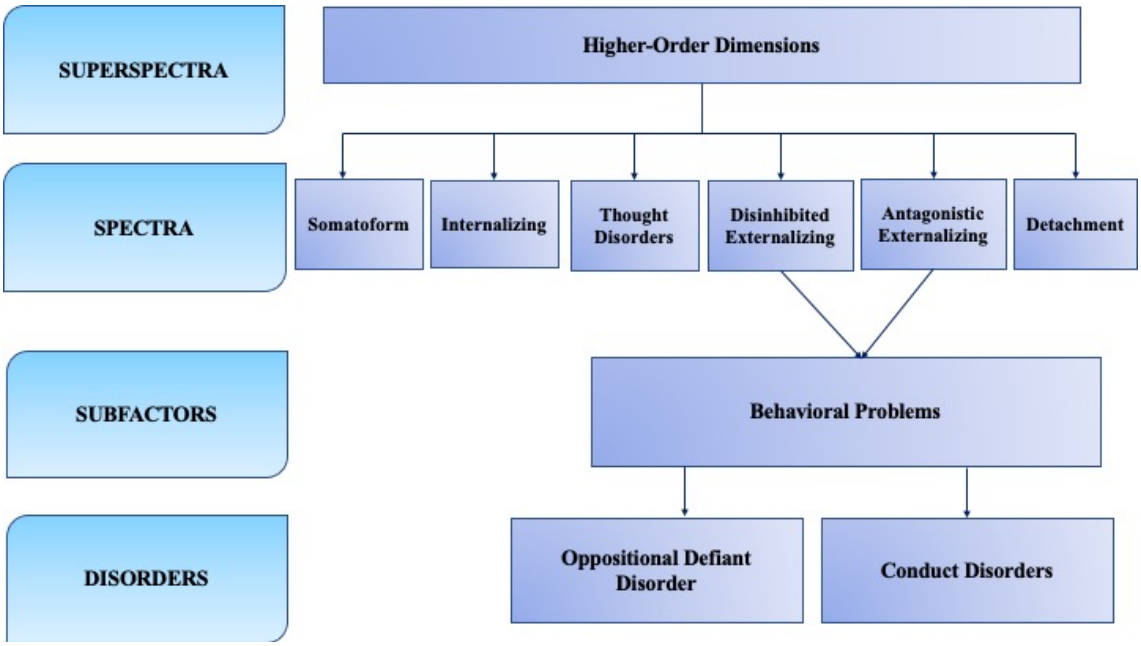
Psychopathology can be defined as any behavioral pattern - including actions, emotions, motivations, as well as regulatory and cognitive processes - that causes personal impairment or distress in different facets of an individual's life (Bandura, 1969; Ullmann & Krasner, 1975). From the earliest taxonomies, psychopathology was treated as a set of mutually exclusive nominal conditions, a vision that has deeply influenced the description of mental disorders in a categorical manner in all diagnostic manuals (Lahey et al., 2017). However, plenty of research suggests that these this disorders can be conceptualized within a dimensional and hierarchical structure of psychopathology (Forbes et al., 2016). It is even suggested that many genes pleiotropically influence the risk for multiple mental disorders (Kendler, 2005). Indeed, even the fifth edition of the Diagnostic and Statistical Manual (DSM-5; American Psychiatric Association [APA], 2013), suggests the existence of a large grouping of disorders rather than individual diagnostic categories. Hence, what has been defined as mental disorders would be an indicator of latent transdiagnostic spectra rather than discrete types (Carragher et al., 2015; Goldberg, 2015). In this context, different proposals have emerged to organize psychopathology as a hierarchical taxonomy (e.g., Achenbach et al., 2016; Krueger & Piasecki, 2002).

Nowadays, the model that currently generates the greatest consensus is The Hierarchical Taxonomy of Psychopathology (HiTOP; http://medicine.stonybrookmedicine.edu/HITOP). The HiTOP model (Kotov et al., 2017) hierarchize psychopathology on spectra (and superspectra), subfactors, syndromes, and traits/homogeneous components. In this regard, it considers the existence of six spectra: internalizing (or negative affectivity), thought disorder (or psychoticism), disinhibited externalizing, antagonistic externalizing, detachment, and somatoform (see Figure 1). Furthermore, this model has on the top of its vertex a super-spectra, which is consistent with the presence of a general psychopathology factor (Caspi et al., 2015; Lahey et al., 2011). At a subfactor level, an antisocial dimension is proposed, which is defined by the syndromes Attention Deficit Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder

(ODD), Conduct Disorder (CD), and Antisocial Personality Disorder (APD), blending elements of the disinhibition and antagonism spectra.

Highlighted, the term behavioral problems (BP) has been widely used as a synonym for oppositional and antisocial problems, both in clinical practice and in scientific literature (eg., Hukkelberg et al., 2019), and it is being used with this particular sense in the present survey. Despite several studies have supported components of a hierarchical model in youth (Achenbach et al., 2017; Laceulle et al., 2015; Lahey et al., 2011), the bulk of evidence to support the HiTOP model has come from adults (Ruggero et al., 2019). Therefore, there is an increasing need to better understand BP from a neurodevelopmental perspective.

Figure 1. *Hierarchical Taxonomy of Psychopathology*



Source: Prepared by the author based on the model proposed by Kotov et al. (2017). This figure only highlights the most relevant topics for this dissertation.

1.2 Behavioral Problems in Children and Adolescents

The term BP includes problems of aggressiveness, negativism, and impulsivity (Hukkelberg et al., 2019). Moreover, they constitute the most prevalent psychopathology in children and adolescents, being one of the most common reasons for referral to Mental Health Services (GBD2019, 2022), and they may be precursors of psychiatric disorders that occur in up to 60% of adults (Kim-Cohen et al., 2003). Several surveys on the trajectory of BP show that the majority of children and adolescents have low levels of BP over time, but there is a relatively small group (about 5%) that show high and stable levels of BP with a tendency to increase (Klingzell et al., 2016; López-Romero et al., 2015). Nowadays, it is known that the most chronic and severe patterns of antisocial behavior appear at an early age (Otto et al., 2021). Approximately 9-10% of the school-age population may exhibit some form of BP (APA, 2013; Gresham, 2015). Longitudinal and epidemiological studies have consistently show greater rates of boys displaying BP in comparison with girls (APA, 2013; Berkout et al., 2011), with the average ratio of males to females being approximately 5:1 (Young et al., 2010). It seems to be higher in urban areas and in lower social classes - although in recent years an increasing group of children and adolescents with behavioral disorders from a middle-high socioeconomic background is appearing - (Reijneveld et al., 2010; Rodríguez-Hernández & Barrau, 2012).

BP are classified in the DSM-5 (APA, 2013) under the chapter "*Disruptive, Impulse Control and Conduct Disorders*", including (ODD), (CD), Intermittent Explosive Disorder, APD, Pyromania, Kleptomania, and other specified and unspecified disruptive, impulse control and conduct disorders. However, the eleventh edition of the International Classification of Diseases (ICD-11) separates these diagnoses into three chapters, including ODD and CD under the chapter "*Disruptive Behavior or Dissocial Disorders*", APD (Dissociality) under the chapter "*Personality Disorder*", and the rest of disorders under the chapter "*Impulse control disorders*" (World Health Organization [WHO], 2018).

ODD and CD are the most common behavioral disorders in childhood and adolescence (GBD2019, 2022; Noordermeer et al., 2016). According to the DSM-5 (APA, 2013), ODD is

defined by a frequent and persistent pattern of irritable and angry mood, vindictiveness, and a developmentally inappropriate, negativistic, defiant, and disobedient behavior toward authority figures; in addition, the severity of its presentation must be specified (mild, moderate, or severe). Additionally, features of CD would be delineated by a persistent pattern of multiple antisocial behaviors during childhood and adolescence, including fighting, bullying, stealing, vandalism, and lying for personal gain, with different specifiers trying to delimit their presentation in more homogeneous groups: a) age of onset, using 10 years as the cut-off point (childhood-onset CD, adolescent-onset CD, and unspecified-onset [if age of onset is unknown]), b) severity (mild, moderate, or severe), and c) a new specifier -which captures the relevance of callous and unemotional traits- named "*with limited prosocial emotions* (LPE)". Their prevalence rate would range between 2 and 14 % for ODD and between 2 and 16 % for CD (Boylan et al., 2007; Loeber et al., 2000). Both disorders are more prevalent in boys than girls, with ratios ranging from 3:1 to 9:1 (Loeber et al., 2000).

Regarding comorbidities, ADHD is often a precursor to childhood-onset BP (Faraone et al., 2021; Villodas et al., 2012). Substance abuse is related to BP in adolescence (Copeland et al., 2013). Comorbid internalizing symptoms may be associated with BP (Mahendran et al., 2021). Thus, BP often co-occurs with major depressive disorder, particularly in girls, and it is also associated with anxiety (Angold et al., 1999). Noteworthy, the presence of any comorbidity worsens the course and prognosis of BP (Angold et al., 1999; Mahendran et al., 2021).

1.2.1 Developmental Pathways to Behavioral Problems

At least, three main pathways through which children and adolescents can develop BP have been suggested (Frick & Viding, 2009). The first and second group would be childhood-onset, often beginning to exhibit mild BP as early as in preschool age or the first years of elementary school, and tending to increase in frequency and severity throughout childhood and adolescence, though being more likely to exhibit these traits in adulthood. The difference between these two groups lies in the fact that the second group shows the presence of callous-unemotional traits, which are considered putative precursors of the affective dimension of adult psychopathy - and would delimit the appearance of a distinctive subgroup of childhood-onset, since these traits

designates an etiologically different group of children and adolescents with severe BP, more persistent and less responsive to conventional treatments (Frick et al., 2014). The third group would be adolescent-onset, and would not have exhibited behavioral problems prior to entering adolescence (Moffitt, 2003). Moreover, different causal mechanisms have been proposed; a dysfunctional transactional process for childhood-onset group, and an exaggeration of the normative process of rebellion for adolescent-onset (Moffitt, 2015). However, considering only the age of onset implies the existence of certain limitations, including the lack of consensus about using the 10 years mark as the cut-off point, and its appropriateness for girls as they tend to present a later onset (Konrad et al., 2022; Silverthorn et al., 2001). In addition, a considerable number of children in the childhood-onset group show a decreasing or desisting pattern in BP across time (e.g., Barker & Maughan, 2009).

For this reason, it is crucial to delimit a more homogeneous group with unique etiological mechanisms that are more likely to present BP, more severe and persistent in adulthood. In addition, besides the two traditional specifiers indicating age of onset and severity of the condition, the specifier LPE for CD in DSM-5 (APA, 2013) or/and ODD in ICD-11 (WHO, 2018) has recently been added. LPE delimits a group that presents lack of remorse or guilt, callous-lack of empathy, unconcerned about performance, and shallow or deficient affect, which correspond to the affective dimension of the multidimensional construct of psychopathy.

Furthermore, BP can be triggered by different vulnerabilities (i.e., equifinality; Cicchetti & Rogosch, 1996). Research regarding the etiology and development of BP has generated a large body of literature that highlights the great heterogeneity of children who present BP, which has suggested the existence of different etiologies and developmental trajectories (Fairchild et al., 2019a; Frick et al., 2014; Frick & Viding, 2009; Rosa-Justicia et al., 2022).

Highlighted, the etiology of BP is complex, with contributions from both genetic and environmental risk factors and different forms of interplay among the two (gene–environment interaction and correlation). Thus, surveys had estimated that heritability is estimated to range

from 5-74% (Wesseldijk et al., 2018), although at least 50% of the variance of BP could be attributed to environmental influences (Jaffee et al., 2012; Latimer et al., 2012).

1.2.2 Risk and Protective Factors Related to Behavioral Problems in Children

BP can be driven by different vulnerabilities, with risk or protective factors being present in a large number of cases (Moffitt & Scott, 2008). Research shows that some risk factors are more important than others, and although accumulation of factors is important, it does not necessarily determine the outcome (Torrubia & Molinuevo, 2014). Thus, the probability of appearance of BP as well as their severity would be proportional to the balance between risk factors and protective factors (Loeber & Farrington, 2000). The most relevant risk factors and protective factors are described below (Table 1).

1.2.2.1 Risk Factors

Risk factors are variables that show a predictive relationship with the appearance of BP, regardless of whether the association is causal or not. For a better understanding, risk factors have been grouped into three main categories: a) individual, b) parental and family, and c) environmental, external to the family.

Individual

Genotype. Proposed genes were related to serotonergic and dopaminergic neurotransmission (such as genes encoding the sodium - dependent serotonin transporter [SLC6A4], the catechol-O-methyltransferase enzyme [COMT], the monoamine oxidase A enzyme [MAOA] and the sodium-dependent dopamine transporter [SLC6A3]; Salvatore & Dick, 2018). Genes encoding the oxytocin receptor (OXTR), and the vasopressin V1a receptor (AVPR1A; Pappa et al., 2016; Veroude et al., 2016), or an important regulator of neurodevelopmental processes (RBFOX1; Fernàndez-Castillo et al., 2020) have been implicated. Genome-wide association studies (GWAS) show that many implicated genes are related to other psychiatric disorders (pleiotropy), and conditionally detected only when there is an interaction with other environmental variables (Fairchild et al., 2019).

Prenatal and perinatal injuries. Different prenatal injuries may act as risk factors in the development of BP, which include: maternal infection (Parker et al., 2016; Patel et al., 2021), use of alcohol (Popova et al., 2016), tobacco (Gaysina et al., 2013), other substances use (Ruisch et al., 2018), or maternal psychological stress (Barker & Maughan, 2009; MacKinnon et al., 2018) during pregnancy. Regarding perinatal injuries, the following are highlighted: the presence of obstetrical complications seem to increase the impact of other environmental risk factors (Lukkari et al., 2012), malnutrition, and exposure to heavy metals (Liu, 2011), or the presence of parental psychopathology (Barker et al., 2012).

Temperament, emotional deficits, and psychopathological problems. BP in childhood could be associated with the presence of a "difficult temperament", characterized by strong emotional reactivity, a deficit in the skills needed to adequately regulate emotional reactivity, or both (Frick & Morris, 2004). Nevertheless, children with childhood-onset BP who also exhibit callous-unemotional traits often display a distinct temperamental style, characterized by a preference for dangerous and novel stimuli, a reward-oriented response style, and a lack of reactivity to emotional stimuli that signify distress in others, and lack of empathy, being the latter in many respects antagonistic to the former (Frick & Viding, 2009). Overall, the effects of temperament are more consistently detected when combined with environmental risk factors, which increase the risk of BP if another psychopathology (i.e. ADHD) is also present (Torrubia & Molinuevo, 2014). In addition, considering the current knowledge about the relationship between callous-unemotional traits (i.e., precursors of the affective dimension of adult psychopathy) and BP, and despite this is the main topic that will be developed throughout this dissertation, we must point out that the presence of the other two dimensions encompassing psychopathy (i.e., behavioral and interpersonal) are also related to the presence of BP (Salekin, 2017).

Neuropsychological and cognitive deficits. BP are related to deficits in executive functions (EF; Wall et al., 2016), which define the capacity to achieve goals through appropriate effective actions. These deficits are suggested to be more evident in childhood-onset BP than in adolescence-onset BP (Moffitt, 2003), but some studies have questioned this point (Fairchild et

al., 2013; Fairchild, Van Goozen, et al., 2008; Roisman et al., 2010), showing a similar neuropsychological profile in both childhood- and adolescence-onset BP. Nevertheless, EF is a topic that will be developed in depth throughout this dissertation. Intelligence has been inversely correlated with BP (Kandel et al., 1988; Lynam et al., 1993; Nixon et al., 2017; Schwartz et al., 2015; White et al., 1989). Particularly, this statement is mainly obvious in verbal/language skills (Pajer et al., 2008). Furthermore, childhood-onset BP seem to be more strongly correlated to cognitive impairment (V. A. Johnson et al., 2015).

Neuroendocrinology and psychophysiology. Low basal cortisol levels had been associated traditionally with the presence of BP, but the accumulated evidence is inconsistent (Fairchild et al., 2019). There is consistent evidence that children and adolescents with CD or ODD show cortisol hyporeactivity to stress (Fairchild, van Goozen, et al., 2008; Popma et al., 2006). Research consistently shows that the presence of BP is associated with a low resting heart rate, as well as attenuated heart rate responses to stress (Portnoy & Farrington, 2015). In addition, lower resting skin conductance levels and reduced skin conductance responses to emotional stimuli have also been described (Herpertz et al., 2005), particularly during fear conditioning (Fairchild, Van Goozen, et al., 2008).

Parental and family

Parenting practices and styles. BP are clearly associated with maternal hostility, physical and emotional neglect, or low levels of parental warmth/sensitivity (Bellina et al., 2020; Pinquart, 2017; Yan et al., 2021). The relationship between parenting and BP tends to be bidirectional, which in turn translates into higher levels of BP (Garon-Carrier et al., 2022). Parental maltreatment is another important risk factor for BP (Norman et al., 2012), especially in children at high genetic risk (Jaffee et al., 2005).

Family risk factors. Lower socioeconomic status (SES) is one of the main environmental adversities, with a strong association with BP (Granero et al., 2015), being the strongest predictors low household income and low parental education (Reiss, 2013). Finally, the exposure to

conflicts, violence, or family psychological distress/ psychopathology (e.g., alcoholism) are factors that also influence the appearance of BP (Torrubia & Molinuevo, 2014).

External environmental

Other environmental risk factors include deviant peers, and community poverty (Fairchild et al., 2019). Likewise, the relationship between community violence and BP has been demonstrated (Kersten et al., 2017). In addition, a possible mediating role of the neighborhood where one lives has been observed (Boyle & Lipman, 2002; Kalff et al., 2001).

1.2.2.2 Protective Factors

Protective factors are variables that hinder or attenuate the process of BP development. There has been a historical tendency to study risk factors more than protective factors. Recently, research has increased knowledge about protective factors, which can also be classified into individual, familiar, and environmental factors outside the family. The most relevant ones are described below. Higher IQ seems to be a protective factor (Schwartz et al., 2015). However, some surveys found that intelligence was positively associated with conduct problems among youth with elevated psychopathic traits (McKenzie & Lee, 2015; Muñoz et al., 2008), and this may occur because behaviors characterized by psychopathy require adequate intellectual functioning (Salekin et al., 2004). Parental warmth has been associated with a decrease in conduct problems, even in adopted children (Paine et al., 2021). Moreover, interaction patterns between parents and children follow a dyadic system (Granic & Patterson, 2006), which is usually rated in terms of flexibility, and where such flexibility is often associated with reduced BP (van Dijk et al., 2017), and showing even a betterment when programs that improve flexibility are implemented (Granic et al., 2007). Teachers play a crucial role in the development of children and adolescents' socialization and emotional regulation by acting as important attachment figures (Baroncelli & Ciucci, 2020; Crum et al., 2016). Thus, according to Horan et al., (2016) a quality relationship between teachers and students acts as a protective factor.

Table 1.Risk and Protective Factors Related to Behavioral Problems in Children

RISK FACTORS
Individual
Genotype Prenatal and perinatal injuries Temperament, emotional deficits, and psychopathological problems Neuropsychological and cognitive deficits Neuroendocrinology and psychophysiology
Parental and family
Parenting practices and styles (e.g., physical, and emotional neglect, low parental warmth) Family risk factors (e.g., low SES, family psychopathology)
External environmental
Deviant peers Community poverty
PROTECTIVE FACTORS
Higher IQ Parental warmth External attachment figures

1.3 Psychopathic Traits in Childhood

Psychopathy is one of the most controversial clinical entities in psychiatry due to conceptual and terminological confusion (Torrubia & Cuquerella, 2008), to such an extent that it has managed to generate intense debates in the scientific field about what is and what is not psychopathy (Skeem et al., 2011). In adulthood is described as a syndrome comprising a constellation of traits that include interpersonal, affective, lifestyle and antisocial behaviors (Hare & Neumann, 2008). Characteristics such as superficial charm, manipulation, egocentrism, insensitivity, lack of remorse or empathy, impulsivity and irresponsibility are widely accepted (Somma et al., 2016). Nevertheless, there is still a vigorous debate as to whether psychopathy should be conceptualized as a construct of four interrelated dimensions (interpersonal, affective, irresponsible lifestyle, and antisocial behavior) or just of three dimensions excluding antisocial

behavior as it is considered a consequence of the others (Cooke & Michie, 2001; Neumann et al., 2007). The construct of psychopathy has been extended downwards to youth populations with a burgeoning line of research that has made great progress over the past two decades and confirm the presence of temperamental traits early in development that can be precursors of adult psychopathy (Colins et al., 2014; Ezpeleta et al., 2013; Frick et al., 2000). Nonetheless, the use of the term "psychopathy" in childhood or adolescence is doubtful, owing to the pejorative connotations, the malleability of the personality at these ages, as well as the risk of negative consequences in the choice of treatment, being preferred the use of the expression "psychopathic traits" (Forth et al., 2003).

