Psychometric properties and measurement invariance of the Youth Psychopathic Traits Inventory – Short version among Portuguese youth

Abstract

This study aimed to examine the psychometric properties of the Youth Psychopathic Traits Inventory - Short version (YPI-S) among a mixed-gender sample of 782 Portuguese youth (*M*=15.87 years; *SD*=1.72) collected in a school context. Confirmatory factor analysis offered support for the expected 3-factor structure. Partial cross-gender measurement invariance and cross-sample measurement invariance of the YPI-S using a forensic sample of institutionalized males was established. The Portuguese version of the YPI-S showed adequate psychometric properties in terms of internal consistency, mean inter-item correlation, corrected item-total correlation, convergent validity, and discriminant validity. In support for criterion-related validity, the YPI-S also showed statistically significant associations with self-reported conduct disorder symptoms, alcohol abuse, and drug use. In terms of known-groups validity, males from the school sample scored lower than males from the forensic sample and higher than females from the school sample. The YPI-S seems to be a valuable brief and psychometrically reliable and valid self-report measure, which can be used to assess psychopathic traits in diverse samples of youth.

Keywords: assessment; measurement invariance; Youth Psychopathic Traits Inventory - Short; validation

The constellation of affective, interpersonal, and behavioral deviant traits, referred to as psychopathy (Cooke & Michie, 2001; Hare, 2003), has proven to be of great value when identifying the most early, severe, and stable forms of antisocial behavior (Leistico, Salekin, DeCoster, & Rogers, 2008; Pechorro et al., 2012). The need for early identification is justifiable since psychopathy is considered a high risk condition with a progressive impairment and a decreased therapeutic response over time (Ribeiro da Silva, Rijo, & Salekin, 2012, 2013, 2015; Salekin, 2010, 2015; Salekin, Tippey, & Allen, 2012). Research on the study of psychopathy in children and youth has gained widespread attention over the past decades (Salekin & Lynam, 2010). These research efforts have led the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association, APA, 2013) to add a specifier for Conduct Disorder, which covers the diagnostic criteria for the affective component of psychopathy, considered by many to be the core element of this disorder (e.g., Cleckley, 1941/1988)

There are several self-report measures that can be used to assess psychopathic traits in youth (see Ribeiro da Silva et al., 2013, and Pechorro, Jiménez, Nunes, & Hidalgo, 2016), enabling researchers to study these traits in a less time-consuming way. One self-report measure that has been used in numerous studies worldwide is the Youth Psychopathic Traits Inventory (YPI; Andershed, Kerr, Stattin, & Levander, 2002). In an attempt to reduce the length of the administration time of the YPI, van Baardewijk, Andershed, Stegge, Nilsson, Scholte, and Vermeiren (2010) developed a shorter form of this measure, based on the original 50 items of the YPI: the Youth Psychopathic traits Inventory – Short version (YPI-S; van Baardewijk et al., 2010). The YPI-S, made of 18 items, comprised the same three dimensions of the original YPI (Callous-Unemotional, Grandiose-Manipulative, and Impulsive-Irresponsible), which are based on Cooke and

Michie's three-factor conceptualization of psychopathy (Cooke & Michie, 2001). The YPI-S has proven to be an economic, valid, and reliable three-factor measure aiming to assess psychopathic traits in boys and girls both from community and forensic settings (Colins & Andershed, 2015; Colins, Noom, Vanderplasschen, 2012; Fossati, Somma, Borroni, Frera, Maffei, & Andershed, 2015; Orue & Andershed, 2015; Pechorro et al., 2015; van Baardewijk et al., 2010).

When comparing different groups (e.g. based on gender, sample type), it is fundamental that researchers test if the measure assesses the same construct in all groups, i.e., it is crucial to demonstrate measurement invariance. Measurement invariance will allow trustworthy comparisons between groups, avoiding biased inferences (Chen, 2007; Milfont & Fischer 2010). To our knowledge, just one existing study tested the measurement invariance of the YPI-S in youth, uniquely across gender, with results supporting an invariant three-factor structure for Spanish boys and girls from the community (Orue & Andershed, 2015).

The YPI-S has shown to be highly correlated with the original YPI (e.g., Pechorro et al., 2015; van Baardewijk et al., 2010). Moderate to high correlations between the YPI-S total score and its dimensions have also been demonstrated in previous research (e.g., Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves, Andershed, & DeLisi, submitted; van Baardewijk et al., 2010).

