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Psychopathic severity profiles: A latent profile analysis in youth samples with implications for the diagnosis of conduct disorder

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ABSTRACT

Purpose: The current study aimed to explore the benefits of including a broader set of psychopathic traits (i.e. Grandiose-Manipulative; Callous-Unemotional, Impulsive-Irresponsible traits) to specify Conduct Disorder (CD).
Methods: A Latent Profile Analysis (LPA) based on the three-factor model of the Youth Psychopathic Traits Inventory-Short was performed with a forensic sample of 393 male adolescents and was replicated in a community sample of 481 male adolescents. Significant mean differences on outcome variables across profiles in the forensic sample were also tested using the modified BCH and the DCAT methods.
Results: Results revealed the existence of three psychopathic severity profiles: a low psychopathic traits profile, an average psychopathic traits profile, and a high psychopathic traits profile. Though with lower scores, replication of the LPA in a community sample yielded approximately the same psychopathic severity profiles. The psychopathic profiles within the forensic sample differed on key variables including CD diagnosis, severity of comorbid diagnoses, recidivism risk, and aggression.
Conclusions: Overall, the results highlight the importance of considering the full range of psychopathic traits in the assessment and treatment of youth with conduct problems, especially those in contact with the juvenile justice system.

1. Introduction

The *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; American Psychiatric Association, 2013) recently included Callous-Unemotional (CU) traits as a specifier for Conduct Disorder (CD) termed - "Limited Prosocial Emotions" (LPE). This specifier describes those youth who meet diagnostic criteria for a CD, but also present with at least 2 of 4 CU traits. The *International Classification of Diseases 11th Revision* (*ICD-11*) is also considering a similar CU specifier for the CD diagnosis (World Health Organization; WHO, 2016). While the inclusion of some psychopathic traits has advanced current diagnostic terminology, significant evidence also suggests that considering the a multifaceted model of psychopathy (Cooke & Michie, 2001; Hare, 2003; Salekin & Hare, 2016), combining not only CU, but also Grandiose-Manipulative (GM) and Impulsive-Irresponsible (II) traits could be beneficial when diagnosing and specifying CD (see Salekin, 2016 for a review; Salekin, Andershed, Batky, & Bontemps, 2018; Salekin, Andershed, & Clark, 2018).

The inclusion of CU traits as a specifier for CD was based on a considerable amount of research pointing out that those traits were related to the earliest, most severe, and persistent forms of antisocial behavior, which, in turn, would predict long-term impairments at different levels of functioning (Baskin-Sommers, Waller, Fish, & Hyde, 2015; Frick, Ray, Thornton, & Kahn, 2013; Kumsta, Sonuga-Barke, & Rutter, 2012; Viding & McCrory, 2012). A substantial body of research has also shown that youth with elevated CU traits display distinct genetic, biological, cognitive, affective, and social features, suggesting that the etiology of conduct problems for this group of youth may be different from those without elevated CU traits (see Frick & Wall Myers, 2018 for a review).[1]

To meet diagnostic criteria for CD, an individual must present at least 3 of 15 possible symptoms, which account for the great

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[1] It is important to acknowledge that some of this research was based on psychopathy total scores as well as scales that contained primarily GM traits and/or II traits.

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heterogeneity of individuals with this disorder and, consequently, for the relevance of subtyping CD into clinically distinctive groups (APA, 2013; Frick, 2001; Frick & Nigg, 2012; Klahr & Burt, 2014). Thus, it seems crucial to include a specifier that not only helps to identify a severe antisocial subgroup of CD, but also that increases diagnostic information for case conceptualization and treatment planning (see Salekin, 2016, 2017 for review; see also Colins & Andershed, 2015). Though the CU specifier seems to partially respond to those needs (Baskin-Sommers et al., 2015; Frick et al., 2013; Frick & Wall Myers, 2018; Kumsta et al., 2012; Viding & McCrory, 2012), the available evidence on the validity of this specifier is sparse and critical questions still remain (Colins, Andershed, Salekin, & Fanti, 2018; Jambroes et al., 2016; Lahey, 2014; Salekin, 2016, 2017). Specifically, some authors argued that the combination of CD with high levels of all psychopathic traits better predicts behavioral problems and criminal recidivism than any single psychopathic trait by itself (Asscher et al., 2011; Colins & Andershed, 2015; Collins et al., 2018; Forth & Book, 2010; Leistico, Salekin, DeCoster, & Rogers, 2008; Lorber, 2004; Somma, Andershed, Borroni, Salekin, & Fossati, 2018). Moreover, research has also shown that psychopathic traits are associated with distinctive dysfunctions at the genetic, molecular, neural, cognitive, and social levels, which account for persistent antisocial deviance and criminal behavior (see Blair, Peschardt, Budhani, Mitchell, & Pine, 2006 and Ribeiro da Silva, Rijo, & Salekin, 2012 for a review). Finally, it seems that it is the combination of high levels of GM, CU, and II traits that decrease the responsiveness to treatment in youth with CD (Leistico et al., 2008; Salekin, 2010, 2017). Forum.

Taken together, these findings indicate that while including CU traits as a specifier for CD is important for both clinical and research purposes, there are several reasons to also consider other dimensions of psychopathy as well. First, it seems that including the multifaceted model of psychopathy as a specifier for CD may, more accurately, help to reduce the heterogeneity of this diagnosis, allowing to identify a more severe antisocial subgroup of CD individulas (Colins et al., 2018; Salekin, 2016, 2017; Salekin, Andershed, & Clark, 2018). Second, this multifaceted model of psychopathy may help to improve our understanding of conduct disordered youth, helping to clarify etiological models, as well as to disentangle the contribution of each psychopathic trait to specific impairments (Salekin, 2016, 2017). Third, it seems paramount to assess these set of traits in clinical practice, in order to improve case conceptualization, as well as prevention and intervention efforts (Colins et al., 2018; Salekin, 2016, 2017; Salekin, Andershed, & Clark, 2018).