Psychopathic traits in childhood could be conceptualized as a multidimensional construct, with at least three dimensions that somehow resembles the construct in adulthood (Colins et al., 2014; Frick et al., 2000). It includes an interpersonal dimension (i.e., lying, manipulation, deceitfulness, dishonesty, grandiosity, and glibness/superficial charm), an affective dimension (i.e., lack of empathy, callousness, shallow affect, failure to accept responsibility for one's own actions, and lack of guilt or remorse), and a behavioral/lifestyle dimension (i.e., impulsivity, need for stimulation, sensation seeking, proneness to boredom, parasitic lifestyle, lack of realistic long term goals, and irresponsibility). These traits do not emerge suddenly in early adulthood but have roots in childhood and adolescence (DeLisi, 2016; Frick et al., 2014), with some evidence suggesting that psychopathy should be understood as a neurodevelopmental disorder (Blair, 2010; Lynam et al., 2007), where adult psychopathy likely show its preliminary manifestations early in development (Frick & White, 2008; Ribeiro da Silva et al., 2020). Indeed, it is well known that psychopathic traits can be detected since early ages (i.e., 3 to 6 years old; Colins et al., 2014; Ezpeleta et al., 2013; Salekin, 2016).

As mentioned in a previous section, the LPE specifier -related to the affective dimension of psychopathic personality- has been included in the international classification systems of mental disorders (APA, 2013; WHO, 2018). However, some authors consider that it is insufficient (e.g., Salekin, 2017), and that the other two dimensions of psychopathy (interpersonal and

behavioral) may be relevant in the explanation of children and adolescent BP. The presence of psychopathic traits, especially those related to the affective dimension -termed callous-unemotional traits-, help to distinguish a group of children with more persistent BP and with worse response to conventional treatments (Frick et al., 2014; Longman et al., 2016). Nevertheless, not all children with these traits exhibit BP (Fanti, 2013; Hadjicharalambous & Fanti, 2018; Rowe et al., 2010), nor callous-unemotional traits are synonymous with psychopathy.

There is a burgeoning line of research that expands knowledge about these two less studied dimensions in their relationship with BP profiles and trajectories on childhood, conducted in different countries and samples, showing positive relationships with external correlates such as ADHD symptoms, reactive and proactive aggression, as well as a negative correlation with prosocial behavior (e.g., Colins et al., 2014; López-Romero, Maneiro, et al., 2019; Somma et al., 2016; Wang et al., 2018). Some surveys have suggested that children who scoring high in all psychopathic dimensions may present a profile of greater vulnerability of BP (Colins et al., 2020; Colins, Andershed, et al., 2018), even in our environment (López-Romero et al., 2020, 2021). In fact, López-Romero and colleagues (2021) found five latent class groups in a community sample of preschoolers: 1) control group (39.2 % of the whole sample), 2) high scores on interpersonal traits (16.5 %), 3) high scores on callous-unemotional traits (6.2%), 4) high scores on behavioral traits (34.8%), and 5) high scored in all three dimensions of psychopathy– named putative psychopathic personality- (3.3%), suggesting that the latter group has a similar percentage that adulthood psychopathy, corresponding to those who are found to be at the highest risk for concurrent, future, and stable BP, aggression, and lack of prosocial behavior.

The study of the stability of psychopathic traits from preschool age until adulthood is critical in order to ascertain their malleability throughout developmental stages (López-Romero et al., 2014). Thus, different studies from preschool age to adolescence show a moderate temporal stability (Salekin, 2017). Indeed, callous-unemotional traits (the most studied dimension) are fairly stable in childhood, but there is substantial variability in the level of stability, that depends

on the source of information, being more stable whether parents are the source of information (Frick et al., 2014). Overall, psychopathic traits in children are moderately stable through lifespan.

1.3.1 Risk and Protective Factors Related to Psychopathic Traits in Children

Emerging research on psychopathic traits in childhood has provided increasing evidence about the correlates related to each of the dimensions that comprise the syndrome. Thus, it is suggested that the dimensions could be rooted in distinct underlying etiologic-dispositional factors with differentiated developmental pathways and different psychosocial correlates (Herpers et al., 2014; Molinuevo et al., 2014; Salekin, 2017). Similarly to BP, we find both risk and protective factors (Table 2).

1.3.1.1 Risk Factors

Individual

Genotype. Twin studies have shown that psychopathic traits are moderately to strongly heritable (Moore et al., 2019; Viding et al., 2005). In fact, Tuvblad and colleagues (2017), showed in early childhood that genetic influences accounted for 57, 25, and 74 % of the phenotypic variance for interpersonal, callous–unemotional and behavioral, respectively; shared environmental factors accounted for 17, 48, and 9 % (n.s.), and non- shared environmental factors (including error) accounted for the remaining variance, 26, 27, and 17 %, respectively. In addition, it is also possible that specific genetic variants may interact with some environmental factors (in particular early adversity) in order to explain the development of psychopathic traits (Blair, 2013). At the molecular genetical level, Sadeh et al., (2010) found increased interpersonal traits and callous-unemotional traits in adolescents homozygous for the long allele on the serotonin transporter gene (SLC6A4), but it was only observed for those with lower SES.

Prenatal and perinatal adversity. Maternal prenatal risk (e.g., psychopathology, criminality, substance use) has been identified as a risk factor on the development of psychopathic traits (Barker et al., 2011; Gao et al., 2017; Wright et al., 2019). In this regard, Wright and colleagues (2019) suggested that elevated maternal cortisol was associated with lower child callous-unemotional traits in girls, but not in boys.

Temperament. The broad construct of psychopathy is related with low conscientiousness and low agreeableness in adolescents (e.g., Lee et al., 2010), or reward responsiveness, and social dominance in children and youths (e.g., Andershed et al., 2002; Frick et al., 1999; Roose et al., 2011; Sadeh et al., 2009). At dimensional level in children, interpersonal traits are related with low agreeableness but higher conscientiousness, callous-unemotional traits are related with low conscientiousness and low agreeableness, and behavioral traits show negative association with both agreeableness and conscientiousness (Hawes et al., 2014). Furthermore, increased risk-taking in children with psychopathic traits has also been suggested when compared with other children with BP (Salekin, 2017).

Emotional deficits. Evidence suggests that psychopathic traits are associated with some emotional deficits (i.e., deficits in facial affect, detection of distress cues, fear conditioning or empathic concern), but no pathognomonic signs or symptoms have been identified (e.g., Blair & Coles, 2000; Dadds et al., 2009; Fairchild et al., 2010; Ivanova-Serokhvostova et al., 2022)

Neuropsychological and cognitive deficits. Surveys have suggested an alteration in some functions of the amygdala and its related areas, and potential low connectivity between the amygdala and prefrontal cortex, similar to findings in adulthood (Salekin, 2017). At dimensional level, analyses suggest that interpersonal traits are less associated with brain abnormalities than callous-unemotional and behavioral traits (Aghajani et al., 2016; Cohn et al., 2015). The broader construct of psychopathy seems to be unrelated with lower intelligence as does BP (Salekin, 2017), although as mentioned above, some findings suggested that intelligence was positively associated with conduct problems among youth with elevated psychopathic traits (McKenzie & Lee, 2015; Muñoz et al., 2008). Finally, the emerging research on the relationship between psychopathic traits and executive functions in childhood is scarce and has yielded contradictory results (e.g., Graziano et al., 2019; Wall et al., 2016; Waller et al., 2017) although this topic will be developed in the following section.

Psychopathological problems. Relationship between psychopathic traits and the externalizing pole is well established, both in children and adult populations (De Brito et al., 2021; Marcus et al., 2019; Salekin, 2017). Unraveling psychopathy dimensions, behavioral traits have

been related to reactive aggression (Fite et al., 2009), and interpersonal traits with both, reactive and proactive aggression, as well as bullying and cyberbullying (Muñoz Centifanti et al., 2013; Orue & Calvete, 2019). Lastly, the relationship between callous-unemotional traits and more severe and stable BP and antisocial behavior has been widely studied (Frick et al., 2014), as well as their strong correlation with low prosocial behavior (Waller et al., 2020). Nevertheless, evidence about the relationship between psychopathic traits and other forms of psychopathology in childhood is scarce and less consistent compared to the externalizing ones. For example, research in children had suggested that callous-unemotional traits can co-occur with elevated levels of anxiety symptoms (Humayun et al., 2014). At dimensional level, another study in childhood found that callous-unemotional and behavioral traits were related with high levels on neuroticism and interpersonal traits were related with low levels on neuroticism (Hawes et al., 2014). In adults and youth, there appear to be two distinct groups of persons with a high level of psychopathic traits but with differing levels of anxiety, also referred to as variants (i.e., primary and secondary; Craig et al., 2021; Frick et al., 1999; Goulter et al., 2021; Huang et al., 2020; Humayun et al., 2014; Kahn et al., 2013; Mahendran et al., 2021), but in children, this topic, has been less studied.

Neuroendocrinology and psychophysiology. Although it is difficult to draw firm conclusions, one study suggested that boys with elevated psychopathic traits showed greater levels of coupling between testosterone, cortisol, and DHEA, whereas boys with elevated callous-unemotional traits alone showed greater levels of uncoupling of the three hormones (Johnson et al., 2014). Another survey found a significant negative correlation between cortisol and interpersonal and behavioral traits in girls (Stoppelbein et al., 2014). Furthermore, peripheral nervous system research has shown some irregularities in children with psychopathic traits. Thus, interpersonal traits were associated with low skin conductance response, and behavioral traits with low heart rate, but it is not yet entirely clear which component dimension will yield replicable findings (Salekin, 2017).

Family

Parenting practices and styles/ Family risk factors. A wide range of risk factor in this area may be involved in the development or maintenance of psychopathic traits, among which we highlight, disrupted family functioning (Roberts et al., 2018), parenteral harshness (Salihovic et al., 2012; Waller et al., 2012; Yeh et al., 2011), disorganized parent–child attachment (Pasalich et al., 2012), and negative parental emotion (Waller et al., 2013). Parenting stress has correlated with interpersonal and callous-unemotional traits in children (Fite et al., 2008), as well as ineffective parenting practices as inconsistent discipline and poor monitoring/supervision are correlated with behavioral traits (Molinuevo et al., 2014). Similarly, a recent meta-analysis found a moderate link between any type of child maltreatment and psychopathic traits, although this was stronger for the behavioral dimension (de Ruiter et al., 2021). Moreover, both parenteral harshness and low parental warmth mediate the relationship between interpersonal-affective traits in parents with callous-unemotional traits in youths (Dotterer, Burt, et al., 2021). Noteworthy, within a gene-environment framework, MAOA polymorphism moderates the impact of parenting practices on the risk of callous-unemotional traits in preschoolers (Pueyo et al., 2021).

1.3.1.2 Protective Factors

As with BP, protective factors associated with psychopathic traits are an understudied area. Thus, warm, responsive, and consistent parenting has been associated with a reduced risk of antisocial behavior and psychopathy (Clark & Frick, 2018; Waller et al., 2013). In this regard, parenting programs have shown a clinical value not only in reducing problematic behavior in children with high psychopathic traits (Kimonis et al., 2019), but also in favoring a significant reduction in all affective, interpersonal, and behavioral features of psychopathic personality (McDonald et al., 2011).

Table 2. Risk and Protective Factors Related to Psychopathic Traits in Children

RISK FACTORS
Individual
Genotype Prenatal and perinatal injuries Temperament Emotional deficits (i.e., deficits in facial affect, detection of distress cues, fear conditioning or empathic concern) Psychopathological problems Neuropsychological and cognitive deficits Neuroendocrinology and psychophysiology
Parental and family
Parenting practices and styles (e.g., parenteral harshness, disorganized parent–child attachment, inconsistent discipline, low parental warmth maltreatment) Family risk factors (e.g., low SES, family psychopathology)
PROTECTIVE FACTORS
Parenteral warm Responsive, and consistent parenting

1.3.2 Measurement of Psychopathic Traits in Childhood

The fact that the construct of psychopathy has been extended downwards to child and adolescent populations implies the need for reliable, validated, and objective assessment instruments in order to continue expanding knowledge about it. In this regard, Forth and colleagues (1990) were the first to examine systematically psychopathic traits in adolescence, and based on the most widely used tool for clinical assessment and empirical research on adult psychopathy -*the Psychopathy Checklist-Revised* (PCL-R; Hare, 1991, 2003) - they developed the *Psychopathy Checklist: Youth Version* (PCL: YV), an instrument that captures from a multidimensional perspective the four dimensions of adult psychopathy (Interpersonal, Affective, Behavioral, and Antisocial), with 20 items rated on 3- point Likert scale (0 = *No; 1 = Maybe; 2 = Yes*), in adolescents aged 12-18 (Forth et al., 2003; Forth et al., 1990).

Lynam (1997) developed the *Child Psychopathy Scale* (CPS) a self- and parent- reported, 55- item tool, rated dichotomously (0 = *No*; 1 = *Yes*) for adolescent aged 12 or more. CPS shows a two-factor structure (Factor 1 interpersonal/affective; Factor 2 behavioral/antisocial) consistent

with the two-factor model of the PCL-R (Lynam, 1998). Nevertheless, the extremely high correlations between the factors indicated that they were indistinguishable, thus, CPS is usually used as a one factor instrument.

Similar to PCL: YV was the development of the *Antisocial Process Screening Device* (APSD; Frick & Hare, 2001), being another adaptation of the PCL-R. The APSD consists in a 20-item questionnaire, rated on a 3- point Likert scale (0 = *Not all true; 2 = Definitely true*), designed to be completed by parents, teachers (age range 6- 13 years) and self-report (age range 13-18years) with good fitting for a three-factor model (Narcissism or Interpersonal, Callous-Unemotional and Impulsivity; Dong et al., 2014; Hawes et al., 2014).

The research with the APSD revealed that callous-unemotional traits was the dimension that allowed to better discriminate a group of children and adolescents at higher risk of BP (Frick & White, 2008). Therefore, the *Inventory of Callous- Unemotional Traits* (ICU) was developed to measure these traits more comprehensively (Frick, 2003). This tool, that captures three facets of the affective dimension (Callousness, Uncaring, and Unemotional), includes 24 items coded on a 4- point Likert scale (0 = *Not all true;* 3 = *Definitely true*), and there are parents, teachers, and self-report versions.

Lastly, the *Youth Psychopathic Traits Inventory* (YPI; Andershed et al., 2002), is a self-report instrument, with 50-item coded on a 4-point Likert scale (1 = *Does not apply at all;* 4 = *Applies very well*), aimed to evaluate psychopathic traits in youth aged 12- 18 years through three dimensions (Interpersonal, Affective, Behavioral); moreover a simplified version for children between 9 and 12 years old of the YPI is also available (Van Baardewijk et al., 2010).

However, to the best of our knowledge none of them has been designed to meet two principles together: to be applicable in early childhood and to contemplate the three dimensions of the psychopathy construct previously mentioned in a developmental appropriate manner (Colins et al., 2014; Somma et al., 2016). In a way that closely resembles how it is often conceptualized in adolescence and adulthood, Colins et al., (2014), developed *the Child Problematic Traits Inventory* (CPTI), providing a multidimensional psychometric assessment of psychopathic traits from early childhood onward. This instrument consists in 28 items rated on a

4- point Likert scale (1 = *Does not apply at all;* 4 = *Applies very well*), that load on three theoretically proposed dimensions (interpersonal, callous-unemotional, and behavioral). Although it was primarily developed to be a teacher-reported measure, some surveys have also tested its psychometric properties when reported by parent/primary caregiver [1](Colins et al., 2020; López-Romero, Maneiro, et al., 2019; Luo et al., 2019; Somma et al., 2016; Wang et al., 2018).

1.4 The Role of Executive Functions for Understanding Behavioral Problems

As has been outlined in previous sections, there are other cognitive processes (i.e., EF) closely related with both BP and psychopathic traits. However, the relationship between EF, psychopathic traits, and BP in childhood is an understudied area. Therefore, it is worthwhile to pause to describe what EF are, how to measure them, as well as the current knowledge available on their relationships with the other two topics.

1.4.1 Definition and Assessment of Executive Functions

EF encompasses higher order cognitive processes, which regulate goal-oriented, efficient, and adaptative behavior (Diamond, 2013), playing a fundamental role in flexibly adapting to changing circumstances (Zelazo, 2020), and it is crucial in self-regulation of behavior and emotions (Carver et al., 2017). Highlighted, EF follows a relatively protracted developmental course, improving throughout childhood and beyond into adulthood (Anderson, 2002; Anderson, 2018). By consensus, it has been established that there are three core EF (Lehto et al., 2003; Miyake et al., 2000): inhibition (inhibitory control, including behavioral inhibition, selective attention and cognitive inhibition), working-memory, and cognitive flexibility. From these, higher-order EF are built such as reasoning, problem solving, and planning (Collins & Koechlin, 2012; Lunt et al., 2012).

Moreover EF, can also be categorized into cold EF, which are purely cognitive tasks (e.g., working memory, inhibition, metacognition), and hot EF, which involve affective or motivational

[1] The term CPTI parent-reported version will henceforth be used to refer to both parents, and primary caregiver.

components (e.g., behavior regulation, emotion regulation; De Luca & Leventer, 2008; Zelazo & Müller, 2010). Neuroimaging findings suggest that hot EF would have greater involvement than cold EF in the occurrence of BP (Noordermeer et al., 2016). However, this is a fuzzy distinction, since both work together as part of a more general adaptive function, and there is considerable overlap between the underlying neural systems (Zelazo & Carlson, 2012). In fact, executive dysfunction can be usefully considered as a transdiagnostic indicator of atypical development in general, being a common consequence of many different types of developmental disturbance and being implicated in different psychopathological disorders (Zelazo, 2020).

No "gold standard" for EF measurement is available (Royall et al., 2002). Traditionally, the measurement of EF has used performance tasks, whose validity is assessed in terms of their sensitivity to frontal damage (Miyake et al., 2000). This fact implies that many EF tasks have uncertain validity because they involve complex, multifaceted tasks that draw on both executive and non-executive processes (Chan et al., 2008). In this context, EF assessment scales were developed to provide an ecologically valid indicator in complex, daily situations (Gioia & Isquith, 2004). Both kind of measures provide different and complementary types of information and are useful and valuable (Toplak et al., 2013).

1.4.2 Relationship between Psychopathic Traits and Executive Functions

Psychopathic traits have also been linked to EF and both, at the neurobiological level, have been associated with impairments in the prefrontal cortex, suggesting overlapping brain areas (Blair, 2007; Finger et al., 2008). Meta-analyses examining the callous-unemotional/psychopathic traits domain within older adolescents and adults indicated that higher callous-unemotional/psychopathic traits were associated with less EF deficits (Morgan & Lilienfeld, 2000; Ogilvie et al., 2011). Nonetheless, some authors had suggested that these findings refer more to antisocial behavior than to psychopathic traits per se, adding that some dimensions of psychopathy (i.e., behavioral/lifestyle dimension) are more related to EF (e.g., inhibitory control) deficits than the other two psychopathy dimensions (Baskin-Sommers, Brazil, et al., 2015; Friedman et al., 2021). On the other hand, research in adults of successful

psychopaths (individuals who manifest basic psychopathic traits but manage to stay out of the criminal justice system), suggests that they would exhibit intact or superior executive functions. In addition, according to this hypothesis, deficits in EF would be more closely linked to the antisocial dimension of psychopathy, whereas successful psychopaths would stand out for their high EF scores in the interpersonal dimension.(Gao et al., 2020; Glenn & Raine, 2020).