In the original study, using a community sample of 2105 youth, the YPI-S proved to be a reliable measure to assess a three-factor model of psychopathy, with internal consistency values of the YPI-S total score and dimensions ranging from acceptable to good (van Baardewijk et al., 2010). Other studies replicated similar internal consistency values for the YPI-S total score and for the Grandiose-Manipulative

dimension, but lower values (ranging from low to acceptable) were found for the Callous-Unemotional and Impulsive-Irresponsible dimensions (Colins & Andershed, 2015; Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submited). In the original study, when comparing the YPI and the YPI-S, despite the removal of nearly two-thirds of the items, the reliability coefficients of the YPI-S still remained satisfactory. In Pechorro and colleagues' (2015) study, which compared the YPI and the YPI-S in a sample of detained youth, the YPI-S presented less reliability problems than the original longer form. The fact that the YPI-S did not include the original 10 subscales and the reversed items from the original YPI were all dropped out, may have contributed to solve certain internal consistency problems and problems in factor analyses regarding the YPI (Andershed et al., 2002; Colins et al., 2012; Pihet, Suter, Meylan, & Schmid 2014; Ribeiro da Silva, Motta, & Rijo, 2016).

The YPI-S has proven to be positively related to other screening measures assessing psychopathic traits (Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; Ray, Pechorro, & Gonçalves, in press), proactive and reactive aggression (Orue & Andershed, 2015; Pechorro et al., 2015; Ray et al., in press), bullying, cyberbullying (Orue & Andershed, 2015), alcohol/drug abuse, crime seriousness (Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted), conduct problems, criminal behavior, and delinquency (Colins & Andershed, 2015; Colins et al., 2012; Fossati et al., 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; Ray et al., in press). On the other hand, the YPI-S has revealed negative or null associations with the social anxiety (Pechorro et al., 2015). The YPI-S has also revealed negative or null associations with global empathy, which assess the affective and the cognitive components of empathy (Pechorro, Gonçalves et al., submitted).

Concerning gender differences, a few studies reported that, generally, boys scored significantly higher than girls in all the three factors of the YPI-S (Colins et al., 2012; Orue & Andershed, 2015), though only Orue and Andershed (2015) previously tested for measurement invariance of the YPI-S across gender. Two other studies have supported the measurement invariance of the original YPI (Pechorro, Ribeiro da Silva, Andershed, Rijo, & Gonçalves, in press; Pihet et al., 2014) across sample type (community/school versus institutionalized/forensic). These studies reported that forensic boys tended to score higher on the original YPI and its dimensions than community boys. However, to our knowledge, yet no study compared scores on the YPI-S across sample type, with or without testing previously for measurement invariance.

The YPI-S has been translated and psychometrically validated among samples of youth from different European countries (Colins & Andershed, 2015; Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; van Baardewijk et al., 2010), but studies testing the psychometric properties of the YPI-S are still scarce. Moreover, the psychometric properties of the YPI-S have not been assessed in large, geographically diverse samples of male and female youth while simultaneously testing for measurement invariance across gender and sample type (forensic male versus school male). Thus, the main goal of the present study was to validate the Portuguese version of the YPI-S. It was predicted that: (1) the three-factor structure of the YPI-S would be replicated and measurement invariance across gender and sample type would be found; (2) the YPI-S would show acceptable to good internal consistency values as measured by the alpha and omega coefficients; (3) the YPI-S would show convergent validity, discriminant validity, and criterion-related validity.

Method

Participants

The current sample was recruited from public schools of the Lisbon, Algarve, and Coimbra regions managed by the Portuguese Ministry of Education. A sample of 782 participants (*M*=15.87 years; *SD*=1.72 years; range=12-20 years), divided into males (*n*=371; *M*=15.97 years; *SD*=1.70 years; range=12-20 years) and females (*n*=411; *M*=15.77 years; *SD*=1.73 years; range=12-20 years), agreed to voluntarily participate in the study. The participants were mostly white Europeans (89.5%), while the remaining participants were black (3.7%), mixed race (5.8%), or belonged to other diverse ethnic groups (1%). Significant differences were found between the white Europeans group and the ethnic minorities group regarding age (F=18.06; $p \leq .001$) with the ethnic minorities participants being older, but no differences were found regarding years of education (F=.25; p=.620). No differences were found between males and females from the school sample regarding age (F=2.64; p=.105) nor years of education (F=1.70; p=.193).

Sample type measurement invariance was examined using a previously collected forensic sample of male youths from the Portuguese juvenile detention centers managed by the Portuguese Ministry of Justice (see Pechorro, Andershed et al., 2015). Participants in this sample included 221 male youths (*M*=16.75 years; *SD*=1.41 years; age range=13–20 years). Most of them were white Europeans (54.3%), but the sample also included black Africans (20.5%), mixed race South-Americans (18.6%), and other ethnic minorities (6.8%). Most of them (87.6%) were convicted of having committed serious and/or violent crimes (e.g., robbery, assault, rape). Significant difference were found between the males from the school sample and the males from the forensic

sample regarding age (F=31.92; $p \leq .001$) and years of education (F=448.95; $p \leq .001$), with the males from the forensic sample being older and having less years of education.