An important issue for classification systems is the use of clinically relevant disorders and specifiers (APA, 2013; WHO, 2016). In trying to address this issue, research has been interested in studying the manifestations of symptoms/traits on a person-by-person basis (i.e., how symptoms function and vary within individuals). Latent profile Analysis (LPA), a variant of Latent Variable Mixture Modeling, is considered a robust and accurate person-centered method used to classify individuals from a heterogeneous population into smaller, more homogeneous subgroups based on individuals' scores on continuous variables (Bauer & Curran, 2003; McLachlan & Peel, 2004; Muthén, 2001; Muthén & Muthén, 2001; Vermunt & Magidson, 2002). As a stricter probabilistic/model, LPA is more flexible than cluster analysis techniques, because is based on an explicit model of the data and also takes into account that each person has a certain (nonzero) membership probability for other classes (Vermunt & Magidson, 2009). Recent studies have applied LPA to explore different profiles of psychopathic traits in adult forensic (e.g., Krstic et al., 2018; Mokros et al., 2015; Neumann, Vitacco, & Mokros, 2016) and adult community (e.g., Colins, Fanti, Salekin, & Andershed, 2017) samples. In youth, studies applying LPA have used measures of CU traits alone (e.g., Fanti, Demetriou, & Kimonis, 2013; Kimonis, Goulter, Hawes, Wilbur, & Groer, 2017).

Though there are no studies applying LPA to tap the broader psychopathic syndrome in youth samples, previous research has employed Latent Class Analysis (LCA; like LPA, LCA is person-centered method, but is based on individuals' scores on categorical variables) and cluster analysis techniques to sort youth according to their levels of psychopathic traits. For instances, Nijhof et al. (2011) used LCA and found evidence for three-latent classes (normal; impulsive, non-psychopathic-like; and psychopathy-like) in a residential youth sample (n = 214), using the Youth Psychopathic Traits Inventory. Andershed, Köhler, Louden, and Hinrichs (2008) found evidence for a three-cluster solution (Unemotional/Impulsive–Irresponsible, Low Traits, and Psychopathic Personality) in a male offender sample (n = 148), using the Psychopathy Checklist: Screen Version. In turn, Lee, Salekin, and Iselin (2010) identified three clusters that varied in the severity of psychopathic traits (low, moderate, and high) in a sample of male offenders (n = 94), using both the Psychopathy Checklist: Youth Version and the Antisocial Process Screening Device. Despite incongruences across these studies findings, youth scoring higher on all the psychopathic traits were likely to correspond to the smallest group, but to have higher prevalence rates of CD, higher levels of aggression, and higher recidivism risk, than youth belonging to other groups (e.g., Andershed et al., 2008; Lee et al., 2010; Nijhof et al., 2011). Regarding comorbidity rates, though this is still an area without consensus (Sevecke & Kosson, 2010), some variable-centered (not person-centered) studies found that youth with psychopathic traits had higher comorbidity rates, mostly with externalizing, but also with internalizing psychopathology (e.g., Lansing, Plante, Beck, & Ellenberg, 2018; Latzman et al., 2018; Salekin, Leistico, Neumann, DiCicco, & Duros, 2004).

Although cluster analysis studies have provided important findings, there is a need for LPA investigation in youthful populations to further build on cluster analytic results (McLachlan & Peel, 2004; Vermunt & Magidson, 2002), to provide comparisons with adult LPA studies, and to add to the current knowledge about associations between psychopathic profiles and comorbidity within a person centered perspective. Moreover, LPA, as a person-centered analytic tool that is thought to be closest to what happens in real clinical practice (Bauer & Curran, 2004; Lubke & Muthén, 2007; McLachlan & Peel, 2004; Muthén, 2001; Vermunt & Magidson, 2002), may further aid in our understanding of children with CD and psychopathic traits. In detail, due to the multitude of possible combinations of criteria that a youth may meet to receive a CD diagnosis (APA, 2013; Frick, 2001; Klahr & Burt, 2014), LPA studies can help to support and guide translational science, ascertaining for the clinical usefulness of subtyping CD according to the presence/absence of psychopathic traits (Salekin, 2016).

2. The current study

The main goal of the current study was to explore the benefits of including GM, CU, and II traits as CD specifiers. To attain this goal, we used LPA to identify groups of forensic male youth based on their levels of psychopathic traits (GM, CU, and II) and to test if these findings would replicate in a male youth community sample. Finally, we compared the psychopathic profiles of the forensic sample on key outcome variables (CD diagnosis, comorbidity, recidivism risk, and aggression). We expected to find similar psychopathic profiles in the forensic and community samples, with at least one group with low scores on all three psychopathic traits and another group with high scores on all three psychopathic traits (Andershed et al., 2008; Lee et al., 2010; Nijhof et al., 2011). We also expected to find at least another intermediary group, though it is difficult to formulate hypothesis regarding the trait composition of this group, because of the mixed findings of previous research (Andershed et al., 2008; Lee et al., 2010; Neumann, Schmitt, Carter, Embley, & Hare, 2012; Nijhof et al., 2011). As research has shown that psychopathic traits are continuously distributed throughout the population, it was expected that the levels of psychopathic traits would be lower in the community sample (e.g., Andershed, Kerr, Stattin, & Levander, 2002; Edens, Marcus, Lilienfeld, & Poythress Jr, 2006; Frick, Bodin, & Barry, 2000; Hare, 2003; Kosson et al., 2013;

Murrie et al., 2007; Neumann et al., 2012; Neumann & Hare, 2008). Finally, it is expected that profiles with higher scores on all three psychopathic traits in the forensic sample would have the highest prevalence rates of CD, the uppermost comorbidity rates, and the highest levels of aggression and recidivism risk, than profiles with lower scores on all three psychopathic traits (e.g., Andershed et al., 2008; Asscher et al., 2011; Leistico et al., 2008; Salekin et al., 2004).

3. Method

3.1. Participants

This study included a forensic sample of 393 male youth aged between 13 and 19 years, who were recruited from Portuguese juvenile facilities, either foster care and juvenile detention centers. All of those recruited in these settings had a history of severe behavior problems and, consequently, had a high probability for having a CD diagnosis (Rijo et al., 2016). This study also included a community sample[2] of 481 male youth aged between 13 and 19 years who were recruited from school settings (i.e., the community sample). Table 1 presents the demographic characteristics of the samples, including the prevalence rate of CD in the forensic sample (see Table 1).