The link between EF and psychopathic traits in childhood, is an understudied area. Additionally, the emerging research in childhood, mainly focusing on the study of callous-unemotional traits, has yielded contradictory results. On the one hand, there are studies that have shown an association between callous-unemotional traits and executive disfunction. For example, some works found in a community preschool sample (EF rated by assessment scales; Ezpeleta et al., 2013), a high-risk preschool sample (EF assessed by performance tasks;
Waller et al., 2017), and in a community sample of boys from a trade school (EF rated by assessment scales; Platje et al., 2018), that children with higher scores in callous- unemotional traits had worse EF. On the other hand, one study in a community sample of elementary school children (EF rated by assessment scales; Wall et al., 2016), found that higher scores in callous-unemotional traits in the absence of high levels of BP were associated with better EF, although the group scoring higher in callous- unemotional traits and BP was the one with the highest executive dysfunction; in another sample of community children (EF assessed by performance tasks; Thomson & Centifanti, 2018), better EF were associated with elevated callous-unemotional traits and an increased likelihood of proactive and reactive aggression. Finally, there are examples of different results within the same study, according to the methodology used to measure EF (EF assessed by both, performance tasks and assessment scales;
Graziano et al., 2019); thus, in a referred to treatment sample of preschoolers with externalizing problems it was found no association between callous-unemotional traits and EF problems as rated by parents/teachers. Nevertheless, exploratory analyses suggested a positive link between callous-unemotional traits and EF as children classified in the high BP/high callous- unemotional group had better EF performance on standardized neuropsychological tasks compared to those classified in the high BP/low callous- unemotional group.

1.4.3 Relationship between Behavioral Problems, Psychopathic Traits and Executive Function

As described above, both psychopathic traits (Salekin, 2017) and executive dysfunction (particularly in inhibitory control and cognitive flexibility; Ellis et al., 2009; Frick & Viding, 2009; Yang et al., 2022) show a strongly association in the development of BP. Indeed, beyond identifying the key factors involved in the onset of BP in childhood, the underlying processes that lead to trajectory variability should be explored.

Thus, some studies found that EF moderated the association between CU traits and BP, but in different way. Waller et al (2017) found in a longitudinal high-risk sample that better EF (assessed by performance tasks) in children with elevated CU traits were associated with less severe BP. Thomson & Centifanti (2018) in a community sample of children aged 9-11, and Baskin-Sommers, Waller, et al (2015) in a high-risk sample of adolescent males, found that a better developed EF facilitated more sophisticated BP; in both surveys EF were assessed by performance tasks . Other study that examined the longitudinal effects of child CU traits at age 5 on social competence -a term that captures BP- at age 8 in a community sample, found that there was a moderating effect of EF (rated by assessment scales) but only as a trend, indicating that the association between CU traits and social competence was only significant for children with worst EF (Kim & Chang, 2019). However, Rizeq and colleagues (2020) did not find a moderating role for EF (assessed by both, performance tasks and assessment scales) in a mixed sample of children between 8 and 12 years old.

Furthermore, there are studies that have investigated the moderating effect of CU traits on the relationship between BP and EF; thus, in a sample of community adolescent twins, where EF were assessed by performance tasks (Dotterer, Tomlinson, et al., 2021), the findings suggest participants with BP and high levels of CU traits show worst EF; similar results were obtained by another study that mixed typically developing and high-risk children aged 6-12, and assessed EF by performance task (Waschbusch et al., 2022). From an alternative perspective, in a mixed preschool sample (Georgiou et al., 2019), findings showed a mediating role of cognitive empathy

- which can be defined as a hot EF (Nemeth & Chustz, 2020) - in the relationship between CU traits and conduct problems but these findings were not replicated for overt and relational aggressive behavior. Lastly, in a study of a young adult twin community sample (Friedman et al., 2021), a mediating role of the INS dimension of psychopathy in the relationship between EF (assessed by performance tasks), and antisocial behavior was found.

Noteworthy, most of the research on BP, EF and psychopathic traits in children and adolescents has only contemplated CU traits and thereby, to further study the relevance of the other two dimensions of psychopathy would be interesting. In addition, the assessment of EF has been mostly done with standardized tasks, so we might miss the day-to-day performance of them (Gioia & Isquith, 2004).

1.5 Justification of the Current Dissertation

Problems of aggressiveness, negativism, and impulsivity – named Behavioral Problems (BP) - could be considered a subfactor that blends elements of the disinhibition and antagonism externalizing spectra, which are two of the six spectra into which psychopathology can be divided, following a hierarchical taxonomy (Kotov et al., 2017). BP constitute the most prevalent psychopathology in children and adolescents, being one of the most common reasons for referral to Mental Health Services (GBD2019, 2022).

Therefore, understanding the factors that influence different BP courses and prognosis, especially those with more persistent BP and with worse response to conventional treatments, is essential to develop appropriate prevention and treatment programs (Rizeq et al., 2020). Scientific evidence has corroborated the importance of two of these factors for the onset and later development of BP: on the one hand the presence of psychopathic traits (Frick et al., 2014; Longman et al., 2016; Salekin, 2017), with the recent inclusion of the LPE severity specifier for CD and/or ODD in the main international classification systems (APA, 2013; WHO, 2018) and, on the other hand, the presence of executive dysfunction (Yang et al., 2022).

Psychopathic traits in childhood can be conceptualized as a multidimensional construct, with at least three dimensions that are part of a syndrome, resembling the psychopathy construct in

adulthood (Colins et al., 2014; Salekin, 2017). Whereas some authors have focused on the study of CU traits in isolation (Frick, 2022), other authors focused in a multidimensional view of psychopathy, with the assumption that this view could better inform developmental models aiming to explain heterogeneity in child BP (Colins et al., 2014; Frogner et al., 2018; López-Romero et al., 2020). In fact, there is heuristic value in studying components of the psychopathy construct in isolation from one another, as well as in combination as part of a global construct (López-Romero et al., 2021). Hence, some authors (e.g., Lilienfeld, 2018) suggest that the complete constellation of traits is better than just the callous-unemotional traits in the statistical prediction of external correlates, with each of the dimensions interacting statistically in such prediction; in addition, each dimension would have its own external correlates. However, although the multidimensionality of psychopathy in childhood may have utility and implications in the typification of BP, there is still no accepted theoretical framework that specifies what are the necessary and specific conditions for defining psychopathy in childhood (Frick, 2022).

Even though there are several measures for assessing psychopathic traits in childhood and adolescence, there are also some limitations in their applicability (e.g., not developmentally appropriate for early childhood, lack of internal consistency for some subscales, focus in just one dimension; Ribeiro da Silva et al., 2020). In this regard, the CPTI (Colins et al., 2014) has been designed to meet two principles together: to be applicable in early childhood and to contemplate the three dimensions of the psychopathy construct (i.e., interpersonal, affective and behavioral) in a way that closely resembles how it is often conceptualized from the three-factor model of psychopathy in adolescence and adulthood (Andershed et al., 2002; Blaauw & Sheridan, 2002; Cooke & Michie, 2001). Several studies have confirmed that it is a psychometrically sound measure, in different countries (i.e., Sweden, Italy, Netherlands, China, and Spain), samples, and whether it is scored by parents or teachers (e.g., Colins et al., 2016, 2018, 2020; López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019; Somma et al., 2016; Wang et al., 2018). The CPTI has even been used in research on the genetic and environmental basis of psychopathic traits in children (Tuvblad et al., 2017). Nevertheless, the model fit seemed to be less optimal in girls than in boys when parents' reports are examined (Wang et al., 2018), and the

average ratings were, overall, higher in boys (e.g., López-Romero, Molinuevo, et al., 2019; Wang et al., 2018). Furthermore, it should be noted that all prior CPTI studies but one (i.e., Colins et al., 2020) tested the CPTI in community-based samples. Indeed, despite the good results, there is a claim for further evaluation of these properties in different samples (i.e., community, at-risk, and referred) and environments.

On the other hand, the research of the relationships between psychopathic traits in children and other forms of psychopathology is scarce compared to externalizing ones. Thus, some surveys (Hawes et al., 2014; Humayun et al., 2014) link high levels of anxiety to CU and INS traits, as well as GD traits to low levels of anxiety. In fact, the predictive capacity of psychopathic traits for other forms of psychopathology (e.g., internalizing disorders) remains unclear.

As noted above, EF are crucial in self-regulation of behavior and emotions (Carver et al., 2017). Indeed, in early stages of development, there is less maturation of the prefrontal cortex, linked to EF. The normal developmental process is completed throughout childhood and adolescence to early adulthood, with individual differences (e.g., genetic, environmental). Thus, executive dysfunction may be a common consequence of many different perturbations of the epigenetic process (Zelazo, 2020; Zelazo & Müller, 2010). Indeed, these differences may help to better understand the development and trajectories of BP. Moreover, research on the extent to which either hot or cold executive dysfunction is associated with BP seems to point to a greater influence of hot EF (Noordermeer et al., 2016). Yet, its study in childhood has been scarce and mainly focused on EF performance tasks assessment, which may not be reflecting complex, daily situations (Gioia & Isquith, 2004).

Highlighted, the emerging research in childhood, by these three topics (i.e., BP, psychopathic traits and EF), is scarce, mainly focusing on the study of CU traits. Most of them has attempted to examine the extent to which psychopathic traits and EF interact in the prediction of BP (i.e., under what circumstances the effects occur; Dotterer et al., 2021; Ezpeleta et al., 2013; Graziano et al., 2019; Platje et al., 2018; Thomson & Centifanti, 2018; Wall et al., 2016; Waller et al., 2017; Waschbusch et al., 2022). It would be interesting to analyze whether other types of effects occur

in the relationships analyzed (i.e., indirect, or mediated effects), since to the best of our knowledge only one study has examined this point and used empathy and not EF (Georgiou et al., 2019), so further research is needed.

In conclusion, the current dissertation was designed aimed to expand the knowledge to the above-mentioned topics through two different studies. For this purpose, and mainly focusing on an at-risk sample, we used a multidimensional approach to assess psychopathic traits and chose to evaluate EF by reported assessment scales, to reflect their daily performance.

CHAPTER 2:

Aims and Hypotheses

2.1 Aims and Hypotheses

This doctoral thesis was aimed to expand the literature about the relationship between BP and psychopathic traits, and the role of EF in this relationship within a community sample, and an at-risk for psychopathology subsample of children aged 5 to 12 years with a multidimensional model of psychopathy (Salekin, 2017). To this end, the main objectives were a) testing the psychometric properties of the Spanish parent-reported version of the CPTI, b) analyzing the association between psychopathic traits and risk for psychopathology, and c) studying the relationship between psychopathic traits, EF, and BP. Data used in this dissertation is part of a larger research project called INSchool, aiming to identify children and adolescents 'mental health problems in a school setting (Bosch et al., 2021; Español-Martín et al., 2021).

To achieve these goals, two studies were carried out, and more precisely, the following general and specific aims were set out for this doctoral thesis:

1. Further validate the Spanish parent- reported version of the CPTI (Colins et al., 2014; López-Romero, Molinuevo, et al., 2019) in a community sample (Study 1):
    1.1. To examine the model fit for the proposed three factor structure, as well as its measurement invariance across gender.
    1.2. To examine the reliability, convergent and discriminant validity of the Spanish parent-reported version of the CPTI with other well validated measures of externalizing and internalizing psychopathology.
2. Exploring to which extent the CPTI dimensions discriminate between healthy community children and children at risk for psychopathology, allowing to particularly identify children within the externalizing pole as compared to children with other psychopathology conditions (e.g., internalizing) and controls (Study 1).
3. Examining whether there is a direct effect of psychopathic traits on EF (Study 2).
4. Analyzing whether there is a direct effect of EF on BP (Study 2).
5. Exploring the potential mediating role of EF in the relationship between psychopathic traits and BP (Study 2).

The general and specific hypotheses were the following:

1. The Spanish version of the CPTI will present adequate psychometric properties of reliability and validity to assess psychopathic traits in childhood samples (Study 1).
    1.1. The three-factor model of the CPTI will show acceptable to good model fit indices and will be invariant across gender.
    1.2. Internal consistency values will be good to excellent for all the CPTI dimensions.
2. The CPTI total will positively correlate with variables such as ADHD symptoms and conduct problems, and negatively with prosocial behavior (Study 1).
    2.1. At a dimensional level, all CPTI dimensions will be positively related to behavioral problems.
    2.2. Once the effect of the other two dimensions will be controlled for, it is expected that GD traits will be more related to aggressive behavior, CU traits will be inversely related to prosocial behavior, and INS traits will show a close association with inattentive and hyperactive behaviors.
    2.3. Due to the scarcity of research on other forms of non-externalizing psychopathology in children, no specific predictions regarding the associations with psychopathy dimensions were made.
3. Psychopathic traits will discriminate between children at risk for psychopathology and healthy children, and in particular it would discriminate externalizing problems from the rest of conditions (Study 1).
4. Psychopathic traits will be related to higher executive dysfunction (Study 2).
5. Poorer EF will be related to BP (Study 2).
6. EF will mediate the relationship between psychopathic traits and BP (Study 2).

CHAPTER 3:

Method and Results

STUDY 1

Further Validation of the Spanish Parent-Reported Child Problematic Traits Inventory: Discriminant Validity for Distinguishing Children Vulnerable to Externalizing and Other Psychopathology Conditions

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Abstract

The Child Problematic Traits Inventory (CPTI) is a relatively new tool for measuring psychopathic traits in early development mainly applied in community samples. The main purpose of the present study was to provide further validation of the parents' version of the CPTI in the Spanish context. In a first phase, the study examined (a) the factor structure and the invariance across gender, (b) the internal consistency, and (c) the convergent and divergent validity of the CPTI in a community sample of 1,387 children (48.1% girls) aged 5-12 years (*M*=8.27; *SD*=2.17). In a second phase, the study tested the capacity of the CPTI to discriminate between normal and two clinical conditions (i.e., externalizing versus other psychopathological problems) in a subsample of 678 at-risk children (46.2 % girls), aged 5-12 years (M = 8.38; *SD* = 2.25), preselected according to psychiatric measures and clinical judgment. The Spanish parent version of the CPTI confirmed a three-factor structure, being invariant across gender, with an adequate internal consistency, and a consistent relationship with delinquent and aggressive behavior. The associations with external variables differed according to each CPTI dimension. In addition, the CPTI discriminated children at risk for externalizing disorders from children with other psychopathology conditions (internalizing and learning disorders) and from healthy children. In sum, the CPTI holds up as a promising measure to assess psychopathic traits in childhood from a multidimensional perspective and, therefore, would open new ways to study diverse etiological pathways leading to the development of psychopathy in children.

Keywords: Psychopathy, CPTI, conduct problems, externalizing problems, assessment, children.

Introduction

Psychopathy is usually described as a syndrome comprising a constellation of concurrent personality traits being captured under at least three dimensions: interpersonal (e.g., grandiosity, deceitfulness), affective (e.g., callousness, lack of empathy), and behavioral/lifestyle (e.g., impulsivity, need for stimulation) (Cooke & Michie, 2001; Hare & Neumann, 2008). Previous research has consistently shown that psychopathic traits are associated with severe and lasting conduct problems, delinquency, psychosocial problems and various forms of aggressive behavior (Colins et al., 2014; Frick et al., 2014; Lynam et al., 2009; Salekin & Lochman, 2008). It has been proposed that psychopathic traits do not emerge suddenly in early adulthood but have roots in childhood and adolescence (DeLisi, 2016; Frick et al., 2014). In this regard, twin studies have shown that these traits are moderately to strongly heritable (Viding et al., 2005; Moore et al., 2019). In addition, it is also possible that specific genetic variants may interact with some environmental factors (in particular early adversity) in order to explain the development of psychopathic traits (Blair, 2013). Hence, the construct of psychopathy has been extended downwards to youth populations with a burgeoning line of research that has made great progress over the past two decades and confirm the presence of temperamental traits early in development that can be precursors of adult psychopathy (Colins et al., 2014; Ezpeleta et al., 2013).

Much of the advances in the conceptualization of child psychopathy come from previous studies focusing on the construct callous unemotional (CU) traits, the affective dimension of psychopathy, which has been considered as the core component of psychopathy (Frick et al., 2014). Recently, there have been calls to expand knowledge on psychopathy in childhood considering it as a multifaceted construct, with the same dimensions as in adulthood (see Colins et al., 2014; Salekin, 2017). As was preliminarily suggested, the facets could be rooted in distinct underlying etiologic-dispositional factors with differentiated developmental pathways and different psychosocial correlates (Herpers et al. 2014; Molinuevo et al., 2014; Salekin 2017). Unraveling dimensions and concerning externalizing problems, research on the interpersonal dimension (e.g., deceitfulness, grandiosity, manipulation) have shown associations

with proactive aggression, bullying and cyberbullying (Muñoz et al., 2013; Orue & Calvete, 2019). The relationship between the CU dimension (e.g., lack of empathy, shallow affect, failure to accept responsibility for one's own actions, and lack of guilt or remorse) and more severe and stable conduct problems and antisocial behavior has been widely studied (see Frick et al., 2014). Traits within the behavioral dimension (e.g., impulsivity; need for stimulation, sensation seeking, proneness to boredom) have been shown to be related to reactive aggression, and also provide an explanation for the onset of conduct problems in children (Salekin, 2016).

Evidence about the relationship between psychopathic traits and other forms of psychopathology in children is scarce and less consistent compared to externalizing ones. Recent research suggests that psychopathy can co-occur with elevated levels of anxiety (Humayun et al., 2014). In adults and youth, there appear to be two distinct groups of persons with a high level of psychopathy traits but with differing levels of anxiety, also referred to as variants (i.e., primary and secondary; Craig et al., 2021; Frick, Lilienfeld, et al., 1999; Goulter et al., 2021; Huang et al., 2020; Humayun et al., 2014; Kahn et al., 2013; Mahendran et al., 2021). However, the heterogeneity among children with psychopathic tendencies remains largely unknown.

The Child Problematic Traits Inventory

With the aim of providing a multidimensional psychometric assessment of psychopathic traits from early childhood onward, the Child Problematic Traits Inventory (Colins et al., 2014) was designed to be used in 3-to 12-year –old children in a way that closely resembles how it is often conceptualized in adolescence and adulthood (Andershed et al., 2012; Colins et al., 2014; Cooke & Michie, 2001). It is composed of 28 items that load on three theoretically proposed factors, namely Grandiose-Deceitful (GD), Callous-Unemotional (CU) and Impulsive-Need of stimulation (INS). In addition, these three factors load onto an overarching latent factor (i.e., Psychopathic Personality).

Nine previous studies (Colins et al., 2016; Colins et al., 2018; Colins, Roetman, et al., 2020; Colins et al., 2014; López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019; Luo et al., 2019; Somma et al., 2016; Wang et al., 2018) have supported the CPTI as a

psychometrically sound measure, with the 28 items loading distinctively on the three theoretical proposed factors. All of them also confirmed acceptable to good model fit as well as excellent internal consistency values, and exhibited the expected correlations with external criteria, including ratings of conduct problems, ADHD symptoms, low social competence and prosocial behavior, different measures of child temperament (e.g., fearlessness), reactive and proactive aggression, and alternative measures of psychopathic traits. The model fit seemed to be less optimal in girls than in boys when parents' reports are examined (Wang et al., 2018), and the average ratings were, overall, higher in boys (e.g., López-Romero, Molinuevo, et al., 2019; Wang et al., 2018).

Notwithstanding all the advances prompted by previous research, it should be noted that all prior CPTI studies but one (i.e., Colins, Roetman, et al., 2020) tested the CPTI in community-based samples, raising the need for further analysis of its properties when used in clinical settings. This is an important milestone since CU traits, which represent the affective dimension of the psychopathy construct, are already considered important to identify a severe subgroup of problematic children (Frick et al., 2014), and have been incorporated in diagnostic classifications systems as the specifier “with limited prosocial emotions” (LPE) for conduct disorder (CD) or/and oppositional defiant disorders (ODD; American Psychiatric Association [APA], 2013; World Health Organization [WHO], 2018).

Previous research has consistently shown that CU traits are usually more prevalent in clinical or forensic samples (10-40%; Christian et al., 1997; Hyde et al., 2015; Kahn et al., 2012; Kolko & Pardini, 2010; Pechorro et al., 2015; Van Damme et al., 2016; Vanwoerden et al., 2016) than in the general population (2-10%; Humayun et al., 2014; Kahn et al., 2012; Oshukova et al., 2017; Pardini et al., 2006). The few studies on the LPE specifier also point to higher prevalence in clinical and forensic samples, as well as differences according to the source of information or the assessment tool used (Colins, Van Damme, et al., 2020; Molinuevo et al., 2020). Furthermore, recent proposals also recommend exploring the potential of interpersonal and behavioral psychopathic traits for subtyping children with externalizing conduct problems (Lilienfeld, 2018; Salekin, 2017). As observed in previous research, the CPTI may serve as an

adequate assessment tool to examine all psychopathic trait dimensions in childhood, but it is still unknown how useful it could be when clinical samples are examined (Colins, Roetman, et al., 2020). Further research in this regard is particularly needed, which may enable comparisons between normative and clinical samples and, even more interestingly, between different clinical conditions (e.g., externalizing versus internalizing problems).

The present study

The main purpose of the current study is to provide further validation of the parents' version of the CPTI in the Spanish context. To this end, the study was structured in two different phases, with four objectives. In the first phase, we examined its psychometric properties, including (1) factor structure, (2) internal consistency, and (3) its convergent/divergent associations with relevant external criteria, in a large sample of community children. In a second phase, we aimed to test (4) to what extent the CPTI dimensions discriminate between healthy community children and children at risk for psychopathology, allowing us to particularly identify children within the externalizing pole as compared to children with other psychopathology conditions (e.g., internalizing) and controls. We hypothesized that the three-factor model of the CPTI would show acceptable to good model fit indices and would be invariant across gender; internal consistency values would be good to excellent for all the CPTI dimensions; the CPTI total would positively correlate with variables such as ADHD symptoms and conduct problems, and negatively with prosocial behavior. At the dimensional level, we expected that all CPTI dimensions would be positively related to behavioral problems. Yet, based on previous CPTI studies, once the effect of the other two dimensions was controlled for, it was expected that GD traits would be more related to aggressive behavior, CU traits would be inversely related to prosocial behavior, and INS traits would show a close association with inattentive and hyperactive behaviors (e.g., López-Romero, Maneiro et al., 2019; López-Romero, Molinuevo et al., 2018); due to the scarcity of research on other forms of non-externalizing psychopathology in children, no specific predictions regarding the associations with psychopathy dimensions were made. Finally, we expected that the CPTI, with all its dimensions, would discriminate between children at risk for

psychopathology and healthy children, and in particular that it would discriminate externalizing problems from the rest of the conditions.

Method

Participants and Procedure

The present study is part of a larger, ongoing research project called *INSchool*, aiming to identify children and adolescents' mental health problems in a school setting (for more information see Español-Martín et al., 2020). Prior to the start of data collection in 2011, the project was accepted and approved by the Department of Education and the Department of Health of the Generalitat de Catalunya (Catalonia, Spain) and was approved by the Clinical Research Ethics Committee of the [blinded for review] in Barcelona. The data of the current study were collected during the 2016-2017 academic year, using a two-step procedure. Figure 1 describes the data collection process.

Study Phase 1: Community-Based Data Collection (objectives 1 to 3)

The data were collected in 15 schools (8 state and 7 private state-subsidized schools) located in different rural and urban areas of Catalonia (NE Spain), which resulted in 1,928 eligible subjects. The school head and the teachers were informed about the purposes of the study. Meetings were held in schools to explain the purposes of the study to the interested parents, who were given information and consent letters as well as questionnaires wrapped in envelopes. In the case of families who did not attend the meeting, envelopes with consents and detailed information about the study were taken home by their children. The parents were instructed to return them in a sealed envelope to their teacher within two weeks. Children were only rated if the parents provided informed consent. Children who were 11 and 12 years old were also required to give written informed consent. The documents were monitored by a professional from the Psychiatric Service of the participant hospital, ensuring the quality of the information collected. These documents were coded to preserve the anonymity of the participants. The final sample was composed of 1,387 children (48.1% girls) aged 5-12 years (M=8.27; SD=2.17), who completed at least the *Child Behavior Checklist*, *Teacher's Report*

Form, and *Youth Self- Report* (CBCL/TRF/YSR; i.e., ≤ 8 missing items) or the *Conners' Parent and Teacher Rating Scale- Short Form* (CPRS-R:S/CTRS-R:S; i.e., ≤ 5 missing items). Parents were most commonly university/college graduates (65.0% mothers; 57.7% fathers) or high school graduates (22.0% mothers; 22.6% fathers). Ninety-five per cent of the fathers and 85.6% of mothers were working, and 53.4% of parents perceived their socioeconomic status (SES) as middling at the time of data collection.

Study Phase 2: At-risk for Psychopathology Sample Selection and Data Collection (objective 4)

Owing to the study's funding constraints, only 9 (8 state and 1 private state-subsidized) of the 15 schools mentioned above were offered a free psychiatric diagnostic process. In the rest of the schools, this process was only available if it was paid for. Therefore, to avoid possible bias, only data from these 9 schools was used to test the discriminant validity of the CPTI between healthy community and at-risk for psychopathology participants in a final sample of 678 children (46.2% girls). In this sample, the educational level of the parents was as follows: university/college graduates (48.0% mothers; 37.9% fathers); high school graduates (29.7% mothers; 29.0% fathers). At the time of data collection, 93.3% of the fathers and 82.6% of mothers were working, and 61.2% of parents perceived their socioeconomic status as middling. Statistically significant differences were found with respect to the schools not included in this phase in terms of lower educational level of mothers (χ^2= 222.99; p< .001) and fathers (χ^2= 264,15; p< .001), lower employment rates [mothers (χ^2= 20.55; p< .001), fathers (χ^2= 18.92; p< .001)], or lower SES (χ^2= 212.09; p< .001) in participating schools. These differences were partly explained by the lower presence of private schools in the selected sample.

Positive screening was considered in children who met the following criteria: a) a T score ≥ 70 on any of the syndrome scales from the CBCL, TRF, or YSR; b) a T score ≥ 70 on any of the subscales from the CPRS-R:S or CTRS-R:S; c) five or more high-risk indicators on the Detection and Action Protocol in Dyslexia (PRODISCAT); or d) a previous diagnosis of

neurodevelopmental disorder from a medical professional. The instruments are described in the Measures section.

All families from phase 1 received a written, individualized report informing them of what had been assessed in this screening phase, the scores obtained, and the recommendation, or not, to participate in a diagnostic process. In the 9 centers where the diagnostic process was offered for free, participants with a positive screening score (n=319) were invited to participate in this second phase. After parents had given their consent, they and their children were separately interviewed by trained psychiatrists to confirm or discard a clinical diagnosis using the *Present and Lifetime version of the Kiddie Schedule for Affective Disorders and Schizophrenia* (*K-SADS/PL*; Kaufman et al., 19-97). In order to avoid possible biases, we first removed 18 subjects, eight with diagnoses of autism spectrum disorder, eight with borderline intellectual functioning and two affected by parental relationship distress. Afterwards, based on the diagnosis provided, the following groups were formed: (1) Externalizing disorders (ED; n = 89), which include attention deficit hyperactivity disorder (ADHD; 94%) and ODD (6%) (CD were not identified in the current sample); (2) Other psychopathology (OP; n = 102), which includes internalizing disorders (12,7%) and learning disorders (87.3%)[1], and (3) Control (CG; n = 487), including both children with a negative screening in the first phase (n = 377) and children without a clinical diagnosis in the second phase (n = 110). No family was financially compensated for their participation.

Measures

For the purpose of the current study, only information provided by parents was considered in this research, except for screening reasons.

Study Phase 1: Community-Based Data Collection

[1] To support their inclusion within the same group (i.e., OP), the discriminant ability between ID and learning disorders was also analyzed, finding only marginal significant differences on CPTI $_{\text{Total score}}$ (data available upon request).

The Child Problematic Traits Inventory (Colins et al., 2014) is a 28-item questionnaire aimed at assessing psychopathic personality traits in children. It consists of 28 items rated on a response scale ranging from 1 (*Does not apply at all*) to 4 (*Applies very well*), and on the basis of how the child usually behaves rather than how the child is behaving at the moment. It is composed of three scales: Grandiose-Deceitful (GD; 8 items; e.g., "Thinks that he/she is better than everyone on almost everything"); Callous-Unemotional (CU; 10 items; e.g., "Does not become upset when others are being hurt"); and Impulsive-Need for stimulation (INS; 10 items; e.g., "Often does things without thinking ahead"). The total score of each scale, as well as the composite total score were computed as the mean of the responses to the items. A higher score is indicative of higher levels in psychopathic traits, either in their total score or in the different dimensions. In this study, we used the official authorized Spanish translation (López-Romero, Molinuevo, et al., 2019) and we considered the parents' responses.

The Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) for parents is a screening instrument intended to measure psychosocial functioning of children and adolescents. It is a 25-item questionnaire, scored on a 3-point response scale that ranges from 0 (*Not true*) to 2 (*Certainly true*), and divided into five scales: Emotional symptoms (5 items; Cronbach's alpha [α]=.71; Mean inter-item correlation [MIC]=.33); Conduct problems (5 items; α=.61; MIC=.24); Hyperactivity/inattention (5 items; α=.80; MIC=.44); Peer relationship problems (5 items; α=.62; MIC=.25); and Prosocial behavior (5 items; α=.68; MIC=30). The scores for the first four scales were added up to generate a total difficulties score (α=.82; MIC=.31). A higher score is indicative of more problems, excepting the Prosocial behavior scale. In the present study, we used the Spanish version of the SDQ for parents, which is available as a free download from the www.sdqinfo.com.

The Conners' Parent Rating Scale- Short Form (CPRS-R:S; Conners, 1997), and its Spanish version (Amador-Campos et al., 2002), includes 27 items scored on a 4-point scale, ranging from 0 (*Not true*) to 3 (*Very true*). It was developed to assess attention-deficit/hyperactivity disorder (ADHD) and its most common comorbid problems, over the previous month, through four scales: Oppositional problems (α=.87; MIC=.53), Attention

deficit problems (α=.89; MIC=.58), Hyperactivity/Impulsivity (α=.82; MIC=.44), and ADHD index (α=.92; MIC=.48). *The Conners' Teacher Rating Scale- Short Form* (CTRS–R:S; Conners, 1997) was also used for the screening process for phase 2.

*The Child Behavior Checklist/ 4-18 de Achenbach (*CBCL; Achenbach, 1991a) is a checklist that parents complete to detect emotional and behavioral problems in children and adolescents occurring over the previous 6 months. *The Teacher's Report Form* (TRF; Achenbach, 1991b), and the *Youth Self- Report* (YSR; Achenbach, 1991c) were also used for the screening process for phase 2. The CBCL consists of 113 items, scored on a 3-point response scale ranging from 0 (*Not true*) to 2 (*Very true or often true*). The CBCL is made up of eight syndrome scales: Withdrawn (α=.70; MIC=.22); Somatic complaints (α=.55; MIC=.15); Anxious/depressed (α=.82; MIC=.25); Social problems (α=.65; MIC=.20); Thought problems (α=.49; MIC=.17); Attention problems (α=.78; MIC=.24); Delinquent behavior (α=.57; MIC=.25); and Aggressive behavior (α=.87; MIC=.26). These items can be used to calculate scores on three broadband scales: Internalizing, Externalizing, and Total Problems. The CBCL has been translated and adapted to Spanish, with good psychometric properties (Rubio-Stipec et al., 1990).

In this study, prior to the main statistical analyses, 10 items were eliminated because of their low frequency when referring to primary school children. These were item 40 ("Hears sounds or voices that aren´t there") from the Thought problems scale, and the following nine items from delinquent behavior: item 39 ("Hangs with others who get in trouble"), item 67 ("Runs away from home"), item 72 ("Sets fires"), item 81("Steals at home"), item 82 ("Steals outside the home"), item 96 ("Thinks about sex too much"), item 101 ("Truancy, skips school"), item 105 ("Uses drugs for nonmedical purposes") and item 106 ("Vandalism"). Cronbach's α and MIC values were calculated following this assumption.

Sociodemographic characteristics was assessed with items developed ad hoc for the present study. To this end, parents provided information on variables such as the child's age, gender and health (general anamnesis and medical record), and the family's socioeconomic level. Children's academic data were provided by teachers.

Study Phase 2: At-risk for Psychopathology Sample Selection and Data Collection

The instruments used in the screening process for phase 2 were: CPRS-R:S, CTRS–R:S, CBCL, TRF, YSR, and the PRODISCAT.

PRODISCAT (Col·legi de Logopedes de Catalunya, 2011) is a protocol developed by the Speech Therapists Association of Catalonia and aimed at teachers of preschool, elementary and secondary education, and vocational training with the objective to detect possible cases of dyslexia at an early stage. It consists of 18-44 items, depending on the educational stage, some of which represent high-risk indicators that require intervention. The remaining items indicate associated difficulties that may worsen the symptomatology and that will need to be considered in the intervention plan. This tool was only used for screening purposes.

The Kiddie Schedule for Affective Disorders and Schizophrenia Present and Lifetime Version (Kaufman et al., 1997). *The K-SADS/PL* is a semi-structured interview aimed at early diagnosis of psychiatric disorders in school-aged children 6-18, according to the Diagnostic and Statistical Manual of Mental Disorders–Fourth edition–Text revision (DSM-IV-TR; APA, 2000). This interview was administered to parents and students separately. Items are scored using a 0- to 3-point scale from 0 (*No information is available*) to 3 (*Threshold level of symptomatology*). This tool includes an 82-symptom screen interview and five diagnostic supplements: Affective disorders, Psychotic disorders, Anxiety disorders, Behavioral disorders, and Substance abuse, eating, and tic disorders. Diagnostic supplements are only applied if at least a threshold score is received on any of the symptoms studied in that area of the screening interview. Only scores with a threshold level of symptomatology were considered for diagnosis. The Spanish version of the K-SADS/PL has shown an excellent interrater reliability for the evaluation of psychopathology in children and adolescents (any affective disorder, Cohen's kappa coefficient (κ) = .84; any anxiety disorder, κ = .84; any externalized disorder, κ = .87) (Ulloa et al., 2006).

Statistical Analyses

In order to examine the factor structure of the CPTI, a set of Confirmatory Factor Analyses (CFA) were conducted, with robust weighted least squares used as estimator

(WLSMV). Model fit was assessed using root mean square error of approximation (RMSEA; study criterion ≤ .08), comparative fit index (CFI; ≥ .90), and Tucker–Lewis index (TLI; ≥ .90) (Hu & Bentler, 1999). Three levels of measurement invariance (MI; i.e., configural, metric, and scalar) were tested across gender groups using the sequential strategy suggested by Meredith and Teresi (2006). Change in CFI (ΔCFI) was used as an indicator for testing MI, given its independence of model parameters and sample size (ΔCFI ≤ 0.01 supports the presence of MI across groups) (Cheung & Rensvold, 2002). The internal consistency was computed with Cronbach's alpha and interpreted as poor (≤.60), marginal (.60 to .69), acceptable (.70 to .79), good (.80 to.89), and excellent (≥.90) (Barker et al., 2002). As Cronbach's alpha is dependent on the length of the scale, MIC was computed as a more straightforward indicator of the internal consistency, with values ranging from .15 to .50, at minimum, being considered adequate (Clark & Watson, 1995).

The study of convergent and discriminant validity was performed through zero-order correlations, and a series of structural equation models (SEM), which make it possible to test the latent contribution of each CPTI dimension while overcoming the limitations of partialing redux (Sleep et al., 2017). Specifically, eleven models were analyzed; two for the SDQ: one including all the problematic scales (i.e., Emotional symptoms, Conduct problems, Hyperactivity/inattention problems, Peer relationship problems), and one for the Prosocial behavior scale; one model for the CPRS-R:S subscales (i.e., Hyperactivity/impulsivity problems, Attention deficit problems, Oppositional problems); and eight models for each independent facet of the CBCL (i.e., Withdrawn, Somatic complaints, Anxious/depressed, Social problems, Thought problems, Attention problems, Delinquent behavior and Aggressive behavior). Finally, in order to evaluate if the CPTI can discriminate between community and clinical children, the aforementioned groups (i.e., externalizing problems, internalizing problems, and the control group) were compared in the CPTI subscales and total scores by means of a GML Univariate Analysis of Variance. To further test the differences between groups, multiple comparisons post-hoc analysis was carried out, with Cohen's *d* estimation as

the effect size of mean comparisons. CFAs and SEM analyses were conducted in Mplus 7.4 (Muthén & Muthén, 2011). All other analyses were conducted in SPSS 21.0.

Results

Descriptive Information

Descriptive statistics between the main study variables are presented in Table 1. As expected, participants scored relatively low in all CPTI factors and Total score, as well as all the analyzed variables, except Prosocial behavior, which showed high mean scores.

Factor Structure and Measurement Invariance

The three-factor model of the parent-reported CPTI showed an adequate (RMSEA = .07; CFI = .91; TLI = .91) model fit, and better fit the data as compared to the CPTI unidimensional solution (RMSEA = .10; CFI = .82; TLI = .90). All items loaded well and with statistical significance ($p < .001$) on the expected CPTI factor (see Figure S1, available online). Item 1 "Likes change and that things happen all the time"; the factor loading = .38 was low but greater than .30, being considered acceptable when factor loads are interpreted (Brown, 2014). Rerunning the CFA without Item 1 improved the model fit indices, although not in a meaningful way (RMSEA = .06; CFI = .93; TLI = .93).

MI tests were performed across gender groups. The three-factor model of the CPTI was firstly tested for boys and girls separately, resulting in an acceptable model fit for boys and girls (RMSEA = .07/.07; CFI = .92/.92; TLI = .91/.91 respectively). Model fit indices for configural invariance were RMSEA = .07, CFI = .92, and TLI = .91; for metric invariance: RMSEA = .07, CFI = .92, and TLI = .92; and for scalar invariance: RMSEA = .06, CFI = .93, and TLI = .93. Results from MI suggest that the parent-reported CPTI scores were invariant across gender (ΔCFIs < .01) (Cheung & Rensvold, 2002).

Internal Consistency of the CPTI Scores and Correlations between CPTI Scores.

Overall, the Cronbach's α and MIC values were indicative of good to excellent internal consistency for both the CPTI total score (α = .91; MIC = .28), and the three CPTI factors: GD (α=.85; MIC=.43), CU (α=.85; MIC=.38), and INS (α = .85; MIC = .36). Significant zero-order

correlations were found between CPTI factor scores and CPTI total score (r_s ranging from .79 to .87), and between the three CPTI factor scores (r_s ranging from .47 to .54). All correlations were significant at $p < .001$ (see Table 1).

Convergent and Divergent Validity of the CPTI

The Table 1 shows the results of the zero-order bivariate correlations between the CPTI and the SDQ, the CPRS-R:S and the CBCL. As observed, the CPTI factors and Total score were significantly correlated with all the external criteria (r_s ranging from .23 to .65 for the SDQ; from .32 to .64 for the CPRS-R:S; and from .10 to .63 for the CBCL). These correlations were positive for all analyzed variables except for the SDQ prosocial behavior scale, which was negatively related with CPTI factors and Total score.

The unique associations between each of the three CPTI factors (e.g., GD) and external variables, while controlling for the other two factors (e.g., CU and INS), were examined thought a set of SEM analyses. The goodness of fit indices for all the analyzed models are presented in Table 2, with acceptable model fit for all of them. As displayed in Table 3, the CPTI scores showed a different pattern of associations with the analyzed measures. The GD factor was associated with high levels of conduct problems and delinquent behavior and, to a lesser extent, with oppositionism and aggressive behavior. The CU factor was clearly associated with peer relationship problems, withdrawn and thought problems, but above all, with low levels of prosocial behavior. Finally, the INS factor was related in a significant way to all scales (especially inattention and hyperactivity) except for peer relationship problems and prosocial behavior.

Discriminant Validity of the CPTI across Different Clinical Conditions

As observed in Table 4, result from comparisons showed statistically significant differences across the analyzed groups in the three CPTI factors and CPTI total score: GD ($F = 24.18$; $p < .001$); CU (15.59; $p < .001$); INS ($F = 69.29$; $p < .001$); $CPTI_{Total}$ ($F = 59.41$; $p < .001$).

Multiple comparisons post-hoc analysis showed that the GD factor discriminated between externalizing and other psychopathological conditions, and between externalizing

disorders and the control group, with medium effect sizes (d = 0.51 and 0.68). The CU factor discriminated between externalizing disorders and the other psychopathological conditions with a small effect size (d = 0.42), and between externalizing and control group with a medium effect size (d = 0.59). The INS factor discriminated between externalizing and other psychopathological conditions, and between externalizing disorders and the control group, in both cases with large effect sizes (d = 1.02 and 1.35). Finally, $CPTI_{Total}$ discriminated between externalizing and other psychopathological conditions, and between externalizing disorders and the control group, with large effect sizes (d = 0.87 and 1.15). No CPTI factors and Total score discriminated between the other psychopathological conditions and the control group.