3.2. Measures

The Youth Psychopathic Traits Inventory-Short (YPI-S; Van Baardewijk et al., 2010; Portuguese version by Pechorro, Andershed, Ray, Maroco, & Gonçalves, 2015) is an 18-item self-report version of the original Youth Psychopathic Traits Inventory (YPI; Andershed et al., 2002). The YPI-S assesses psychopathic traits in youth via ratings within three different factors: Grandiose-Manipulative (GM; e.g., "It's easy for me to manipulate people"), Callous-Unemotional (CU; e.g., "I think that crying is a sign of weakness, even if no one sees you"), and Impulsive-Irresponsible (II; e.g., "I like to do exciting and dangerous things, even if it is forbidden or illegal"). Each factor is estimated by a set of six items. Each item in the YPI-S is rated on a four-point scale (1 = "Does not apply at all" to 4 = "Applies very well"). The YPI-S can be scored by simply adding the item ratings, and higher scores are indicators of increased levels of psychopathic traits. The YPI and the YPI-S were validated in several countries across the globe, both in forensic and community samples of youth (see Salekin, Andershed, & Clark, 2018 for a review). The three-factor structure of the YPI-S was, among others, confirmed in a sample of Portuguese male young offenders (Pechorro et al., 2015) and in a Portuguese youth community sample (Pechorro, Ribeiro da Silva, Andershed, Rijo, & Gonçalves, 2017). This measurement model has proven to be invariant across boys taken from those different samples (Pechorro, Ribeiro Da Silva, Andershed, Rijo, & Gonçalves, 2017). The YPI-S has revealed a strong convergence with the original YPI and it has been demonstrated to have good psychometric properties (Pechorro et al., 2015; Pechorro et al., 2017; Van Baardewijk et al., 2010). The three-factor measurement model achieved good fit, both for the forensic (RMSEA = 0.04, ranging from 0.04 to 0.05; CFI = 0.91; SRMR = 0.06) and the community (RMSEA = 0.05, ranging from 0.04 to 0.05; CFI = 0.91; SRMR = 0.05) samples. The YPI-S showed acceptable to good internal consistency based on alpha and mean inter-item correlations (MIC; within the recommended value range of 0.15–0.50; Clark & Watson, 1995). Specifically: for the forensic sample the alphas for the GM, CU, and II factors were 0.79 0.69, and.73, respectively, while the MIC ranged between 0.27 and 0.36 and for the community sample the alphas for the GM, CU, and II factors were 0.78 0.64, and.55, respectively, and MIC ranged between 0.17 and 0.36. The YPI-S factors presented moderate correlations between each other, ranging from 0.30 to 0.34. Table 1 also presents the descriptive statistics of the YPI-S factors across samples.

Table 1
Demographic characteristics and descriptive of measures for the forensic and community samples*

	Forensic sample (n = 393)	Community sample (n = 481)	$t/\chi 2$
Sample size	393 (45.0)	481 (55.0)	
Age	16.29 (1.35)	16.40 (1.10)	(754.42) = −1.32
Years of education	6.34 (1.66)	9.77 (1.16)	(680.73) = 34.51*
SES			
Low	302 (76.8)	118 (24.5)	
Medium	85 (21.7)	241 (50.1)	(4) = 254.10*
High	6 (1.5)	122 (25.4)	
YPI-S-GM	13.10 (3.24)	12.48 (3.20)	(2.871) =2.84*
YPI-S-CU	12.86 (3.18)	11.78 (2.85)	(2.871) = 5.28*
YPI-S-II	16.45 (3.39)	13.92 (2.62)	(876.42) = 12.57*
CD-MINI-KID	316 (80.4)	–	–
Comorbidity-MINI-KID	2.20 (1.26)	–	–
YLS/CMI-T (n = 189)			
Low	21 (5.3)	–	–
Moderate	85 (21.6)	–	–
High	76 (19.3)	–	–
Very High	7 (1.8)	–	–
BPAQ-T	75.57 (18.72)	–	–
BPAQ-PA	24.81 (7.03)	–	–
BPAQ-VA	13.69 (3.98)	–	–
BPAQ-A	18.08 (5.24)	–	–
BPAQ-H	20.10(5.96)	–	–

Note. Information for sample size, SES, CD-MINI-KID, and recidivism risk are presented as n (%); information for age, years of education, descriptive of measures and comorbidity are presented as M (SD). YPI-S = Youth Psychopathic Traits Inventory: Short Form: GM = Grandiose-Manipulative Factor CU = Callous-Unemotional Factor; II = Impulsive-Irresponsible Factor; CD-MINIKID = Number of individuals receiving a Conduct Disorder diagnosed with the Mini-International Neuropsychiatric Interview for Children and Adolescents; Comorbidity-MINI-KID = Number of diagnosis established with the MINI-KID; YLS/CMI-T = Youth Level of Service/Case Management Inventory, Total Score; BPAQ = Buss-Perry Aggression Questionnaire: T = total score; PA = Physical Aggression Factor; VA = Verbal Aggression Factor; A = Anger Factor; H = Hostility Factor.

* Main effects significant at $p < .001$ for Independent-Samples t-tests and $\chi 2$ tests between the forensic and the community samples

The Mini-International Neuropsychiatric Interview for Children and Adolescents (MINI-KID; Sheehan et al., 2010; Portuguese Authorized Version by Rijo et al., 2016) is a structured clinical diagnostic interview, which assesses DSM-IV/ICD-10 Axis I disorders in children and adolescents in a way that is both comprehensive and concise. MINI-KID is organized into diagnostic sections, each one starting with 2 to 4 screening questions for each specific disorder. Additional symptom questions within each disorder section are asked only if the screen questions are positively answered. All questions are in a binary "yes/no" format. The MINI-KID takes into account not only DSM criteria A, but also the impairment and duration of the symptoms, being considered a short and accurate instrument to diagnose Axis I disorders. Additionally, items are included to address ruling out medical, organic, and/or drug causes for disorders. Diagnostic criteria are summarized and documented within each disorder section and on a summary sheet. The MIMI-KID takes between 30 and 90 min to administer, depending on the number of screening questions that are positively answered by the child/adolescent. In a previous study (Sheehan et al., 2010), inter-rater reliability was found to be excellent for all mental health disorders assessed with the MINI-KID.

The Youth Level of Service/Case Management Inventory (YLS/CMI; Hoge, Andrews, & Leschied, 2002; Portuguese version by Pimentel, Quintas, Fonseca, & Serra, 2015) is a 42-item checklist, which assesses eight different risk factors/needs: Prior and Current Offenses/Disposition, Family Circumstances/Parenting, Education/Employment, Peer

[2] The community sample was only used to replicate the LPA procedure.

Relations, Substance Abuse, Leisure/Recreation, Personality/Behavior, and Attitudes/Orientation. Each item is scored dichotomously (present/absent), and each response in the affirmative receives a point towards the respective factor score and also to the total score (i.e., the sum of all eight risk/need scores). Based on the total score, youth can be categorized into four levels of recidivism risk: low, moderate, high, or very high. The reliability and validity of this measure has been confirmed by research, including in a Portuguese study showing that the YLS/CMI total risk score is significantly correlated with indices of reoffending (Hoge et al., 2002; Pimentel et al., 2010). In the present study, the total risk score of the YLS/CMI was used as a measure of recidivism risk.