Discussion

The current study aimed to provide further validation of the psychometric properties of the parent-reported CPTI in a large sample of school-aged children. This study shows that the parent-reported CPTI confirms the original structure of three interrelated factors (GD, CU, and INS), being invariant across gender, and with good to excellent internal consistency. Relations between CPTI scores and external correlates replicated and extended previous research (Colins et al., 2016; Colins et al., 2018; Colins, Roetman, et al., 2020; Colins et al., 2014; López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019; Luo et al., 2019; Somma et al., 2016; Wang et al., 2018). Overall, we provide additional support for the utility of the CPTI for assessing psychopathic traits in childhood through parents' reports. Of particular note is that our findings provide new evidence supporting the utility of the CPTI to establish comparisons between normative and at-risk for psychopathology samples, particularly those in the externalizing pole.

Psychometric Properties

The model fit for the three-factor structure of parent-reported CPTI was adequate, replicating the results obtained in previous CPTI studies, including both parents' and teachers' reports. In this regard, it is noteworthy that our results largely converge with those obtained in a previous multi-study conducted with the teacher-reported version of the CPTI in our country

(López-Romero, Molinuevo, et al., 2019). The three-factor structure was invariant across gender, in line with all prior parent-reported CPTI studies (Colins, Roetman, et al., 2020; López-Romero, Maneiro, et al., 2019; Luo et al., 2019; Somma et al., 2016) except for one (Wang et al., 2018). Moreover, the factor loadings were mostly high (almost all well over .40) on their corresponding factor, showing a good result in the assessment literature on parent-rated psychopathic traits in childhood (Dadds et al., 2005; Frick et al., 2000). Although it was initially an instrument designed to be reported by teachers, the internal consistency values of the CPTI scores obtained in this sample indicate that it can be used by parents, being a tool with the ability to unravel the roots of psychopathic personality and antisocial behavior early in development (Farrington et al., 2010; Waller et al., 2013).

Convergent and Divergent Validity of the CPTI

According to our predictions, clear positive correlations were obtained in the CPTI variables, particularly with externalizing problems such as ADHD symptoms, aggressive and delinquent behavior, and conduct problems, as well as a negative correlation with prosocial behavior, which confirms the convergent and divergent validity of the CPTI. Nevertheless, zero order bivariate correlations showed how the CPTI factors and Total score related with all external criteria correlates, including internalizing problems. As reflected in previous studies, the combination of certain psychopathic traits together with the presence of anxiety traits is related to different psychopathological outcomes (Craig et al., 2021; Humayun et al., 2014). Even considering that individuals with psychopathic traits have been traditionally defined as low anxious, research conducted at early developmental stages has shown some mixed results when examining emotional problems (e.g., Kubak & Salekin, 2009). In addition, anxiety and other related emotional problems have been examined as potential indicators of the primary (i.e., low anxious) and secondary variants (i.e., high anxious) of psychopathy (Kimonis et al., 2012), a result that should be further explored in the context of CPTI research.

When testing the unique contribution of each CPTI factor (e.g., GD), after accounting for the shared variance with the others (e.g., CU and INS), different and unique associations were obtained for these variables. As expected, GD traits correlate with conduct problems,

oppositional problems, delinquent behavior and aggressive behavior. Our results are in line with all previous studies that relate GD traits with greater transgression, unprovoked aggression and lower neuroticism (Salekin, 2017). As has already been observed, this highlights the unique association between GD traits and aggressive or delinquent behavior, where GD traits have shown a stronger relationship than CU traits (Lau et al., 2011; Lau & Marsee, 2013)

Only CU traits remain significantly and negatively correlated with prosocial behavior, and positively correlated with peer relationship problems, probably because the development of consciousness, often defined by guilt and empathy (Thompson & Newton, 2010), plays a clear role in both promoting prosocial behavior and inhibiting problematic behavior (Waller et al., 2020). Supporting previous studies (e.g., Dadds et al, 2005), the CU factor is not found to be related to SDQ conduct problems, unlike the GD factor, where the association is notorious. This is possibly due to the fact that this scale reflects a proactive aggression and interpersonal manipulation style. To a lesser extent, this is also observable in the aggressive behavior scale of the CBCL, and even in terms of criminal behavior, since GD traits seem to modulate more severe antisocial pathways (Lau & Marsee, 2013). Nevertheless, it should be noted that CU traits remained significantly correlated with both oppositional behavior from the CPRS-R:S, and both delinquent and aggressive behavior from the CBCL, supporting the predictive value of CU traits at early developmental stages (Frick et al., 2014).

It is worth noting the relationship between CU traits and withdrawn, but especially with thought problems. Although we do not have a fully satisfactory explanation, we must bear in mind that children are in a continuous process of neurodevelopmental change. It is possible that internalizing symptoms in these children, when expressed behaviorally, appear callous or unemotional. For example, a sensitive and withdrawn child may present as indifferent to the social and emotional needs of peers; however, this apparent indifference may be reflecting underlying anxiety and social introversion On the other hand, the presence of obsessions, intrusive thoughts or self-absorption, which are symptoms that could belong to the anxious or psychotic sphere, could be interpreted by parents as CU traits. All of this could be framed within the historical terminological confusion faced by this area of study (Torrubia &

Cuquerella, 2008; Skeem, Polaschek, Patrick, & Lilienfeld, 2011). Further studies to analyze the relationship of this dimension with the variables described, as well as the study of neurobiological correlates, are needed.

As regards INS traits, beyond the expected associations with external behavioral problems (e.g., conduct problems, oppositional behavior, or aggressive behavior), positive correlations were observed with withdrawn, somatic complaints or anxious/depressed symptomatology, perhaps because of the close relationship between impulsivity and other psychiatric symptoms (Vidal et al., 2014), as well as the potential co-occurrence between conduct problems, largely linked with INS traits, and emotional problems (Bubier & Drabick, 2009). Another feasible explanation is the fact that co-occurring elevated INS/CU traits and internalizing disorders in some children could be a consequence of the behavior problems they experience (Frick, Lilienfeld, et al., 1999).

Discriminant validity of the CPTI

To the best of our knowledge, this is the first study to analyze comparisons between a normative sample and an at-risk for psychopathology sample, using the CPTI as a comparative framework. In addition, only one study has tested the psychometric properties of CPTI in a clinical referred sample (Colins, Roetman, et al., 2020). Although statistically significant differences between the groups were found in all dimensions, they were especially high for INS and for CPTI $_{\text{Total score}}$. The results showed that children in the ED group scored higher than children in the other two groups (OP/CG) on all three CPTI dimensions and on the total score. In more detail post-hoc analyses, the INS and CPTI $_{\text{Total score}}$ demonstrated a high ability to discriminate between ED-OP and ED-CG; GD and CU showed acceptable discriminant ability in the same groups particularly to discriminate between ED-CG.

The ability of the INS dimension to discriminate children with externalizing disorders from healthy children is in line with previous results at the dimensional level (Salekin, 2016), but is also consistent with the diagnoses in our sample, where the main diagnosis was ADHD. Additional research with samples containing a higher prevalence of ODD or CD will therefore be necessary. Also, the failure to discriminate between the children with another

psychopathology than externalizing from healthy children may also be due to the scarcity of internalizing disorders in our sample and the composition of this group, mainly composed by children with learning disorders. However, we would like to note that data were also analyzed considering only internalizing disorders (ID; n=13), and it was observed that there was no discrimination between ED and ID, but there was discrimination between these two conditions and CG (data available upon request); although the sample size is small and could be interpreted as a power of effect problem, it could also show the importance of carrying out further works with homogeneous groups of internalizing pathology to see if differences are found. In order to better interpret these results, it should be also noted that psychopathy has been associated with poorer academic achievement, being independent of CD or SES (Allen et al., 2018; Bird et al., 2019). Specifically, CU traits were potent predictors of reading comprehension over and above ADHD and even IQ (Vaughn et al., 2011). At the same time, learning disorders have been associated with the appearance of anxiety (Haft et al., 2019), which may justify why both internalizing problems and learning disorders covariate within the OP group. That said, it is important to highlight that this is a cross-sectional study and therefore we can only objectify the concurrence of psychopathology and psychopathic traits, without establishing causality.

The different dimensions that make up the CPTI and the general construct of psychopathy have the capacity to discriminate between the mentioned populations and identify a group of children with ED. These results are again in line with the requirement to study the potential of interpersonal and behavioral traits for subtyping children with externalizing conduct problems (Lilienfeld, 2018; Salekin, 2017). Future studies on clinical samples should be conducted in other countries to elucidate whether this ability to discriminate between different cultures is maintained. If confirmed, it could lead to the inclusion of the CPTI in evaluation protocols, for example to establish different treatment lines.

Theoretical and Practical Implications

Overall, the results obtained in this study support the consideration of psychopathy as a multidimensional construct that could influence behavioral problems by combining the three factors (Colins et al., 2014). Also, these findings converge with previous research that

establishes a close relationship among psychopathic traits in children and a wide range of behavioral and psychosocial problems (Salekin & Lynam, 2010). Finally, the present results would be in line with current proposals that claim for the inclusion of all psychopathy dimensions, and not only CU traits, as potential identifiers of CD and other relevant problems in developmental models and diagnostic classification systems (Lilienfeld, 2018; Salekin, 2017).

Even considering that these results support the main findings obtained in an ever-increasing line of research, they also open new ways of discussion and analysis that should be addressed in future research. Hence, in line with previous CPTI validation studies, CU traits is not the only dimension predicting serious conduct problems in children (e.g., Colins et al., 2016; Colins et al., 2018; Colins, Roetman, et al., 2020; Colins et al., 2014; López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019; Luo et al., 2019; Somma et al., 2016b; Wang et al., 2018). Although it does not invalidate all the contributions made in previous literature, it should be noted that most studies that have focused on CU traits have not controlled for other psychopathy dimensions, which seem to be relevant as well in their associations with behavioral maladjustment, as is the case of GD traits (Salekin, 2017). In addition, it would be interesting to study interaction effects between the dimensions since previous studies have shown that both concurrent and prospective behavioral maladjustment can be driven by interaction effects between all three psychopathy dimensions (e.g., Fanti et al., 2018), a result that should be further explored in future research.

Even though we already know that the three-factor model of psychopathy, as delineated in the CPTI, seems to work in childhood, there is much that we need to know about this construct in general, and all its dimensions in particular, when trying to understand serious conduct problems in childhood and later antisocial behavior/delinquency in adolescence, as well as other forms of psychopathology. To this end, future studies should keep focusing on studying psychopathic traits from a multidimensional perspective, considering the potential role of the psychopathic construct (i.e., with high levels in all three dimensions), as well as the contribution of each specific dimension or other potential trait interactions and configurations (Salekin, 2016). Finally, there is a need to clarify whether previous results obtained in the CU

literature (e.g., etiological processes, cognitive, emotional and environmental correlates…) are comparable when all dimensions are taken into account or, in contrast, if there are specific deficits for each dimension that contribute to a unique etiological pattern underlying psychopathic personality. Answering these questions will clarify the role of the psychopathic construct, and will have potential practical implications relevant to assessment, diagnostic classification and tailored interventions.

Strengths and Limitations

The strengths of this study include the availability of a large sample of children and within this a considerable at-risk for psychopathology, and the use of well-validated and commonly used questionnaires and a diagnostic interview to measure external correlates. However, this study has some limitations to be considered. First, only parents were used as a source of information. Nevertheless, this could be also considered a strength, since the present study shows, as have previous ones (Colins, Roetman et al., 2020; López-Romero, Maneiro, et al., 2019; Luo et al., 2019; Somma et al., 2016; Wang et al., 2018), that CPTI can be answered by parents as well as by teachers, giving us the possibility of evaluating psychopathic traits from early ages with multiple informants, as recommended (Frick et al., 2000). Second, this study does not include preschool children so we cannot know what is happening in 3-4-year-olds. Third, the non-inclusion of alternative measures to assess psychopathic traits. Fourth, the use of a cross-sectional design does not allow us to establish predictions between psychopathic personality and future conduct problems and treatment outcomes. Fifth, the results are not representative of the general population, and more studies are needed taking this into account, and also considering sociodemographic information, particularly parents' educational level, employment situation, and SES as potential differential variables when assessing psychopathic traits (Zxaanswijk et al., 2018). Sixth, internalizing diagnoses were scarce in our sample with an elevated presence of learning disorders; nevertheless, it provides preliminary information on the relationship of this instrument with another psychopathology also present in children. And, externalizing diagnoses were mainly made up of ADHD, with a high prevalence (17%), although within the range indicated by some reviews (Polanczyk et al., 2007). Seventh, because it was beyond of the

purpose of the current study, the differences between the ADHD subtypes have not been analyzed, an issue that should be addressed in future research. Finally, future studies should also account for potential gender differences, particularly as regards the predictive and discriminant value of psychopathic traits.

Conclusions

In sum, this study replicated and extended prior work on the psychometric properties of the parent-reported CPTI and went some way to answering prior calls to develop a psychometrically sound and comprehensive assessment tool of psychopathic traits in children (Hawes et al., 2014; Waller et al., 2015). Our results appear to provide robust evidence of the usefulness of CPTI for subtyping children with behavioral disorders, since it proved to be capable of discriminating between normative and at-risk for psychopathology samples. This underlines the need for more studies that compare different populations, ideally, from a multi-informant perspective. We may broadly conclude that it is necessary to keep studying psychopathy from a multidimensional perspective, which would enable us to extend our knowledge on the general construct while accounting for each specific dimension.

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Table 1

Descriptive Statistics and Zero-Order Correlations between Main Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
CPTI																				
1.GD	-																			
2.CU	.54*	-																		
3.INS	.51*	.47*	-																	
4.Total score	.79*	.79*	.87*	-																
SDQ																				
5.Emotional symptoms	**.24***	**.23***	**.32***	**.33***	-															
6.Conduct problems	**.60***	**.49***	**.54***	**.65***	.34*	-														
7.Hyperactivity/Inattention	**.36***	**.35***	**.64***	**.59***	.33*	.49*	-													
8.Peer problems	**.29***	**.39***	**.26***	**.37***	.33*	.38*	.26*	-												
9.Prosocial behavior	**-.31***	**-.44***	**-.23***	**-.38***	-.06	-.38*	-.24*	-.38*	-											
CPRS-R:S																				
10.Oppositional	**.49***	**.46***	**.53***	**.61***	.41*	.73*	.41*	.28*	-.24*	-										
11.Inattention	**.34***	**.32***	**.49***	**.49***	.38*	.43*	.65*	.26*	-.13*	.45*	-									
12.Hyperactivity	**.37***	**.33***	**.64***	**.58***	.24*	.46*	.69*	.18*	-.15*	.50*	.46*	-								

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.
CBCL																				
13.Withdrawn	**.26***	**.39***	**.28***	**.37***	.52*	.37*	.28*	.42*	-.22*	.45*	.40*	.21*	-							
14.Somatic complaints	**.12***	**.10***	**.16***	**.17***	.45*	.18*	.14*	.18*	-.02	.22*	.19*	.10*	.37*	-						
15.Anxious/depressed	**.29***	**.29***	**.37***	**.40***	.72*	.39*	.32*	.39*	-.11*	.49*	.39*	.27*	.63*	.44*	-					
16.Social problems	**.26***	**.30***	**.35***	**.38***	.47*	.36*	.38*	.52*	-.09*	.41*	.44*	.30*	.52*	.33*	.58*	-				
17.Thought problems	**.21***	**.32***	**.30***	**.34***	.50*	.28*	.32*	.34*	-.10*	.42*	.39*	.30*	.55*	.32*	.52*	.46*	-			
18.Attention problems	**.34***	**.33***	**.57***	**.54***	.50*	.44*	.72*	.33*	-.13*	.48*	.68*	.60*	.51*	.30*	.58*	.62*	.57*	-		
19.Delinquent behavior	**.58***	**.48***	**.51***	**.63***	.28*	.59*	.45*	.29*	-.24*	.58*	.40*	.47*	.37*	.20*	.37*	.39*	.34*	.48*	-	
20.Aggressive behavior	**.53***	**.44***	**.62***	**.32***	.39*	.71*	.53*	.32*	-.24*	.79*	.47*	.57*	.44*	.26*	.53*	.48*	.41*	.59*	.67*	-
N	1364	1346	1336	1386	1383	1383	1383	1383	1383	1383	1383	1383	1385	1385	1385	1385	1383	1385	1385	1385
Mean	1.24	1.22	1.66	1.39	0.32	0.25	0.62	0.21	1.66	2.44	3.32	2.19	2.45	2.30	4.29	1.80	0.48	3.82	1.47	6.22
SD	0.40	0.37	0.53	0.36	0.38	0.30	0.50	0.31	0.35	3.17	3.89	3.08	2.30	1.72	3.87	2.01	1.01	3.33	1.66	5.42
Range [Min-Max]	1.00-4.00	1.00-3.90	1.00-3.80	1.00-4.00	0.00-2.00	0.00-2.00	0.00-2.00	0.00-2.00	0.00-2.00	0.00-18.00	0.00-18.00	0.00-18.00	0.00-14.00	0.00-12.00	0.00-25.00	0.00-15.00	0.00-10.00	0.00-19.00	0.00-11.00	0.00-37.00

Note. CPTI = *The Child Problematic Traits Inventory (*GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-need of stimulation)*;* SDQ = *The Strengths and Difficulties Questionnaire; CPRS-R:S = The Conners' Parent Rating Scale- Short Form;* CBCL = *Child Behavior Checklist/ 4-18 de Achenbach.*

In bold, correlations between the CPTI factors and Total score and external criteria

* Significant *p* value after applying Bonferroni's correction to counteract the issue of multiple testing ($p < .003$)

Table 2

Goodness of Fit of the Different Computed Models

	χ2 (df)	RMSEA	CFI	TLI
SDQ				
Problematic scales	4780.28 (1059)	.050 [.049, .052]	.92	.91
Prosocial behavior	3017.84 (489)	.061 [.059, .063]	.92	.91
CPRS-R:S				
Total scale	4624.54 (974)	.052 [.051, .054]	.93	.92
CBCL				
Withdrawn	3495.02 (623)	.061 [.059, .063]	.90	.89
Somatic complaints	2583.27 (623)	.050 [.048, .053]	.93	.92
Anxious/depressed	3661.09 (813)	.053 [.052, .055]	.91	.90
Social problems	2861.96 (588)	.056 [.054, .058]	.92	.91
Thought problems[a]	2563.85 (521)	056 [.054, .058]	.92	.92
Attention problems	3329.31 (696)	056 [.054, .058]	.91	.91
Delinquent behavior[a]	3189.68 (458)	.069 [.066, .071]	.91	.90
Aggressive behavior	3991.61 (1074)	.048 [.046, .049]	.92	.91

Note. CPTI = *The Child Problematic Traits Inventory;* SDQ = *The Strengths and Difficulties Questionnaire; CPRS-R:S = The Conners' Parent Rating Scale- Short Form;* CBCL = *Child Behavior Checklist/ 4-18 de Achenbach.RMSEA= Root mean square error of approximation; CFI= Comparative fit index; TLI= Tucker–Lewis index.*

[a] Scales affected by elimination of items, given their low frequency (Item 40 from Thought problems; items 39, 67, 72, 81, 82, 96, 101, 105 and 106 from Delinquent behavior).

Table 3

Structural Equation Modeling Including the CPTI Factors and External Criteria

	CPTI_GD	CPTI_CU	CPTI_INS
	β	β	β
SDQ			
Emotional symptoms	.01	.09	.40***
Conduct problems	.82***	-.02	.22***
Hyperactivity/Inattention	-.02	-.07	.80***
Peer relationship problems	.07	.38***	.10
Prosocial behavior	-.02	-.64***	.10
CPRS-R:S			
Oppositional	.17***	.20***	.41***
Inattention	.03	.08	.53***
Hyperactivity	-.04	-.09	.88***
CBCL			
Withdrawn	-.04	.51***	.14**
Somatic complaints	.01	.02	.23***
Anxious/depressed	.06	.11	.39***
Social problems	.07	.20**	.31***
Thought problems	-.14	.47***	.32***
Attention problems	-.04	-.02	.77***
Delinquent behavior	.73***	.22***	.10*
Aggressive behavior	.19***	.16**	.48***

Note. CPTI = The Child Problematic Traits Inventory (*GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-need of stimulation)*; SDQ = The Strengths and Difficulties Questionnaire; CPRS-R:S = The Conners' Parent Rating Scale- Short Form; CBCL = Child Behavior Checklist/ 4-18 de Achenbach; Estimates are standardized regression coefficients.