The Buss–Perry Aggression Questionnaire (BPAQ; Buss & Perry, 1992; Portuguese version by Vieira & Soeiro, 2002) is a 29-item self-report measure. Items are rated on a 5-point scale (ranging from "extremely uncharacteristic of me" = 1 to "extremely characteristic of me" = 5). The BPAQ offers a global measure of aggression and scores on four subscales: physical aggression (9 items; e.g., "I may hit someone if he or she provokes me"), verbal aggression (5 items; e.g., "My friends say that I argue a lot"), anger (7 items; e.g., "I have trouble controlling my temper"), and hostility (8 items; e.g., "Other people always seem to get the breaks"). The BPAQ has revealed good psychometric properties, including its Portuguese version (Buss & Perry, 1992; Vieira & Soeiro, 2002). In the present study, the alpha for the total scale in forensic sample was 0.92, and for the physical aggression, verbal aggression, anger, and hostility factors were 0.80, 0.78, 0.77, 0.81, respectively. In turn, alpha for the total scale in community sample was 0.92, and for the physical aggression, verbal aggression, anger, and hostility factors were 0.84, 0.71, 0.80, 0.82, respectively. The BPAQ factors also achieved optimal MIC in the present study, ranging between 0.32 and 0.37. for the forensic sample and between 0.34 and 0.38 for the community sample.

3.3. Procedure

This study was approved by the ethics committee of the Faculty of Psychology and Education Sciences of the University of Coimbra and by a national data protection committee. Institutional authorizations were sought from the Ministry of Justice (in order to assess male youth placed in Portuguese juvenile detention facilities due to criminal behavior), from executive boards of Portuguese Child and Juvenile Protection Services (to assess youth that had a a history of severe behavior problems and were placed in Portuguese foster care facilities), and from executive boards of public schools (to assess community youth). After authorization was obtained, all participants were informed about the nature of the study and were invited to voluntarily participate. It was explained that their decision would not impact their sentencing/school grades in any way and that no payment or extra credit would be offered. Confidentiality and anonymity of their responses were also guaranteed. Participants older than 18 years gave verbal and written consent for their own participation and participants younger than 18 years verbally assented to their own participation in addition to their parents/legal guardians' written consent. 17 and 33 youth, respectively from the forensic and community samples, declined to participate. Youth with suspected cognitive impairment, psychotic symptoms, and/or developmental disorders were excluded from this study.

Data collection in the forensic sample consisted of three assessment phases: (a) the clinical interviewing procedure (see the Measures section), to assess mental health disorders in participants (including the identification of exclusion criteria not previously identified); (b) the self-report assessment, and (c) the recidivism risk assessment. Evaluators received extensive training, including a 3-day workshop, on the administration and rating of the structured clinical interview (see the Measures section). Once the training was completed, interviewers were frequently supervised by a senior researcher during the assessment phase. In the forensic sample, six youth fulfilled one or more exclusion criteria. The remaining participants further completed a self-report measure to assess psychopathic traits (see the Measure section). Twelve participants failed to complete this questionnaire. A listwise case deletion approach was applied for missing data. From the forensic sample, 262 youth also completed a self-report questionnaire to assess aggression (see the Measures section). Data related to recidivism risk (i.e., the total risk score of the YLS/CMI) was collected from the report files of youth placed in juvenile detention facilities. This data was previously compiled by a separate mental health professional or probation officer based on interviews with the youth, a review of his clinical/criminal record, and information gathered from various collateral sources (e.g., parents/legal guardians, teachers, and social workers).

In the community sample, only youth with no history of behavioral problems and/or mental health disorders were eligible for the study. This initial selection was made by parents/teachers after researchers have explained these exclusion criteria for the community sample. So, data collection in the community sample consisted only of the assessment of psychopathic traits by a self-report measure (see the Measure section). For the 19 participants who failed to complete this questionnaire, a listwise case deletion approach was applied.

3.4. Data analysis

The data were analyzed using SPSS v24 (IBM SPSS, 2016) and M*plus* v7 (Muthén & Muthén, 2010) statistical software. The SPSS software was used in the initial phase for descriptive and inferential statistics and for internal consistency calculations (Clark & Watson, 1995).

Mplus 7 was used to perform a Confirmatory Factor Analysis (CFA – using the Robust Maximum Likelihood estimator) to examine the evidence for a three-factor model of the YPI-S (the data were modeled based on items). The adjustment of the model, investigated via CFA, was judged based on the two-index approach proposed by Hu and Bentler (1999), with the requirements of a Comparative Fit Index (CFI) higher than 0.95 or a Root Mean Square Error of Approximation (RMSEA) lower than 0.06 combined with a Standardized Root Mean Square Residual (SRMR) lower than 0.09.

M*plus* was also used to conduct LPA to identify distinct subgroups of youth (latent profiles) based on their scores on the GM, CU, and II YPI-S factors in the forensic sample. The same procedure was then replicated in the community sample.

The first stage in LPA was to determine the number of classes with well-defined differentiated profiles across samples (forensic and community). Thus, LPA models were fit in a series of modeling steps starting with the specification of a one class model. Then, the number of classes was then subsequently increased until there was no further improvement in the model; i.e., adding another class would result in meaningless classes (Lubke & Muthén, 2007). To avoid Local Likelihood Maxima, we increased the sets of random start values to 3000 (with the best 100 of these starts being retained for final stage optimization), increased the number of iterations to 100 in the first steps of the optimization procedure, and checked the replicability of best log likelihood value (Morin, 2016).

The adjustment of the models and the decision about model selection were then judged by the following guidelines proposed by Ram and Grim (2009). We first examined the output of each estimated model and searched for potential problems or inconsistencies. We then compared models with different numbers of classes using Information Criteria (IC) based on fit statistics; i.e., Bayesian Information Criteria (BIC; Schwartz, 1978), Akaike Information Criteria (AIC; Akaike, 1987), and Sample-Size-Adjusted BIC (SSA-BIC; Sclove, 1987). Lower values on these fit statistic indices indicate better model fit; i.e., an optimum trade-off between model parsimony and residuals, with BIC being considered a better fit statistic index than the other IC indices (Nylund, Asparouhov, & Muthén, 2007). Next, we examined Entropy values, which assess the accuracy with which models classify individuals into their most likely

class. Entropy ranges from 0 to 1, with higher scores representing greater classification accuracy. Entropy values superior to 0.70 are preferable, indicating clear classification and greater power to predict class membership (Muthén, 2001). Then we tested the statistical significance to determine whether a more complex model (*k* classes) would fit the data significantly better than a more parsimonious model (*k* – 1 classes) by using the Lo-Mendell-Rubin test (LMR; Lo, Mendell, & Rubin, 2001) and the Bootstrap Likelihood Ratio Test (BLRT; McLachlan & Peel, 2004). The LMR and the BLRT tests provide *p*-values that can be used to determine if there is a statistically significant improvement in fit for the inclusion of one more class. For statistical model comparisons, the BLRT is generally preferred over the LMR test (Nylund et al., 2007). The sample size of the smallest class was then evaluated, specifically deciding that models with a class of < 1% and/or numerically $n < 25$ members should be rejected or rigorously grounded by theory and research (Bauer & Curran, 2004). Finally, and because LPA is a probabilistic approach, we also considered the average probabilities of class membership (Rost, 2006). The more distinct the average latent class probabilities for the most likely class membership are, the more useful and accurate the latent class solution will be. Thus, average probabilities equal to or larger than 0.80 (Rost, 2006) indicate a good class solution.

After determining the optimal number of classes, we tested for significant mean differences on outcome variables across profiles in the forensic sample. We did not include them on the LPA model in order to retain some "independence" between the classes and the variables of interest and to avoid meaningless results (Asparouhov & Muthén, 2014). Traditional analyses (e.g., logistic regression, analysis of variance) have been questioned when applied to mixture modeling, because they may introduce error and decrease precision by fixing an individual's probability of their highest class to 1 and all others to 0. Different approaches have been proposed to remedy these problems (Asparouhov & Muthén, 2014), such as using the auxiliary variable function in M*plus*. This function allows for comparisons between classes while taking into account participants' partial membership in classes, while also facilitating the exploration of relationships between profiles and other auxiliary variables without directly including them in the model.

Among these approaches, we selected the modified BCH method (Bakk & Vermunt, 2016; Bolck, Croon, & Hagenaars, 2004), which is the most robust approach and the recommended method for examining relationships between profiles and continuous distal outcomes (in this study, aggression-related variables and number of comorbid diagnoses) across latent profiles (Asparouhov & Muthén, 2014). We also selected the DCAT method (Lanza, Tan, & Bray, 2013), which is the preferred method to accommodate categorical distal outcomes across latent profiles (Asparouhov & Muthén, 2014). In the present work, the presence of a CD diagnosis and other mental health disorders,[3] as well as recidivism risk were investigated through the DCAT method.

4. Results

Table 2 shows the LPA model fit outcomes for the forensic and community sample. According to LPA results, and considering both samples, solutions with latent classes fit the data better than it did a unitary solution without latent classes. The Information Criteria (IC) based fit statistics (particularly BIC, but also AIC and SAS-BIC), along with entropy values and LMR/BLRT tests (Ram & Grimm, 2009), indicated that a three-class solution was the best model for allocating cases to profiles in the forensic sample. The same was true in the replication sample (i.e., the community sample), except for the entropy value of the three-profile solution (lower than 0.70). However, remaining indicators were all in favor of a three-profile solution. Moreover, the average probabilities of class membership for the four-class solution had one or two average probabilities lower than 0.80 (ranging from 0.70 to 0.93) in the tested samples (Rost, 2006). Therefore, across the different samples the three-profile solution provided a better model fit than a two or a four-profile solution (Ram & Grim, 2009) (see Table 2).

Table 3 reports profile allocation based on maximum posterior probability for the three latent profiles across samples. Taking into account the YPI-S factors mean scores, the three profiles were labeled as: Low Psychopathic Profile (LPP); Average Psychopathic Profile (APP), and High Psychopathic Profile (HPP). The HPP was the profile with the lowest percentage of youth (though always superior to 1% as recommended by Bauer & Curran, 2004) and the APP was the one with the highest percentage of youth. The average probabilities of class membership were always superior to 0.80 (Rost, 2006), except for the LPP in the community sample (0.78). Table 3 also presents the YPI-S factor mean scores across the three latent profiles and samples (which were statistically different within each sample as expected in LPA approaches) and Fig. 1 provides a visual illustration of this (see Table 3 and Fig. 1). Although the profiles were similar across the samples, it should be noted that the community sample profiles had lower scores in all YPI-S factors when compared to the similar profiles of the forensic sample.

Table 4 reports the relationships between the three psychopathic severity profiles in the forensic sample and the outcome variables (CD, comorbidity, recidivism risk, and aggression), in addition to overall chi-square tests and chi-square statistics for pairwise differences between profiles. The results indicated that those with a HPP were at a higher risk for CD, ODD, Substance Dependence, number of comorbid diagnosis, had a higher recidivism risk, and had higher aggression scores (considering the total score of the BPAQ or any of its four subscales physical aggression, verbal aggression, anger, and hostility). These results were significant for the majority of the comparisons, except when comparing the APP and the HPP on the total score of the BPAQ and its factors or when comparing the LPP and the APP on CD and comorbidity (see Table 4).[4]

5. Discussion

The goal of this study was to explore the benefits of including GM, CU, and II traits as CD specifiers. To address this, we used LPA to identify groups of forensic male youth based on their levels of psychopathic traits (GM, CU, and II) as measured by the YPI-S. Moreover, we also used LPA to determine if the findings from the LPA in the forensic sample would replicate in a community sample of male youth. Finally, the current study sought to examine and compare the psychopathic profiles of the forensic sample on key outcome variables

[3] To avoid null or residual indicators, we only considered disorders that had a prevalence rate of at least 10% in the forensic sample. Considering this criterion, only Alcohol Dependence ($n = 49$; 12.5%), Substance Abuse ($n = 44$; 11.2%), Substance Dependence ($n = 103$; 26.2%), and Oppositional Defiant Disorder ($n = 141$; 35.9%) were taking into account for further analysis. For additional information on this topic, please contact the corresponding author.

[4] We also conducted different LPA in the forensic sample to identify distinct latent profiles based on: YPI-S-GM; YPI-S-CU; and YPI-S-II, separately. The model fit indicators to obtain the optimal number of classes was always worse than using the combination of GM, CU, and II YPI-S factors. Furthermore, the LPA results considering YPI-S factors separately did not replicate in the community sample. In addition, comparisons between the GM, CU, or II severity profiles in the forensic sample on the outcome variables was never as pronounced as when using the three YPI-S factors to establish severity profiles. In this respect, the GM severity profiles differed on CD, ODD, recidivism risk, and physical aggression; while the CU severity profiles only differed on recidivism risk; and the II severity profiles differed on comorbidity, recidivism risk, and aggression (BPAQ and its factors). For additional information on this topic, please contact the corresponding author.

Table 2
Model fit of the latent profile analyzes for the forensic and community samples.