**p < .05. **p< .01. *** p < .001 (all two-tailed).*

Table 4

Discriminant Validity of the CPTI across Different Clinical Conditions

	N	EXTERNALIZING DISORDERS (1) (N=82-89)		OTHER PSYCHOPATOLOGY (2) (N=93-102)		CONTROL (3) (N=470-487)		F(*p*)	Post-hoc 1 vs 2		Post-hoc 1 vs 3		Post-hoc 2 vs 3	
		Mean	SD	Mean	SD	Mean	SD		*p*	d^1	*p*	*d*	*p*	*d*
GD	664	1.56	.62	1.27	.50	1.22	.35	24.18***	***	0.51	***	0.68	n.s.	-
CU	656	1.47	.53	1.27	.43	1.22	.35	15.59***	**	0.42	***	0.59	n.s.	-
INS	652	2.29	.57	1.70	.59	1.59	.46	69.29***	***	1.02	***	1.35	n.s.	-
CPTI-Total	678	1.80	.45	1.42	.42	1.35	.32	59.41***	***	0.87	***	1.15	n.s.	-

Note. CPTI = *The Child Problematic Traits Inventory* (*GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-need of stimulation)*; d= Cohen's d; n.s.= non-significant.

The groups have been made according to the diagnoses obtained by *The Kiddie Schedule for Affective Disorders and Schizophrenia Present and Lifetime Version.*

[1] Cohen's *d* was interpreted as small = .02, medium = .05 and large = .08 (Cohen, 1992)

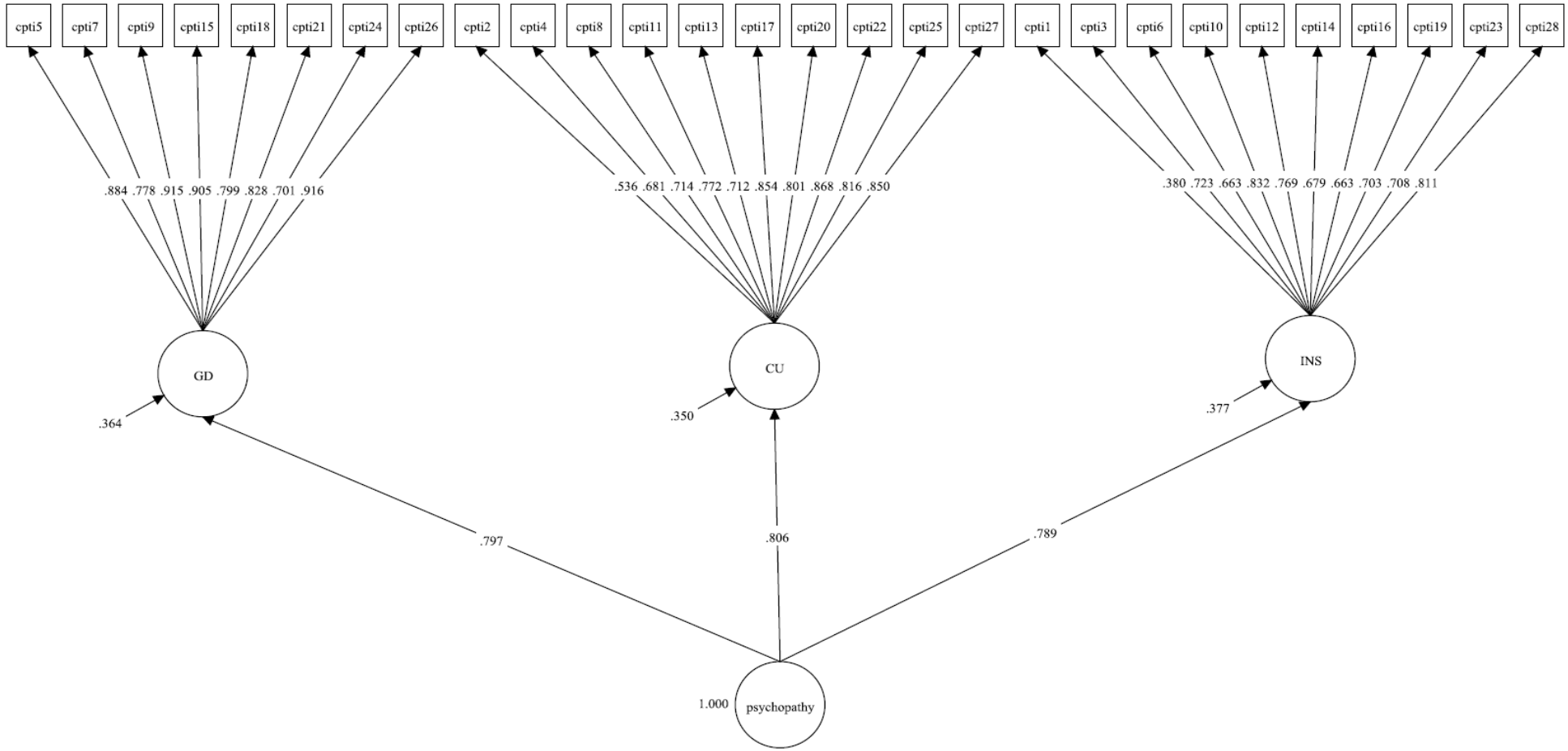
*$p < .05$. **$p < .01$. *** $p < .001$.

Supplemental material

Further Validation of the Spanish Parent-Reported Child Problematic Traits Inventory: Discriminant Validity for Distinguishing Children Vulnerable to Externalizing and Other Psychopathology Conditions

Figure S2

Standardized Model Parameters for the Four-factor Model of the CPTI



Note. GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-need of stimulation

STUDY 2

Do Executive Functions have a Mediating Role in the Relationship between Psychopathic Traits and Behavioral Problems in Children at Risk for Psychopathology?

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Abstract

Psychopathic traits (PT) are present from early development and are associated with severe behavioral problems (BP). Poorer executive function (EF) is also associated with BP. This study aims to examine whether PT are associated with deficits in EF, whether these deficits are associated with BP, and the potential mediating role of EF in the relationship between PT and BP. Parents of 180 children at-risk for psychopathology, aged 5-12 years, (M = 8.29; SD = 2.13; 41.1% girls) participated. Results from path analyses supported the expected direct effects, and highlighted the mediation effect of EF in the association between PT and BP. The effects were noteworthy when considering behavioral regulation and emotional control, showing how the relationship between the affective dimension of PT (callous-unemotional traits) and BP was fully mediated by these EF. These findings provide insight into BP heterogeneity and may clarify pathways of BP development, prognosis, and treatment.

Keywords: Psychopathic traits, executive functions, behavioral problems, mediation, children

Introduction

Children with behavioral problems (BP) are heterogeneous, with a wide variety of profiles, etiologies and trajectories [1, 2]. Understanding the factors that influence different BP courses is essential to develop appropriate prevention and treatment programs [3]. In reference to their etiology, at least 50% of the variance of BP could be attributed to environmental influences [4, 5], although heritability is estimated to range from 5-74% [6]. Parenting practices and styles [7], school context [8], intelligence [9], psychopathic traits [10], or executive functions (EF) [11], have been proposed as factors that may contribute to the occurrence of BP.

BP are strongly associated with executive dysfunction, particularly in inhibitory control and cognitive flexibility [12, 13]. EF encompasses higher order cognitive processes, which regulate goal-oriented, efficient, and adaptative behavior [14], and it is crucial in self-regulation of behavior and emotions, especially inhibitory control - one of the core EF [15]. These functions can be divided into cold EF, which are purely cognitive tasks (e.g., working memory, inhibition, metacognition), and hot EF, which involve affective or motivational components (e.g., behavior regulation, emotion regulation) [16, 17]. However, this is a fuzzy distinction, since both work together as part of a more general adaptive function, and there is considerable overlap between the underlying neural systems [18].

Psychopathic traits have also been linked to EF. Meta-analyses examining psychopathic traits in older adolescents and adults indicated an association with executive dysfunction [19, 20]. Nevertheless, some authors suggest that they refer more to antisocial behavior than to psychopathic traits per se, adding that some dimensions of psychopathy (i.e., behavioral/lifestyle dimensions) are more related to EF deficits (e.g., inhibitory control) than others (i.e., affective and interpersonal dimensions) [21, 22]. In children, the emerging literature, which focuses mainly on the affective dimension - callous-unemotional (CU) traits, is scarce and contradictory. There are studies that have shown positive associations between CU traits and executive dysfunction in community and high-risk preschool children [23, 24] and community adolescents [25], whilst others have found positive relationships between CU traits and better EF in community children [11, 26]. In addition, results can differ according to

informants, parents or teachers [27]. At the neurobiological level, both psychopathic traits and EF have been associated with impairments in the prefrontal cortex, suggesting overlapping brain areas. Yet not all children with psychopathic traits (CU) and EF deficits present BP, which suggests that they may interact at different levels [3].

Indeed, beyond identifying the key factors involved in the onset of BP in childhood, the underlying processes that lead to trajectory variability should be explored. In this regard, there is a growing interest in explaining under what circumstances the effects occur. For instance, the moderating effect of EF has been investigated with mixed results. Some studies found that EF moderated the association between CU traits and BP, but in different ways; better EF in the presence of elevated CU would lead to milder BP [24], or better developed EF would facilitate more sophisticated BP [26, 28]. Other studies detected a slight tendency of a moderating effect [29], or even no effect [3]. The moderating effect of CU traits on the relationship between BP and EF has also been tested, and the scant literature suggests that BP at high levels of CU traits show worst EF [30, 31]. From an alternative perspective, in a mixed preschool sample [32], findings showed a mediating role of cognitive empathy - which can be defined as a hot EF [33] - in the relationship between CU traits and BP, but these findings were not replicated for overt and relational aggressive behavior. Lastly, in a study of a young adult twin community sample [22], a mediating role of the behavioral dimension of psychopathy in the relationship between EF and antisocial behavior was found.

In the current study, we sought to expand the literature on associations among children's psychopathic traits, EF, and BP in an at-risk sample of children aged 5 to 12 years. First, we examined direct effects of psychopathy dimensions (interpersonal, affective, behavioral/lifestyle, and the whole construct) on EF, and of EF on BP. We hypothesized that psychopathic traits explain -invertedly- EF, and that poorer EF are related to BP. Second, we examined the potential mediating role of EF in the relationship between psychopathic traits and BP, in an attempt to analyze whether other types of effects occur in the relationships examined (i.e., indirect or mediated effects), with practical implications of interest for prevention [22, 32]. We hypothesized that EF mediate the relationship between the psychopathic traits and BP.

Method

Participants and Procedure

The present study is part of a larger, ongoing research project called INSchool, aiming to identify children and adolescents' mental health problems in a school setting (Bosch et al., 2021; Español-Martín et al., 2021) [34, 35]. The project was approved by the Clinical Research Ethics Committee of the [blinded for review]. Informed consent was obtained from all individual participants included in the study. Data for the current study were collected during the 2016-2017 academic year. Eligible subjects (N= 319) were those participants who were susceptible to being at-risk for psychopathology - for a detailed description of the sample see [36] -, after they and their parents were separately interviewed by trained psychiatrists to confirm or discard a clinical diagnosis using the *Present and Lifetime version of the Kiddie Schedule for Affective Disorders and Schizophrenia* (*K-SADS/PL*) [37]. Parents were invited to complete *The Behavioral Rating Inventory of Executive Function* (BRIEF and BRIEF-2) [38, 39] to assess the EF. To avoid possible biases, we removed 18 subjects, eight with diagnoses of autism spectrum disorder, eight with borderline intellectual functioning and two affected by parental relationship distress. Of the remaining 301 participants, only those with reports of EF (n = 197) were considered, with a retention rate of 65.4%. There were statistically significant differences between participants without EF reports (n = 104), and those with EF reports (n = 197) in delinquent behavior (t [297] = 2.23, p = .03, d = .27, r = .13). No differences were found for aggressive behavior, conduct problems, or psychopathic traits. Since the assessment with BRIEF-2 was very scarce in this wave (n = 17), only the participants evaluated with BRIEF were retained. The final sample was composed of 180 children (41.1% girls) aged 5–12 years (M = 8.29; SD = 2.13), from eight schools (7 state and 1 private state-subsidized) of two different rural and urban areas of Catalonia (NE Spain). Schools in these two different areas did not differ in terms of families' SES (χ_2 [3] = 6.06, p = .109).

Measures

Sociodemographic characteristics were assessed with items developed ad hoc for the project INSchool. To this end, parents provided information on variables such as the child's age,

gender, and health (general anamnesis and medical record), and the family's socioeconomic level.

The Child Problematic Traits Inventory-Parent reported (CPTI) [40, 41] is a 28-item questionnaire aimed at assessing psychopathic personality traits in children. It consists of 28 items rated on a response scale ranging from 1 (*Does not apply at all*) to 4 (*Applies very well*). It is composed of three scales: Grandiose-Deceitful (GD; Cronbach's alpha [α] =.88); Callous-Unemotional (CU; α =.81); Impulsive-Need for stimulation (INS; α=.88), and a composite total score ($CPTI_{total\ score}$; α =.91).

The Strengths and Difficulties Questionnaire (SDQ) [42] is a 25-item screening instrument intended to measure psychosocial functioning of children and adolescents, scored from 0 (*Not true*) to 2 (*Certainly true*), and divided into five scales: Emotional symptoms; Conduct problems (CP); Hyperactivity/inattention; Peer relationship problems; and Prosocial behavior. In the present study, only the CP scale (α =.62) was considered.

The Child Behavior Checklist (CBCL) [43, 44] is a 113-item checklist reported by parents and scored from 0 (*not true*) to 2 (*very true or often true*). The CBCL encompasses eight syndrome scales: Withdrawn; Somatic complaints; Anxious/depressed; Social problems; Thought problems; Attention problems; Delinquent behavior (DB); and Aggressive behavior (AB). In the present study, only the DB (α =.62) and AB scales (α =.89) were considered. Prior to the main statistical analyses, 10 items were eliminated because of their low frequency when referring to primary school children.

The Behavioral Rating Inventory of Executive Function (BRIEF) [38, 45] is reported by parents and used to assess impairment of EF. It consists of 103 items scored on a 3-point scale: *never*, *sometimes*, and *often*. The BRIEF has eight clinical scales, of which inhibitory control (Inhibit; INH), cognitive and behavioral flexibility (Shift; S) and emotional regulation (Emotional Control; EC) make up the composite Behavioral Regulation Index (BRI), i.e., hot EF. The Composite Metacognition Index (MI), reflecting cold EF, comprises of Beginning a task or generate ideas (Initiate; I), Working Memory (WM), Plan/Organize (PO), planning and organization of cognition and problem solving (Organization of Materials; OM), and self-

monitoring in the social context as well as monitoring problem solving and task performance (Monitor; M) . High scores on any of the BRIEF scales indicate the presence of problems in the area represented.

Statistical Analyses

All analyses between psychopathic traits, EF, and BP were examined through path analyses in Mplus 7.4 [46], which makes it possible to examine complex models including the direct and indirect (mediated) effects with observed variables. A total of 18 models were tested to assess the three scales of behavioral problems described above. Of these, nine considered the dimensions of psychopathy, and nine the global construct of psychopathy. Analyses of the BRIEF indices and scales were performed separately, the latter being grouped according to the index to which they were related. A combination of maximum likelihood (ML) and bootstrapping (b = 5,000) was used in order to maximize accurate estimations under a non-normal distribution and estimate bias-corrected 95% confidence intervals for indirect effects [47]. Goodness of fit was assessed with chi-square distribution ($\chi 2$/DF), comparative fit index (CFI), root-mean-square error of approximation (RMSEA), and standardized root-mean-square residual (SRMR). The criteria considered for an optimum fit were $\chi 2$/DF < 2–3, CFI > .95, RMSEA and SRMR< .05; and for an acceptable fit $\chi 2$/DF < 4, CFI > .90, and RMSEA and SRMR < .08 [48, 49].

Results

Preliminary analyses revealed statistically significant differences in delinquent behavior in terms of gender (t [178] = 2.52, p = .01, d = .38, r = .19), with higher rates in boys, and in the EF Initiative in terms of age (F [7, 172] = 2.17, p < .05), with younger children (i.e., 6-year-olds) showing significantly lower levels of initiative than their oldest counterparts (i.e., 12-year-olds). No differences were found for aggressive behavior, conduct problems, psychopathic traits and the remaining EF. Therefore, both gender and age were controlled for in subsequent analyses when the affected variables were examined.

A visual representation of the tested mediation model can be seen in Figure 1. All models ranged from acceptable to perfect model fit (further details available in the table notes).

Effect of Psychopathy Dimensions on EF

Only the results obtained with the BRIEF indices are shown below; the results of each BRIEF subscale are attached as supplementary material. Findings show that psychopathic traits in children had a direct effect on EF. These effects were noticeable in the subscale AB of the CBCL (see Table 1), where all dimensions had effects on the BRI index. A direct effect of INS, and $CPTI_{total\ score}$ was found on the MI index. When subscale DB of the CBCL is considered (see Table 2), we can observe direct effects of CU, INS, and $CPTI_{total\ score}$ on the BRI index, whilst only INS, and CPTI scales had a direct effect on the MI index. Similar results are observed for subscale CP of the SDQ (see Table 3).

Effects of EF on BP

Tables 1 and 3 show that EF have an impact on BP. Thus, we can observe how the BRI index has a direct effect on subscale AB of the CBCL, and subscale CP of the SDQ, but not on subscale DB of the CBCL (see Table 2).

Focusing on the BRIEF scales, we observe that the EC subscale has an impact on subscale AB (see Table S1) of the CBCL ($\beta = .368$, $p < .001$ for CPTI dimensions; $\beta = .351$, $p < .001$ for $CPTI_{total}$), on subscale DB (see Table S2) of the CBCL ($\beta = .133$, $p < .05$ for $CPTI_{total\ score}$), and on subscale CP (see Table S3) of the SDQ ($\beta = .382$, $p < .001$ for CPTI dimensions; $\beta = .365$, $p < .001$ for $CPTI_{total}$). The S subscale has an impact on subscale AB (see Table S1) of the CBCL ($\beta = 193$, $p < .01$ for CPTI dimensions; $\beta = .174$, $p < .01$ for $CPTI_{total}$), and on subscale CP (see Table S3) of the SDQ ($\beta = .284$, $p < .001$ for CPTI dimensions; $\beta = .263$, $p < .001$ for $CPTI_{total\ score}$). The INH subscale has an impact on subscale AB (see Table S1) of the CBCL ($\beta = .383$, $p < .001$ for CPTI dimensions; $\beta = .395$, $p < .001$ for $CPTI_{total}$), on subscale DB (see Table S2) of the CBCL ($\beta = .165$, $p < .05$ for CPTI dimensions), and on subscale CP (see Table S3) of the CBCL ($\beta = .252$, $p < .01$ for CPTI dimensions; $\beta = .231$, $p < .01$ for $CPTI_{total\ score}$).The M subscale has an impact on subscale DB (see Table S5) of the CBCL ($\beta = .119$, $p < .05$ for CPTI dimensions). Lastly, the I subscale has an impact on subscale AB (see

Table S4) of the CBCL (β = .140, p < .05 for CPTI dimensions; β = .152, p < .05 for $CPTI_{total}$), and on subscale CP (see Table S6) of the SDQ (β = .196, p < .01 for CPTI dimensions; β= .178, p < .05 for $CPTI_{total}$)

Mediation Effects of Executive Functions on the Relationship between Psychopathic Traits and Behavioral Problems.

There is a mediating role of some EF in the relationship between psychopathic traits and BP. Thereby, indirect effects of GD, CU, INS and $CPTI_{total\ score}$ on subscale AB of the CBCL are observed through the BRI index (see Table 1), as well as the EC subscale, the S subscale and the INH subscale (see Table S1). Indirect effects of CU, INS and $CPTI_{total\ score}$ on subscale CP of the SDQ are observed through the BRI index (see Table 3), and the EC subscale, the S subscale, and the INH subscale (see Table S3). Furthermore, an indirect effect of $CPTI_{total\ score}$ is shown through subscale I on subscale AB of the CBCL (see Table S4), and an indirect effect of INS and $CPTI_{total\ score}$ on subscale CP of the SDQ. No EF mediation is observed between psychopathy and subscale DB of the CBCL.