	Log-likelihood (number of replications)	N° of free parameters	AIC	BIC	SSA-BIC	Entropy	LMR *p*	BLRT *p*
Forensic sample (n = 393)								
1 Class	−3066.902 (100/100)	6	6145.80	6169.65	6150.61	–	–	–
2 Classes	−3006.458 (100/100)	10	6032.92	6072.65	6040.92	0.82	< 0.001	< 0.001
3 Classes	**−2969.701 (100/100)**	**14**	**5927.40**	**6023.04**	**5978.61**	**0.88**	< 0.001	< **0.001**
4 Classes	−2965.095 (85/100)	18	5966.19	6037.72	5980.61	0.62	0.324	0.428
Community sample (*n* = 471)								
1 Class	−3572.209 (100/100)	6	7156.42	7181.47	7162.43	–	–	–
2 Classes	−3542.950 (100/100)	10	7105.82	7147.66	7115.92	0.88	0.029	< 0.001
3 Classes	**−3524.192 (100/100)**	**14**	**7076.39**	**7134.85**	**7090.41**	**0.66**	**0.017**	< **0.001**
4 Classes	−3515.886 (86/100)	18	7067.77	7142.94	7085.81	0.69	0.049	< 0.001

Note: AIC = Akaike Information Criteria; BIC = Bayesian Information Criteria; SSA-BIC = Sample-Size Adjusted BIC; LMR *p* = *p* value of the Lo-Mendell-Rubin test; BLRT *p* = *p* value of the Bootstrap Likelihood Ratio Test.
Optima models are highlighted in boldface.

Table 3
Profile allocation based on maximum posterior probability for three latent profiles. Mean probabilities of latent profiles in the forensic and community samples. Mean scores on the YPI-S factors*

	N	%	Latent Profile*			YPI-S-GM	YPI-S-CU	YPI-S-II
			LPP	APP	HPP			
Forensic sample (N = 393)								
LPP	47	12.1	0.88			9.21 (0.42)	9.19 (0.51)	11.06 (0.66)
APP	328	83.5		0.96		13.36 (0.20)	13.08 (0.19)	16.98 (0.19)
HPP	17	4.4			0.87	18.84 (1.39)	18.76 (1.08)	21.33 (1.01)
Community sample (N = 481)								
LPP	119	24.8	0.78			9.72 (0.74)	9.68 (0.42)	12.76 (0.70)
APP	341	70.9		0.85		13.27 (0.38)	12.12 (0.33)	14.12 (0.15)
HPP	21	4.3			0.83	15.23 (0.98)	18.31 (0.80)	17.30 (1.07)

Note: LPP = Low Psychopathic Profile; APP = Average Psychopathic Profile; HPP = High Psychopathic Profile.
YPI-S = Youth Psychopathic Traits Inventory: Short Form: GM = Grandiose-Manipulative Factor CU = Callous-Unemotional Factor; II = Impulsive-Irresponsible Factor.
Information for YPI-S descriptive is presented as M (SE).
* Average probabilities of profile membership.

including CD diagnosis, comorbidity, recidivism risk, and aggression.

Using LPA, as a more robust and accurate person-centered method than conventional cluster analysis (Bauer & Curran, 2004; Lubke & Muthén, 2007; McLachlan & Peel, 2004; Muthén, 2001; Vermunt & Magidson, 2002), a solution with three latent profiles also showed better model fit both for the forensic and the community samples (Andershed et al., 2008; Lee et al., 2010). As was found in Lee et al. (2010) study, the three latent profile solution was related to different levels of severity of psychopathic traits. Specifically, two extreme groups were found in the tested samples: one group with low scores on all the three YPI-S factors (i.e., the Low Psychopathic Profile: LPP) and another group with high scores on all the three YPI-S factors (i.e., the High Psychopathic Profile: HPP). This latter group was the one with the smallest percentage of youth, which is consistent with existing research (e.g., Andershed et al., 2008; Lee et al., 2010; Nijhof et al., 2011). A third group with average scores on all the three YPI-S factors also emerged (i.e., the Average Psychopathic Profile; APP). However, we must state that though we have found evidence for the existence of the same psychopathic profiles, both in the forensic and in the community samples, the community sample profiles had lower scores in all YPI-S dimensions when compared to the similar profiles of the forensic sample. These findings suggest that the three latent profiles represent distinct variations of psychopathy severity within each sample, offerng support to the notion that psychopathic traits seem to be continuously distributed throughout the population, differing from normality in degree rather than kind (Andershed et al., 2002; Edens et al., 2006; Frick et al., 2000; Kosson et al., 2013; Murrie et al., 2007; Neumann et al., 2012; Neumann & Hare, 2008).

The current study also compared the three profiles of the forensic sample on critical outcome variables. While the HPP had the highest risk of a CD diagnosis, recidivism, and aggression, the LPP was the one with the lowest risks concerning the same variables. These findings are in accordance with defined hypothesis and past research, which has suggested that those with elevated psychopathic traits are at greater risk for a CD diagnosis, recidivism, and aggression (Forth & Book, 2010; Salekin, 2017; Sevecke & Kosson, 2010). However, it should be noticed that though the HPP was the profile that had the highest risk for a CD diagnosis, the LPP and the APP also showed a considerable risk for this diagnosis, which may be due to the nature of the current forensic sample, where most of these youth are expected to meet criteria for CD (see Rijo et al., 2016).

Regarding comparisons between psychopathic profiles of the forensic sample on specific comorbid diagnosis and comorbidity rates, results were consistent with expectations and past research using variable-centered methods. Specifically, though we were only able to compare few other mental health problems beyond CD (due to the low prevalence rates of other psychopathologies in the forensic sample), not surprisingly (e.g., Lansing et al., 2018; Salekin et al., 2004; Sevecke & Kosson, 2010), the HPP was the one at a higher risk for ODD and Substance Dependence, followed by the APP, and by the LPP. Finally, the high comorbidity rates found in the HPP, but also in the APP, are in line with previous works (e.g., Lansing et al., 2018; Salekin et al., 2004;

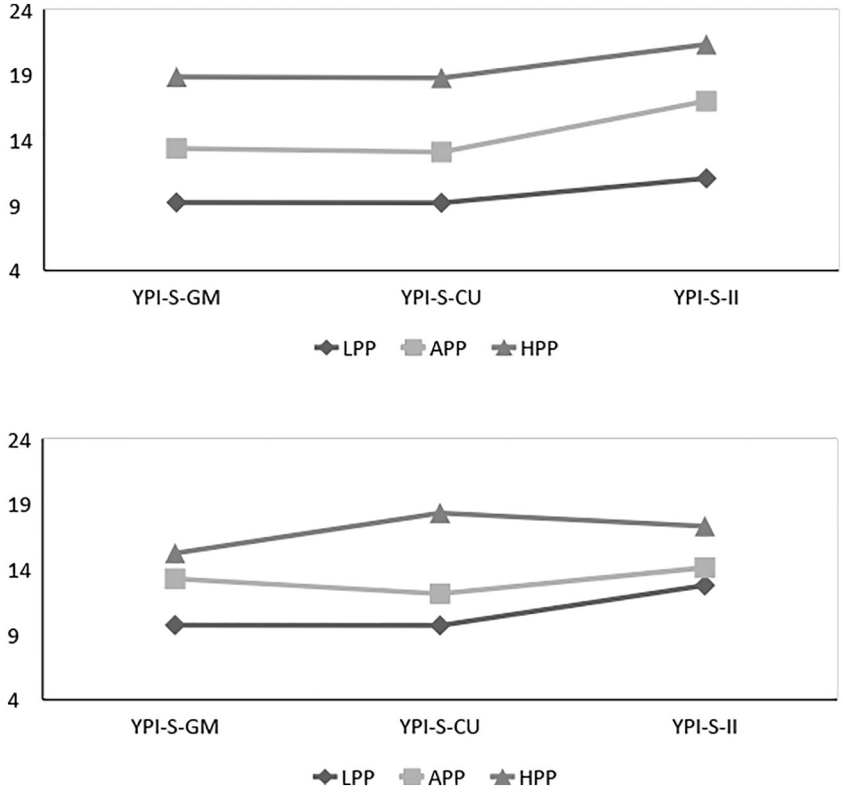

Fig. 1. Latent profile analyzes results: Means scores on the YPI-S factors for the forensic and community samples.

Table 4
Relations of the three latent profiles to the outcome variables in the forensic sample.

	LPP (n = 47)	APP (n = 328)	HPP (n = 17)	$\chi 2$	LPP vs APP	LPP vs HPP	APP vs HPP
CD – MINI-KID	0.72 (0.07)	0.81 (0.02)	1 (0.00)	(2) = 88.54 p < .001	(1) = 1.20 p = .27	(1) = 14.34 p < .001	(1) = 66.87 p < .001
Substance Dependence*	0.09 (0.05)	0.28 (0.03)	0.57 (0.17)	(2) = 13.88 p = .001	(1) = 10.02 p = .002	(1) = 7.36 p = .006	(1) = 3.02 p = .08
ODD*	0.28 (0.08)	0.35 (0.03)	0.71 (0.13)	(2) = 8.36 p = .014	(1) = 0.67 p = .41	(1) = 8–03 p = .005	(1) = 7.10 p = .008
Comorbidity-MINI-KID	1.89 (0.25)	2.19 (0.07)	3.19 (0.37)	(2) = 8.89 p = .01	(2) = 1.22 p = .24	(2) = 8.67 p = .003	(2) = 6.97 p = .001
YLS/CMI-T				(6) 70.00 p = .00	(3) 8.69 p = .03	(3) 6.16 p > .001	(3) 31.45 p < .001
Low	0.17 (0.02)	0.11 (0.00)	0.00 (0.02)				
Moderate	0.53 (0.04)	0.43 (0.21)	0.31 (0.04)				
High	0.31 (0.03)	0.41 (0.24)	0.54 (0.03)				
Very High	0.00 (0.01)	0.04 (0.18)	0.15 (0.01)				
BPAQ-T	56.90 (2.8)	79.61 (1.28)	101.07 (10.92)	(2) = 56.95 p < .001	(2) = 50.08 p < .001	(2) = 15.38 p < .001	(2) = 3.74 p = .05
BPAQ-PA	18.03 (1.09)	25.84 (0.48)	32.45 (3.53)	(2) = 35.56 p < .001	(2) = 39.41 p < .001	(2) = 15.24 p < .001	(2) = 3.37 p = .07
BPAQ-VA	9.85 (0.55)	14.29 (0.27)	17.75 (2.18)	(2) = 53.93 p < .001	(2) = 48.58 p < .001	(2) = 12.37 p < .001	(2) = 2.43 p = .12
BPAQ-A	13.15 (0.74)	18.79 (0.36)	24.60 (3.13)	(2) = 48.58 p < .001	(2) = 42.96 p < .001	(2) = 11.38 p < .001	(2) = 2.97 p = .09
BPAQ-H	15.87 (1.13)	20.69 (0.41)	26.27 (2.98)	(2) = 19.70 p < .001	(2) = 11.87 p < .001	(2) = 10.67 p < .001	(2) = 3.36 p = .07

Note: Analyzes were performed with BCH and DCAT procedures in MPlus 7. LPP = Low Psychopathic Profile; APP = Average Psychopathic Profile; HPP = High Psychopathic Profile. CD-MINI-KID = Probability of having Conduct Disorder diagnosed with the Mini-International Neuropsychiatric Interview for Children and Adolescents; Comorbidity-MINI-KID – Number of diagnosis assessed with the MINI-KID; YLS/CMI-T = Youth Level of Service/Case Management Inventory, Total score; BPAQ = Buss-Perry Aggression Questionnaire: T = total score; PA – Physical Aggression Factor; VA = Verbal Aggression Factor; A = Anger Factor; H = Hostility Factor.

Information for relations of the three latent classes to categorical outcomes variables is presented as probability, Standard Error (SE). Information for relations of the three latent classes to continuous outcomes variables is presented as M (SE).

Only mental health disorders that had a prevalence rate of at least 10% in the forensic sample (assessed with the MIN-KID) were considered; i.e., Alcohol Dependence, Substance Abuse, Substance Dependence, and Oppositional Defiant Disorder (ODD). However, of those, Alcohol Dependence and Substance Abuse had no significant differences between profiles, so were not presented in the table. For additional information on this topic, please contact the corresponding author.

Sevecke & Kosson, 2010), suggesting that youth with high psychopathic traits, especially in forensic settings, also exhibit higher rates of other mental health problems. These high comorbidity rates underscore the critical need to deliver prevention and intervention programs for youth at risk for conduct problems and psychopathy (Ribeiro da Silva, Rijo, & Salekin, 2013; Salekin, 2010).