Discussion

The aim of this study was to investigate how psychopathic traits, EF and BP are related, and expand the literature from a multidimensional and ecological perspective. Consistent with our hypotheses, we demonstrated unique, main effects of psychopathic traits and EF on the relationship with BP, and furthermore, that EF mediate the relationship between the psychopathy dimensions and their global construct and the BP, in a sample of at-risk children aged 5 to 12 years

Consistent with our first hypothesis, both the three dimensions of psychopathy and their general construct explain the presence of poorer EF, in line with previous research in children-adolescents [23 - 25], and adults [19, 20]. However, not all dimensions of psychopathy have the same relationship with EF, and there is little support for a generalized impairment of EF in relation to the dimensions of psychopathy [50]. Hence, it can be observed that only the INS dimension or the global construct of psychopathy inversely explain most of the evaluated EF. The INS dimension has been clearly associated with poorer EF in adulthood over the other two

dimensions [22]. The CU dimension was related to poorer emotional and behavioral regulation (i.e., EC and BRI) according to recent findings in preschoolers [24, 27], and adolescents [25]. Similarly, poorer flexibility in children with high CU traits was also observed (see Supplementary material). In particular, the presence of cognitive inflexibility could partly explain the persistence of behavioral perseverative conducts, despite punishment [51], which in turn is clearly associated with the presence of CU traits [8, 52]. Our findings do not show dysfunction in the MI index, in line with other studies [27, 53] but contrary to the results obtained by Platje and colleagues [25], and could be aligned with those who have reported that more CU traits implied markedly higher cold EF [11, 26]. Regarding the GD dimension, the findings are similar to those obtained for the CU dimension, although they are only observed in the model that considers the AB scale. This might be attributable to the possibility that there is less damage to brain functioning in GD traits than in the other two dimensions [10]. Finally, the fact that the MI index is shown to be intact despite the presence of GD and CU traits may lead us to hypothesize about the concept of successful psychopaths, a subgroup which would be considered to have intact or superior executive functions in adulthood, especially for the GD and CU dimensions [54].

Overall, our findings show that greater executive dysfunction leads to worse behavioral problems. The worse results in BRI and its related scales imply more AB or CP. Again, the findings suggest the importance of hot EF, but also of inhibition and cognitive flexibility. Behavioral and emotional regulation problems have a direct effect on BP [55], and both inhibition and cognitive flexibility could be postulated as being core executive functions [3]. Therefore, lower EF may increase the risk of engaging in BP through a reduced ability to control emotions, reduced behavioral inhibition, and poorer behavioral regulation when faced with adverse situations [56].

A surprising finding of our study was that in our sample, executive dysfunction had a clearer impact on the AB and CP scales than on the DB scale. One possible explanation lies in the fact that the delinquent conduct subscale seems to be more closely related to proactive aggression [57], which would be in line with previous studies [26, 28]. Thus, while reactive

aggressiveness is associated with poor behavioral control and emotional hyper-reactivity [58], proactive aggressiveness would require more complex cognition [59]. Much more research is needed, however, to discard any potential methodological biases and further clarify this unexpected result.

According to our results, the third hypothesis of the present study is no more than partially supported, because only some of the executive functions assessed have a mediating effect on the relationship between psychopathic traits and behavioral problems. As expected, there are direct effects of the different dimensions of psychopathy on the different scales of BP. Similarly, indirect effects of the dimensions of psychopathy on the AB and CP scales are also observed through the BRI and its related scales (i.e., mediation effects). Most of them are partial mediation effects, suggesting that at least part of the effect of psychopathic traits on BP is explained by executive dysfunction. However, our results show a couple of unexpected findings; there is no direct effect between CU and BP, showing as a total mediation effect through BRI index for the AB and CP scales, while there is a direct effect between CU and the DB scale (only if the MI index is taken into account) with no mediation effect by EF. Taken together, these findings suggest that the relationship between CU and BP traits has something to do with the involvement of EF in behavioral regulation. Thus, EF would be relevant variables in the study of psychopathy, especially in CU traits, possibly due to the different cognitive correlates of each of the dimensions of psychopathy and the relationship that both CU traits and hot EF have with the amygdala [10, 60].

The strengths of this study include the availability of a considerable sample of children at-risk for psychopathology, the use of well-validated and commonly used questionnaires to measure external correlates, and the inclusion of the dimensions that make up the psychopathy construct. However, certain limitations should be considered. First, this is a cross-sectional study, so causality cannot be established. Second, as information was provided by parents, our results may be conditioned by shared variance; nevertheless, it could be also considered a strength since it provides ecological validity [3, 61]. Future research should be conducted using

longitudinal studies, including the use of standardized performance tasks for EF, since they do not necessarily measure the same as the EF assessment scales [62].

In sum, our findings show unique, main effects of psychopathic traits and EF on the relationship with BP. Furthermore, EF mediate the relationship of all three psychopathy dimensions and the total psychopathy score with BP, such that the higher the score on the psychopathy dimensions, the lower the EF score, which, in turn, would have a negative impact on BP. The results extend knowledge about correlates of psychopathy associated with each dimension, and may have implications for both the prediction and prevention of BP.

Ethical approval: All procedures in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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Table 1

Effects of Psychopathic Traits on Aggressive Behavior Mediated by the Behavioral Rating Inventory of Executive Function Indices

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on AB		(2) PT on EF		(3) EF on AB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD	BRI	.173*	.037, .314	.234*	.049, .416			.099*	.017, .196
CU		.001	-.117, .128	.260**	.073, .437	.422***	.296, .536	.110**	.031, .191
INS		.303***	.204, .406	.312***	.178, .435			.131***	.071, .192
CPTI total score		.405***	.290, .518	.655***	.553, .744	.419***	.297, .530	.274***	.189, .365
GD	MI	.266**	.110, .408	.116	-.070, .315			.006	-.020, .037
CU		.105	-.012, .240	.115	-.088, .310	.053	-.103, .196	.006	-0.20, .0.38
INS		.414***	.278, .540	.384***	.227, .530			.020	-.036, .084
CPTI total score		.643***	.536, .745	.526***	.409, .642	.069	-.092, .216	.036	-.053, .115

Note. EF = Executive function; PT = Psychopathic traits; AB = Aggressive behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; BRI = Behavioral regulatory index; MI = Metacognition index.

In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00; CFI = 1.00; TLI = 1.00)

*p < .05 **p < .01 ***p < .001.

Table 2

Effects of Psychopathic Traits on Delinquent Behavior Mediated by the Behavioral Rating Inventory of Executive Function Indices

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on DB		(2) PT on EF		(3) EF on DB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD	BRI	.427***	.317, .540	.193	-.014, .389			.029	-.004, .078
CU		.124	-.004, .249	.288**	.109, .475	.152	-.001, .282	.044	-.001, .100
INS		.097	.002, .215	.326***	.192, .451			.050	-.005, .100
CPTI total score		.527***	.381, .648	.662***	.562, .751	.146	-.002, .288	.097	-.002, .195
GD	MI	.449***	.334, .559	.113	-.077, .320			.008	-.010, .036
CU		.161**	.045, .267	.113	-.102, .309	.068	-.060, .186	.008	-.014, .038
INS		.121*	.010, .237	.388***	.232, .533			.026	-.022, .077
CPTI total score		.603***	.494, 695	.528***	.408, .643	.040	-.087, .175	.021	-.044, .095

Note. EF = Executive function; PT = Psychopathic traits; DB= Delinquent Behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$= The Child Problematic Traits Inventory total score; BRI = Behavioral regulatory index; MI = Metacognition index

Model fit: BRI-CPTI Dimensions (χ_2 = .88 [1]; RMSEA = .00 [.00 - .15]; CFI = 1.00; TLI = 1.00); BRI-CPTI total score (χ_2 = .95 [1]; RMSEA = .00; CFI = 1.00; TLI = 1.00)
*p < .05 **p < .01 ***p < .001.

Table 3

Effects of Psychopathic Traits on Conduct Problems Mediated by the Behavioral Rating Inventory of Executive Function Indices

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on CP		(2) PT on EF		(3) EF on CP			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD	BRI	.305***	.156, .438	.163	.049, .416			.067	-.012, .163
CU		-.007	-.154, .142	.284**	.073, .437	.412***	.277, .541	.117**	.045, .203
INS		.183**	.046, .310	.345***	.211, .466			.142***	.078, .210
CPTI total score		.412***	.285, .539	649***	.547, .738	.397***	.242, .526	.258***	.157, .359
GD	MI	.363***	.214, .502	.102	-.093, .308			.010	-.019, .045
CU		.099	-.036, .260	.116	-.085, .310	.095	-.064, .259	.011	-.012, .052
INS		.288***	.121, .440	.393***	.235, .538			.037	-.022, .113
CPTI total score		626***	.514, .727	.524***	.403, .638	.083	-.065, .226	.044	-.034, .127

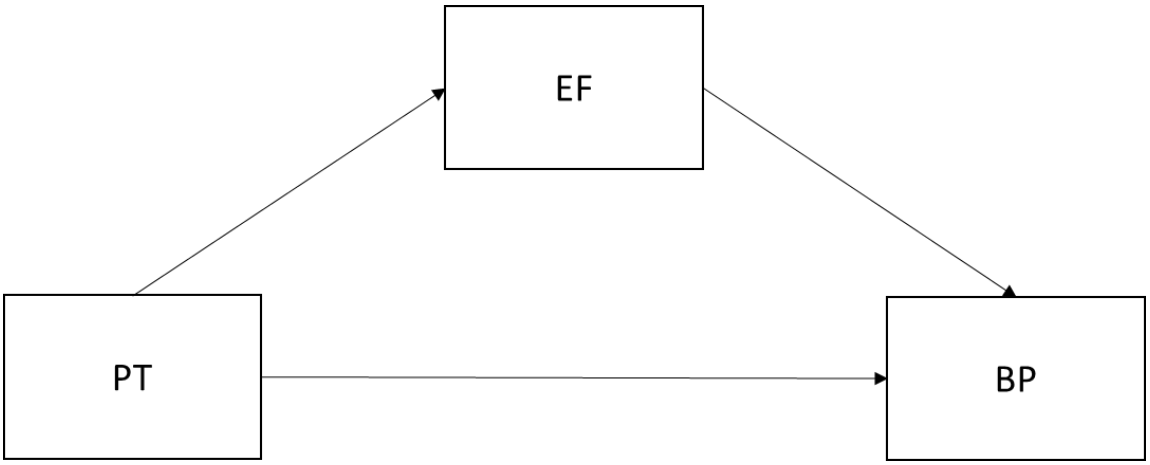
Note. EF = Executive function; PT = Psychopathic traits; CP = Conduct problems; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; $CPTI_{total\ score}$ = The Child Problematic Traits Inventory total score; BRI = Behavioral regulatory index; MI = Metacognition index

In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00; CFI = 1.00; TLI = 1.00)

*p < .05 **p < .01 ***p < .001.

Figure 1

Theoretical Mediation Model of the Relationship between Psychopathic traits and Behavioral Problems via Executive Functioning



Note. PT = Psychopathic traits; EF = Executive functions; BP = Behavioral Problems

Supplemental material

Do Executive Functions have a Mediating Role in the Relationship between Psychopathic Traits and Behavioral Problems in Children at Risk for Psychopathology?

Table S1.

Effects of Psychopathic Traits on Aggressive Behavior Mediated by Behavioral Regulatory Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on AB		(2) PT on EF		(3) EF on AB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	EC	.192**	.052, .324	.217*	.022, .390			.080*	.007, .156
	S	.235**	.083, .370	.191*	-.004, .378			.037	-.002, .095
	INH	.198**	.055, .332	.192	-.020, 398			.074	-.007. .174
CU									
	EC	.110	-.102, .130	.274**	.091, 456	.368***	.250, 479	.101**	.031, .176
	S	.048	-.078, .194	.328**	.113, .513	.193**	.048, .318	.063*	.010, .126
	INH	.073	-.060, .212	.100	-.112, .299	.383***	.256, .504	.038	-.047, .119
INS									
	EC	.362***	.258, .460	.198**	.068, .330			.073**	.024, .129
	S	.407***	.296, .511	.144	-.020, .309			.028	-.003, .067
	INH	.261***	.143, .375	.455***	.300, .603			.174***	.105, .255
CPTI total score									
	EC	.488***	.375, .598	.547***	.427, 657	.351***	.230, .465	.192***	.119, .278
	S	.594***	.495, .687	.489***	.350, .607	.174**	.054, .290	.085**	.025, .151
	INH	.423***	.308, 539	.651***	.537, .750	.395***	.269, .519	.257***	.169, .354

Note. EF= Executive function; PT = Psychopathic traits; AB = Aggressive behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; EC = Emotional Control; S = Shift; INH = Inhibit.

In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00 [.00-.00]; CFI = 1.00; TLI = 1.00).
*p < .05 **p < .01 ***p < .001.

Table S2.

Effects of Psychopathic Traits on Delinquent Behavior Mediated by Behavioral Regulatory Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on DB		(2) PT on EF		(3) EF on DB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	EC	.434***	.319, .547	.174	-.038, .367			.022	-.006, .065
	S	.448***	.332, .564	.167	-.029, .354			.009	-.017, .036
	INH	.430***	.313, .546	.155	-.073, .380			.026	-.004, .083
CU									
	EC	.129*	.004, .253	.304**	.115, .509	.129	-.006, .258	.039	-.002, .095
	S	.150*	.025, .270	.346**	.134, .536	.053	-.085, .178	.018	-.031, .072
	INH	.147*	.021, .259	.124	-.080, .323	.165*	-.021, .292	.020	-.013, .074
INS									
	EC	.120*	.020, .230	.213**	.075, .350			.027	-.001, .068
	S	.139**	.036, .246	.152	-.015, .316			.008	-.013, .038
	INH	.069	-.031, .190	.469***	.313, .620			.077	-.012, .140
CPTI total score									
	EC	.550***	.427, .654	.557***	.433, .667	.133*	.004, .255	.074	.002, .149
	S	.586***	.483, 681	.495***	.364, .611	.080	-.047, .200	.040	-.023, .103
	INH	.552***	.401, .689	.658***	.543, .759	.108	-.059, .275	.071	-.034, .182

Note. EF= Executive function; PT = Psychopathic traits; DB = Delinquent Behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; EC = Emotional Control; S = Shift; INH = Inhibit.

Model fit indices ranged from acceptable to optimum: EC-CPTI dimensions (χ_2 = .01 [1] n.s.; RMSEA = .00 [.00 - .06]; CFI = 1.00; TLI = 1.01); EC-CPTI total score (χ_2 = .05 [1] n.s.; RMSEA = .00 [.00 - .10]; CFI = 1.00; TLI = 1.02); S-CPTI dimensions (χ_2 = .01 [1] n.s.; RMSEA = .00 [.00 - .07]; CFI = 1.00; TLI = 1.04); S-CPTI total score (χ_2 = .07 [1] n.s.; RMSEA = .00 [.00 - .10]; CFI = 1.00; TLI = 1.04); INH-CPTI dimensions (χ_2 = 3.88 [1] $p < .05$.; RMSEA = .10 [.01 - .22]; CFI = .99; TLI = .90); INH-Total score (χ_2 = 3.97 [1] $p < .05$.; RMSEA = .10 [.01 - .22]; CFI = .99; TLI = .94)

*$p < .05$ **$p < .01$ ***$p < .001$.

Table S3.

Effects of Psychopathic Traits on Conduct Problems Mediated by Behavioral Regulatory Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on CP		(2) PT on EF		(3) EF on CP			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	EC	.319***	.180, .450	.141	-.055, .331			.054	-.019, .137
	S	.331***	.184, .470	.146	-.059, .330			.041	-.015, .102
	INH	.339***	.194, .468	.132	-.093, .351			.033	-.019, .112
CU									
	EC	-.003	-.139, .137	.298**	.112, 492	.382***	. .267, 493	.114**	.041, .200
	S	.015	-.128, .180	.336**	.113, .517	.284***	.142, .423	.095*	.025, .180
	INH	.077	-.059, .234	.132	-.072, .330	.252**	.106, .394	.033	-.019, .094
INS									
	EC	.236***	.104, .357	.234**	.097, .369			.089**	.032, .161
	S	.277***	.137, .403	.170*	.009, .332			.048	.003, .107
	INH	.205**	.056, .353	.478***	.319, .634			.120**	.047, .204
CPTI total score									
	EC	.472 ***	.364, .575	.540***	.419, .649	.365***	.231, .482	.197***	.117, .284
	S	.543***	.443, 642	.481***	.350, 597	.263***	.115, .390	.127**	.052, .202
	INH	.519***	.387, .644	.651***	.537, .753	.231**	.071, .385	.151**	.047, .260

Note. EF = Executive function; PT = Psychopathic traits; CP = Conduct problems; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; EC = Emotional Control; S = Shift; INH = Inhibit.

In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00 [.00-.00]; CFI = 1.00; TLI = 1.00).

*p < .05 **p < .01 ***p < .001.

Table S4.

Effects of Psychopathic Traits on Aggressive Behavior Mediated by Metacognition Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on AB		(2) PT on EF		(3) EF on AB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	M	.260**	.100, .401	.127	-.047, .297			.012	-.010, .047
	PO	.270**	.114, .413	.059	-.146, .284			.002	-.020, .0.24
	OM	.265**	.112, .413	.146	-.034, .330			.007	-.019, .034
	WM	.274***	.118, .413	.052	-.137, .269			-.002	-.020, .016
	I[a]	.265**	.111, .403	.119	-.054, .289			.017	-.007, .055
CU									
	M	.098	-.017, .237	.129	-.064, .320	.097	-.046, .240	.013	-.012, .045
	PO	.107	-.015, .241	.107	-.120, .313	.041	-.101, .185	.004	-.019, .033
	OM	.112	.001, .246	-.016	-.228, .173	.045	-.085, .172	-.001	-.022, .013
	WM	.113	.002, .243	.062	-.164, .275	-.034	-.186, .103	-.002	-.030, .013
	I	.084	-.039, .222	.184	-.003, .355	.140*	.003, .274	.026	-.004, .073
INS									
	M	.398***	.263, .521	.374***	.208, .509			.036	-.015, .100
	PO	.420***	.291, .537	.354***	.193, .496			.014	-.032, .072
	OM	.420***	.298, .537	.322***	.163, .476			.015	-.029, .058
	WM	.447***	.318, .570	.356***	.197, .509			-.012	-.069, .035
	I	.372**	.250, .492	.331***	.174, .359			.046	.001, .099
CPTI total score									
	M	.621***	.508, .720	.549***	.422, .658	.107	-.040, .245	.059	-.022, .142
	PO	.655***	.561, .747	.451***	.314, .587	.055	-.090, .193	.025	-.044, .084
	OM	.656***	.569, .746	.387***	.242, .531	.062	-.075, .184	.024	-.034, .070
	WM	.687***	.598, .779	.419***	.293, .550	-.017	-.155, .114	-.007	-.073, .051
	I	.595***	.484, .700	.513***	.393, .622	.152*	.010, .288	.078*	.004, .158

Note. EF= Executive function; PT = Psychopathic traits; AB = Aggressive behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; M = Monitor; PO = Plan Organize; OM = Org. of materials; WM = Working Memory; I = Initiate

[a] As suggested by Modification indices, age was also controlled for conduct problems in models examining the role of the Initiative EF.
In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00 [.00-.00]; CFI = 1.00; TLI = 1.00).
*p < .05 **p < .01 ***p < .001.

Table S5.

Effects of Psychopathic Traits on Delinquent Behavior Mediated by Metacognition Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on DB		(2) PT on EF		(3) EF on DB			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	M	.442***	.331, .561	.121	-.051, .290			.014	-.006, .044
	PO	.451***	.336, .565	.058	-.146, .289			.005	-.018, .024
	OM	.449***	.333, .562	.143	-.048, .328			.006	-.013, .036
	WM	.457***	.342, .564	.056	-.136, .268			-.001	-.017, .018
	I	.448***	.334, .560	.102	-.080, .285			.007	-.010, .031
CU									
	M	.153**	.033, .261	.123	-.064, .315	.119*	.009, .222	.015	-.010, .049
	PO	.159**	.044, .271	.097	-.130, .304	.066	-.031, .198	.008	-.015, .039
	OM	.169**	.055, .278	-.019	-.221, .168	.053	-.064, .164	-.001	-.021, .016
	WM	.170**	.061, .277	.059	-.178, .268	-.018	-.140, .111	-.001	-.024, .013
	I	.156**	.041, .263	.193*	.008, .368	.067	-.051, .187	.011	-.013, .051
INS									
	M	.102	-.009, .219	.391***	.213, .515			.045	.003, .094
	PO	.116*	.005, .233	.359***	.200, .497			.031	-.009, .078
	OM	.130*	.023, .244	.326***	.163, .481			.017	-.021, .057
	WM	.154**	.040, .273	.354***	.198, .507			-.006	-.050, .038
	I	.128*	.026, .237	.338***	.179, .480			.023	-.017, .070
CPTI total score									
	M	.578***	.474, .670	.552***	.426, .659	.084	-.019, .202	.046	-.009, .117
	PO	.599***	.503, .682	.453***	.316, .583	.055	-.060, .178	.025	-.026, .088
	OM	.609***	.524, .689	.389***	.248, .530	.040	-.074, .158	.015	-.030, .068
	WM	.645***	.545, .724	.419***	.294, .548	-.048	-.170, .090	-.020	-.073, .042
	I	.592***	.493, .678	.517***	.399, .625	.066	-.051, .189	.034	-.027, .099

Note. EF = Executive function; PT = Psychopathic traits; AB = Aggressive behavior; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; M = Monitor; PO = Plan Organize; OM = Org. of materials; WM = Working Memory; I = Initiate.

Model fit indices ranged from acceptable to optimum: M-CPTI dimensions (χ_2 = 1.24 [1] n.s.; RMSEA = .03 [.00 - .16]; CFI = 1.00; TLI = 1.00); M-CPTI total score (χ_2 = 1.24 [1] n.s.; RMSEA = .03 [.00 - .16]; CFI = 1.00; TLI = .99); PO-CPTI dimensions (χ_2 = 3.32 [1] n.s.; RMSEA = .09 [.00 - .21]; CFI = .99; TLI = .90); PO-CPTI total score (χ_2 = 2.66 [1] n.s.; RMSEA = .08 [.00 - .20]; CFI = .99; TLI = .96); OM-CPTI dimensions (χ_2 = 1.33 [1] n.s.; RMSEA = .03 [.00 - .06]; CFI = 1.00; TLI = 1.01)
*p < .05 **p < .01 ***p < .001.

Table S6.

Effects of Psychopathic Traits on Conduct Problems Mediated by Metacognition Clinical Scales

CPTI	EF mediator	Direct effects						Indirect effects	
		(1) PT on CP		(2) PT on EF		(3) EF on CP			
		β	CI [95%]	β	CI [95%]	β	CI [95%]	β	CI [95%]
GD									
	M	.364***	.214, .500	.107	-.072, .282			.009	-.016, .042
	PO	.368***	.220, .515	.045	-.171, .274			.004	-.029, .033
	OM	.365***	.217, .503	.134	-.052, .323			.008	-.017, .036
	WM	.317***	.221, .505	.056	-.135, .266			.001	-.020, .023
	I[a]	.365***	.216, .496	.086	-.101, .261			.017	-.022, .055
CU									
	M	.099	-.027, .256	.137	-.051, .325	.083	-.064, .240	.011	-.013, .047
	PO	.101	-.033, .261	.106	-.107, .308	.090	-.053, .241	.009	-.012, .052
	OM	.111	-.019, .264	-.014	-.227, .176	.059	-.082, .195	-.001	-.023, .016
	WM	.109	-.021, .262	.054	-.178, .267	.023	-.126, .186	.001	-.017, .027
	I	.072	-.056, .216	.190*	.023, .361	.196**	.052, .334	.037	.003, .093
INS									
	M	.294***	.123, 445	.383***	.212, .524			.032	-.023, .107
	PO	.293***	.130, .438	.363***	.204, .507			.032	-.016, .099
	OM	.306***	.159, .441	.328***	.170, .481			.019	-.029, .069
	WM	.317***	.152, .468	.356***	.202, .509			.008	-.045, .071
	I	.242**	.083, .390	.348***	.192, .493			.068*	.016, .134
CPTI total score									
	M	.631***	.514, .737	.549***	.425, .658	.070	-.071, .222	.038	-.038, .129
	PO	.636***	.539, 726	.449***	.316, 579	.074	-.060, .211	.033	-.028, .099
	OM	.646***	.563, .730	.386***	.241, .531	.061	-.076, .183	.024	-.036, .071
	WM	.664***	.577, .748	.418***	.290, .547	.013	-.124, .144	.006	-.056, 065
	I	.573***	.470, .674	.509***	.389, 621	.178*	.030, .311	.091*	.017, .168

Note. EF= Executive function; PT= Psychopathic traits; CP = Conduct Problems; CI = Confidence interval; GD = Grandiose-deceitful; CU = Callous-unemotional; INS = Impulsive-Need of stimulation; CPTI $_{\text{total score}}$ = The Child Problematic Traits Inventory total score; M = Monitor; PO = Plan Organize; OM = Org. of materials; WM = Working Memory; I = Initiate

[a] As suggested by Modification indices, age was also controlled for conduct problems in models examining the role of the Initiative EF.
In terms of model fit, all models were identified (χ_2 = .00; RMSEA = .00 [.00-.00]; CFI = 1.00; TLI = 1.00).
*p < .05 **p < .01 ***p < .001.

CHAPTER 4:
General Discussion

4.1 Discussion

The purpose of the present doctoral dissertation was to expand the literature about the relationship between BP and psychopathic traits, and the role of EF in this relationship within a community, and an at-risk sample of children aged 5 to 12 years from the multidimensional model of psychopathy (Salekin, 2017). The main objectives were a) testing psychometric properties of the Spanish parent- reported version of the CPTI, b) analyzing the association between psychopathic traits and risk for psychopathology, and c) studying the relationship between psychopathic traits, EF, and BP. Two studies were conducted, with these objectives in mind. Study 1 provide further validation of the Spanish parent-reported version of the CPTI, regarding the factor structure, reliability, validity, and their ability to discriminate between normative and at-risk for psychopathology samples. Study 2 show unique, main effects of psychopathic traits and EF on their relationship with BP, and remarkably, that EF mediate the relationship between psychopathic traits, considering the global construct and its underpinning dimensions, and BP. The model fit for the three-factor structure of parent-reported CPTI is adequate, replicating the results obtained in previous CPTI studies, including both parents' and teachers' reports. These results also converge with previous studies, carried out in our country, with both the teacher and parent-reported versions of the CPTI (López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019). In addition, the three-factor structure of the CPTI has been shown to be invariant for gender also in line with all prior parent-reported CPTI surveys (Colins et al., 2020; López-Romero, Maneiro, et al., 2019; López-Romero, Molinuevo, et al., 2019; Luo et al., 2019; Somma et al., 2016), but one (Wang et al., 2018). Therefore, our results indicate that the CPTI can be used with parents and may become a measure with the capacity to unravel the roots of psychopathic personality and antisocial behavior from early childhood (Farrington et al., 2010; López-Romero et al., 2021; Waller et al., 2013).

Our findings also confirm the convergent and divergent validity of the CPTI. Thus, positive correlations were obtained in the CPTI variables, particularly with externalizing problems such as ADHD symptoms, aggressive and delinquent behavior, and conduct problems, as well as a

negative correlation with prosocial behavior. On the other hand, all dimensions of psychopathy and their global construct were related to all correlated external criteria, including internalizing problems, as shown by bivariate zero-order correlations. Although individuals with psychopathic traits have traditionally been defined as low-anxious, early developmental research shows that the combination of certain psychopathic traits together with the presence of anxious traits is related to different psychopathological outcomes (Craig et al., 2021; Humayun et al., 2014), including mixed outcomes (e.g., Kubak & Salekin, 2009). In addition, anxiety and other related emotional problems have been examined as potential indicators of primary (i.e., low neuroticism) and secondary (i.e., high neuroticism) variants of psychopathy (Kimonis et al., 2012).

At dimensional level, interpersonal traits correlate with conduct problems, oppositional problems, delinquent behavior and aggressive behavior, in line with previous research that relate interpersonal traits with greater transgression, unprovoked aggression and lower neuroticism (Hawes et al., 2014; Salekin, 2017). In fact, interpersonal traits have shown a stronger relationship than callous-unemotional traits (Lau et al., 2011; Lau & Marsee, 2013), highlighting the unique association between interpersonal traits and aggressive or delinquent behavior. However, the predictive value of callous-unemotional traits at early developmental stages (Frick, 2022; Frick et al., 2014; Squillaci & Benoit, 2021) remains supported because these traits significantly correlated with both oppositional behavior from the CPRS-R:S, and both delinquent and aggressive behavior from the CBCL. Moreover, only callous-unemotional traits remain significantly and negatively correlated with prosocial behavior, and positively correlated with peer relationship problems, because guilt and empathy play a clear role in both promoting prosocial behavior and inhibiting BP (Waller et al., 2020). Likewise, some work has found that internalizing problems may exacerbate aggressive behavior in adolescents who combine both callous-unemotional and interpersonal traits (Lee-Rowland et al., 2020). Our results show that callous-unemotional traits are related to both withdrawal and thought problems, without a fully satisfactory explanation, which may be due to the fact that internalizing symptoms and thought problems in these children, when expressed behaviorally, could be interpreted by parents as callous-unemotional traits. Further studies aimed to analyze the relationship of this dimension

with the variables described, as well as the study of neurobiological correlates, are needed faced by this area of study (Skeem et al., 2011; Torrubia & Cuquerella, 2008). Lastly, behavioral traits are related to both, externalizing and internalizing symptoms, being the most likely explanations that they are intimately related to other psychiatric symptoms (Christian et al., 2021; Gustavson et al., 2020), their co-occurrence with emotional and behavioral problems (Bubier & Drabick, 2009), and even a consequence of the behavior problems they experience (Frick et al., 1999).

With regard the discriminant validity of the CPTI, psychopathic traits discriminate between normative and at-risk for psychopathology (especially from the externalizing pole) samples being both, behavioral traits and the general construct of psychopathy, the most discriminating, in line with previous studies (Salekin, 2016).

Although Study 2 shows that not all dimensions of psychopathy have the same influence on EF, the three dimensions of psychopathy and its general construct explain the presence of executive dysfunction. Only the global construct of psychopathy, and behavioral dimension inversely explain most of the evaluated EF. This finding is consistent with research in adults (Friedman et al., 2021), where behavioral dimension is associated with poorer executive performance. The callous-unemotional dimension was related to poorer emotional and behavioral regulation as other surveys in preschoolers (Graziano et al., 2019; Waller et al., 2017) and adolescents (Platje et al., 2018). Specially, the presence of cognitive inflexibility could partly explain the persistence of behavioral perseverative conducts, despite punishment (Séguin & Zelazo, 2005), which in turn is clearly associated with the presence of callous-unemotional traits (Frick et al., 2014; Squillaci & Benoit, 2021). The findings related to interpersonal dimension are similar to those obtained for the callous-unemotional dimension, although they are only observed in the model that considers the Aggressive Behavior scale of the CBCL. This result could be related to findings suggesting that interpersonal dimension shows less damage to brain functioning than in the other two dimensions (Salekin, 2017). In line with other studies (Graziano et al., 2019; Rydell & Brocki, 2019), our results show no dysfunction in EF related to metacognition and could be aligned with those who have reported that more callous-unemotional

traits implied markedly higher cold EF (Thomson & Centifanti, 2018; Wall et al., 2016). It is worth noting that the fact that EF related to metacognition are shown to be intact despite the presence of interpersonal traits and callous-unemotional may lead us to hypothesize about the concept of successful psychopaths in adulthood where intact or higher EF are also observed, especially for the interpersonal and callous-unemotional dimensions (Wallace et al., 2022).

Overall, our findings show that greater executive dysfunction leads to worse BP. Consistent with the hypothesis that lower EF may increase the risk of engaging in BP through a reduced ability to control emotions, reduced behavioral inhibition, and poorer behavioral regulation in the face of adverse situations (Sprague et al., 2011), our results indicate that lower hot EF, but also lower inhibition and cognitive flexibility involve more BP, supporting the idea that behavioral and emotional regulation problems have a direct effect on BP (Lonigan et al., 2017).

The last hypothesis of the current dissertation is no more than partially supported. Thus, partial mediation effects of EF related to emotional and behavioral regulation were mostly observed in the relationship between psychopathic traits and BP. However, our results show a couple of unexpected findings; there is no direct effect between callous-unemotional traits and BP, showing as a total mediation effect through EF related with emotional and behavioral regulation for the Aggressive Behavior of the CBCL and Conduct Problems of the SDQ scales, while there is a direct effect between callous-unemotional traits and the Delinquent Behavior of the CBCL scale (only if EF related to metacognition are taken into account) with no mediation effect by EF. Taken together, these findings suggest that the relationship between callous-unemotional traits and BP traits has something to do with the involvement of EF in behavioral regulation. Thus, EF would be relevant variables in the study of psychopathy, especially in callous unemotional traits, possibly due to the different cognitive correlates of each of the dimensions of psychopathy and the relationship that both callous-unemotional traits and hot EF have with the amygdala (Noordermeer et al., 2016; Salekin, 2017).

4.1.1 Integration of the Findings

This doctoral dissertation has several strengths, as well as expands knowledge on the three aforementioned topics (i.e., BP, psychopathic traits, and EF). One of the main strengths or

contribution of this doctoral thesis has been to consider psychopathic traits in children as a construct of three interrelated dimensions (i.e., interpersonal, callous-unemotional, and behavioral) that somehow resembles the construct in adulthood (Colins et al., 2014; Frick et al., 2000), since most studies in this field have only considered one (i.e., callous-unemotional). Indeed, the available evidence on the interpersonal and behavioral traits of psychopathy is very scarce compared to the large amount of evidence on the callous-unemotional traits (e.g., genetic studies, biological and neuropsychological correlates, neuroimaging studies; Frick, 2022), which has even led to the creation of the LPE specifier in international classification systems (APA, 2013; WHO, 2018). Another main strength has been the use of both a large community sample, as well as the use of a considerable at-risk for psychopathology subsample.

We have shown that the CPTI parent-version is a useful tool in the assessment of psychopathic traits in childhood providing further validation, with good to excellent internal consistency, replicating and expanding the relationship with external correlates in a large community sample. Thereby, the CPTI may become a measure with the capacity to unravel the roots of psychopathic personality from early childhood (Farrington et al., 2010; López-Romero et al., 2021; Waller et al., 2013). In addition, we provide new evidence supporting the utility of the CPTI to establish comparisons between normative and at-risk for psychopathology samples, particularly those with externalizing symptoms.

The emerging research by BP, psychopathic traits, and EF is scarce in children and manly focusing on the study of callous-unemotional traits. Furthermore, EF have mainly been assessed with performance tasks, which may not be reflecting day-to day situations (Gioia & Isquith, 2004). Therefore, the use of the *Behavioral Rating Inventory of Executive Function* (BRIEF; Gioia et al., 2000; Belmonte, 2016) could be considered another strength.

Indeed, beyond identifying the key factors involved in the onset of BP in childhood, the underlying processes that lead to trajectory variability should be explored. In this regard, there are some examples that attempt to explain under what circumstances the effects occur (i.e., moderation effects; Dotterer et al., 2021; Ezpeleta et al., 2013; Graziano et al., 2019; Platje et al.,

2018; Thomson & Centifanti, 2018; Wall et al., 2016; Waller et al., 2017; Waschbusch et al., 2022). Although, assessing how psychopathic traits and cognitive EF interact and whether their interaction explains the presence of BP, to the best of your knowledge, there are not studies about this area in childhood. Indeed, studying the mediating role of EF in the relationship between psychopathic traits and BP is undoubtedly, a novel contribution to the scientific research.

4.1.2 Theoretical and Practical Implications

The findings of this dissertation could have several practical implications for research and clinical settings. First, our results support the consideration of psychopathy as a multidimensional construct that could influence behavioral problems by combining the three factors (Colins et al., 2014; Salekin, 2017). Second, they converge with previous research that establishes a close relationship among psychopathic traits in children and a wide range of behavioral and psychosocial problems (Salekin & Lynam, 2010). Third, our findings would be in line with current proposals that claim for the inclusion of all psychopathy dimensions, and not only callous-unemotional traits, as potential identifiers of BP and other relevant problems in developmental models and diagnostic classification systems (Lilienfeld, 2018; Salekin, 2017). Fourth, the close relationship between psychopathic traits in childhood and greater executive dysfunction, especially in those EFs related to emotional and behavioral regulation, seems evident (Graziano et al., 2019; Platje et al., 2018; Waller et al., 2017). Fifth, behavioral and emotional regulation dysfunction worsen the presence of BP (Lonigan et al., 2017), and mediate the relationship between psychopathic traits (especially callous-unemotional traits) with BP. Taken together, the fourth and the fifth topics may suggest that treatment aimed at improving EF related to emotional and behavioral regulation would be helpful in both, the prevention and treatment of both psychopathic traits and BP in childhood.

4.1.3 Limitations

Certain limitations should be also considered. First, the use of a cross-sectional design does not allow us to establish predictions between psychopathic personality and future conduct problems. Second, as information was provided by parents, our results may be conditioned by

shared variance; nevertheless, it could be also considered a strength since it provides ecological validity (Gioia & Isquith, 2004; Rizeq et al., 2020). In addition, it could also be considered a strength, since, in line with previous studies (Colins et al., 2020; López-Romero, Maneiro, et al., 2019; Luo et al., 2019; Somma et al., 2016; Wang et al., 2018) our results indicate that the CPTI can be answered by both parents and teachers, giving us the possibility to assess psychopathic traits from early ages with multiple informants, as recommended (Frick et al., 2000). Third, these results are not representative of the general population and, therefore, additional studies with larger representative samples are needed. Fourth, the lack of standardized performance tasks for measure EF since they do not necessarily measure the same aspects as the EF assessment scales, and can provide complementary information (Toplak et al., 2013). In sum, future research with longitudinal studies should also account for potential SES, parent's educational level, gender, or psychopathology differences, particularly as regards the predictive and discriminant value of psychopathic traits, and contemplate the use of both, standardized performance tasks, and assessment scales for measure EF.

CHAPTER 5:

Conclusions

Based on the results of both studies, this following general conclusions can be drawn:

1. Our findings confirm the original structure of three interrelated factors (GD, CU, and INS) of the Spanish parent-reported version of the CPTI, as well as an invariance for gender.
2. The Spanish parent-reported version of the CPTI is a reliable and valid measure for assessing psychopathic traits, showing good to excellent internal consistency. Furthermore, the validity study provides significant information on CPTI convergent and discriminant validity established through relationships with both externalizing and internalizing symptoms, as expected.
3. In terms of the usefulness of the CPTI as a comparative framework for making comparisons between a normative sample and a sample at risk of psychopathology, we can conclude that the CPTI is a useful instrument for differentiating both types of samples, particularly those at the externalizing pole.
4. The three dimensions of psychopathy and its general construct explain the presence of poorer EF, in line with previous research. Nevertheless, there is scarce support for a generalized impairment of EF in relation to the dimensions of psychopathy as they do not all have the same relationship with EF, being INS traits or the global construct of psychopathy, which inversely explains most of the evaluated EF.
5. Lower EF may increase the risk of engaging in BP, especially behavioral regulation, and emotional control, but also inhibition and cognitive flexibility.
6. Our last hypothesis is partially fulfilled because only EF related to behavioral regulation (i.e., emotional control, inhibition, and cognitive flexibility) have a mediating effect on the relationship between psychopathic traits and BP. Moreover, according to our findings, the link between CU traits and BPs would be fully mediated by these EF.

In sum, the results of this doctoral thesis show, on one hand, that the CPTI is a robust and comprehensive psychometric assessment tool for research on psychopathic traits in children and on the other hand, it seems to provide solid evidence of the usefulness of the CPTI for subtyping

children with behavioral disorders. Furthermore, these results show unique, main effects of psychopathic traits and EF on the relationship with BP, likewise the mediating role of EF in the relationship between psychopathic traits and BP. Highlighted, the findings of this doctoral thesis extend knowledge about correlates of psychopathy associated with each dimension, and may have implications for both prediction and prevention of BP.

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