Most notably, it should be highlighted that a high CU only traits profile was not identified in any of the tested samples, as in former research with adult and youth samples using clustering, LCA or LPA procedures (Andershed et al., 2008; Krstic et al., 2018; Lee et al., 2010; Mokros et al., 2015; Nijhof et al., 2011). Moreover, when conducting additional LPA procedures using the YPI-S-GM, YPI-S-CU, and YPI-S-II

factors, separately: the model fit indicators to obtain the optimal number of classes was always worse than using the combination of GM, CU, and II YPI-S factors; the LPA results considering YPI-S factors separately were never replicated in the community sample; and, most importantly, the relationship between the GM, CU, or II severity profiles in the forensic sample and the outcome variables was never as pronounced as using the three YPI-S factors. Remarkably, the CU severity profiles only differed on recidivism risk, while the GM and the II severity profiles showed diferences in a larger number of outcome variables. In turn, the psychopathic severity profiles (resulting from the combination of GM, CU, and II traits) showed differences on even more outcome variables (comorbidity, CD, ODD, Substance Dependence, recidivism risk, and aggression). Taken together, these findings suggest that both for research purposes and clinical practice, a multifaceted model of psychopathy may be more informative and advantageous to specify CD than a model considering CU traits alone (Colins & Andershed, 2015; Collins et al., 2018; Kosson et al., 2013; Lahey, 2014; Salekin, 2016, 2017; Somma et al., 2018).

6. Clinical implications

As mentioned in the opening pages, the inclusion of CU traits as a specifier for CD was, among others, an attempt to reduce the heterogeneity of this diagnosis in order to help to identify a severe subgroup of CD youth and to enhance diagnostic information for case conceptualization and treatment planning (e.g., Baskin-Sommers et al., 2015; Frick et al., 2013; Kumsta et al., 2012; Viding & McCrory, 2012). However, findings from the current work and from former research (see Salekin, 2016, 2017 for a review), suggest that GM, CU, and II traits might better serve as specifiers to CD than CU traits alone. First, several works indicated that there is a lack of support for a CU traits alone specifier, which was also found in the current study, as there was no evidence for a CU trait only profile (e.g., Colins et al., 2018; Jambroes et al., 2016; Kosson et al., 2013; Lahey, 2014; Salekin, Andershed, Batky, & Bontemps, 2018; Salekin, 2016; Somma et al., 2018). Second, the current study offered support to the notion that psychopathic traits tend to hang together, differing in degree rather than kind (Edens et al., 2006; Murrie et al., 2007). Third, and in agreement with previous findings (Asscher et al., 2011; Colins et al., 2018; Colins & Andershed, 2015; Forth & Book, 2010; Lansing et al., 2018; Leistico et al., 2008; Lorber, 2004; Salekin, 2016, 2017; Sevecke & Kosson, 2010; Somma et al., 2018), the current study pointed out that profiles resulting from the combination of all psychopathic traits better predicted comorbidity rates, behavioral problems, and criminal recidivism than profiles resulting from any psychopathic alone.

Thus, it seems that including the multifaceted model of psychopathy to delimitate a specifier for CD may, more accurately, help to reduce the heterogeneity of this diagnosis, identifying a more severe antisocial subgroup of CD individuals (Colins et al., 2018; Salekin, 2016, 2017; Salekin, Andershed, & Clark, 2018). Besides, learning more about the interface between CD diagnoses and GM, CU, and II traits, may help to enhance our understanding of conduct disordered youth, including the mechanisms that underlie each trait (Patrick, 2018; Salekin, 2016, 2017; Salekin et al., 2018) and/or hinder the therapeutic process (Ribeiro da Silva et al., 2013). Finally, this multifaceted model of psychopathy may allow clinicians to be more attentive in the assessment of psychopathic traits in individuals with conduct problems (Jambroes et al., 2016; Lahey, 2014; Salekin, 2016), which may be crucial to improve case conceptualization and to deliver tailored psychotherapeutic interventions (Colins et al., 2018; Ribeiro da Silva et al., 2013; Salekin, 2016, 2017; Salekin, Andershed, & Clark, 2018).

Altogether, results of the current study, coupled with previous research findings, suggest that GM, CU, and II traits might better serve as specifiers to CD as opposed to CU traits alone (Colins et al., 2018; Colins & Andershed, 2015; Salekin, 2016, 2017). However, the assessment and diagnosis of psychopathic traits in children and adolescents, even as a specifier, is still a controversial issue (see Salekin et al., 2018 for a review). On one side, some authors claimed that the construct of juvenile psychopathy has not been adequately established and that it would be inappropriate for clinicians to use a diagnosis that has negative and likely stigmatizing connotations. On the other side, an increasing number of authors has pointed out that an early identification of psychopathy traits might allow clinicians to intervene sooner and more effectively with conduct disordered youth, which, per se, would overcome eventual detrimental effects of that same early identification (Ribeiro da Silva et al., 2012, 2013; Salekin, Andershed, & Clark, 2018).

6.1. Limitations

This study had several limitations. First, the YPI-S is a self-report questionnaire that, in addition to the limitations of any self-report measure, does not include the antisocial factor of the psychopathic syndrome (Andershed et al., 2002; Salekin & Hare, 2016), which may add relevant information to future LPA studies. Second, the YPI-S does not account for the duration of the symptoms that, according to the *DSM-5*, must be consistently displayed over at least a 12 month period (APA, 2013). Third, the forensic sample only included youth with conduct problems, while the community sample did not include youth with conduct problems, which makes results potentially generalizable uniquely to similar samples. Future studies should replicate these findings in larger samples, using other psychopathic measures and including male and female participants, as well as school-attending youth with conduct problems. Larger and diverse youth samples may help to better understand which profiles exist within a population at large, also advancing knowledge by characterizing and comparing those same profiles more broadly. Finally, future studies with longitudinal designs are needed to examine the stability of psychopathic profiles both throughout the lifespan and after the deliver of tailored intervention programs.

7. Conclusion

To our knowledge, this is among the first studies to use LPA to examine the broader set of psychopathic traits (GM, CU, and II) in youth samples. Findings indicated the existence of three psychopathic severity profiles including a low (LPP), average (APP), and high (HPP) psychopathic traits profile in both community and forensic samples of male youth, though the community sample profiles had lower scores in GM, CU, and II factors when compared to the similar profiles of the forensic sample. Moreover, the HPP had the highest risk of a CD diagnosis, comorbidity, recidivism, and aggression, followed by the APP, and by the LPP. These results, along with findings from previous research in adult (e.g., Colins et al., 2017; Krstic et al., 2018; Mokros et al., 2015) and youth samples (Andershed et al., 2008; Lee et al., 2010; Nijhof et al., 2011), underline the importance of examining the total psychopathy scores as well as dimension scores (GM, CU, II). While additional research is needed on this topic, it seems that including GM, CU, and II traits as CD specifiers may be more valuable for research and clinical practice, thereby potentially reducing the toll that CD has on youth, on the juvenile justice system, and in the society at large.

Declarations of interest

None.

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