Measures

The Youth Psychopathic Traits Inventory-Short (YPI-S; van Baardewijk et al. 2010) is an 18-item self-report shorter version of the original YPI (Andershed et al., 2002) designed to measure psychopathic traits in adolescents aged 12-years-old and up. Each item in the YPI-S is scored on a 4 point ordinal scale (ranging from 0 = *Does not apply at all*, to 3 = *Applies very well*). In line with the three-factor model of psychopathy (Cooke & Michie, 2001), the items of the YPI-S comprise three dimensions with six items each, namely the Grandiose-Manipulative or Interpersonal dimension, the Callous-Unemotional or Affective dimension, and the Impulsive-Irresponsible or Behavioral dimension. The YPI-S can be scored by simply adding the answers to the items. Higher scores indicate an increased presence of psychopathic characteristics. The Portuguese version of the YPI/YPI-S (Pechorro, Andershed, Ray, Maroco, & Gonçalves, 2015; Pechorro, Ribeiro da Silva et al., in press) was used.

The Antisocial Process Screening Device (APSD; Frick & Hare, 2001) Self-Report version (APSD-SR; Caputo, Frick, & Brodsky, 1999) is a multidimensional 20-item measure designed to assess psychopathic traits in adolescents modeled after the Hare Psychopathy Checklist-Revised (Hare, 1991, 2003). Each item is anchored on a 3-point ordinal scale (0 = *Never*, 1 = *Sometimes*, 2 = *Often*). The APSD-SR has been used with pre-adolescents and adolescents ages 11–18 years old. Scores are calculated by reverse-scoring the reversible items and then summing the items to obtain the total score and the factors scores. This scale possesses three main factors: Callous-Unemotional, Narcissism, and Impulsivity. Higher scores indicate an increased presence of psychopathic traits. Internal consistency has previously been reported as .50-.61 for

Callous-Unemotional, .56-.63 for Narcissism, .64-.68 for Impulsivity, and .78-.81 for the total APSD-SR (Muñoz & Frick, 2007). The Portuguese version of the APSD-SR (Pechorro, Maroco, Poiares, & Vieira, 2013; Pechorro, Hidalgo, Nunes, & Jiménez, in press) was used. The internal consistency for the current study, estimated by Cronbach's alpha, was .77 for the total school sample, .76 for the male school sample, and .77 for the female school sample.

The Inventory of Callous-Unemotional Traits (ICU; Essau, Sasagawa, & Frick, 2006; Kimonis et al., 2008) is a 24-item self-report scale designed to assess callous-unemotional traits in youth and it is derived from the callous-unemotional (CU) subscale of the Antisocial Process Screening Device (APSD; Frick & Hare 2001). Each item is scored on a four-point scale (ranging from 0= *Not at all true*, to 3= *Definitely true*). Scores are calculated by reverse-scoring the appropriate items and then summing the items to obtain the total score and the factors scores. Using confirmatory factor analysis it was possible to identify three independent factors, namely: Callousness, Unemotional, and Uncaring, with all items also loading onto a general callous-unemotional factor (bifactor model). Higher scores indicate an increased presence of CU traits. Internal consistency based on Cronbach's alpha has previously been reported as .70 for Callousness, .64 for Unemotional, .73 for Uncaring, and .77 for the ICU total (Essau, Sasagawa, & Frick, 2006). The Portuguese version of the ICU was used (Pechorro, Ray, Barroso, Maroco, & Gonçalves, 2016; Pechorro, Hawes, Ray, & Gonçalves, submitted). The internal consistency for the current study, estimated by Cronbach's alpha, was .88 for the total school sample, .88 for the male school sample, and .87 for the female school sample.

The Reactive-Proactive Aggression Questionnaire (RPQ; Raine et al., 2006) is a 23-item self-report measure that distinguishes between reactive and proactive

aggression and is appropriate for use with youths and young adults. Each item is rated on a 3-point ordinal scale (0 = *Never*, 1 = *Sometimes*, and 2 = *Often*). Summed scores provide a measure of reactive or proactive aggression as well as global aggression score. Confirmatory factor analysis identified two factors: reactive aggression and proactive aggression. Higher scores indicate higher levels of aggression. Internal consistency for adolescents has previously been reported as .86 for proactive aggression, .84 for reactive aggression, and .90 for total aggression (Raine et al., 2006). The Portuguese version of the RPQ (Pechorro, Ray, Raine, Maroco, & Gonçalves, in press; Pechorro, Raine, Ray, Kahn, & Gonçalves, submitted) was used. Internal consistency for the present study, estimated by Cronbach's alpha, was .85 for the total school sample, .86 for the male school sample, and .83 for the female school sample.

The Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998) is a 22-item self-report scale designed to assess the subjective experience of social anxiety in adolescents aged between 13 and 18 years. Four of the items are fillers and therefore are not taken into account when calculating the final score. Each item is rated on a 5-point ordinal scale (ranging from 0 = *Not at all* to 4 = *All the time*). Confirmatory factor analysis identified three factors: Fear of Negative Evaluation (FNE), Social Avoidance and Distress-New (SAD-New), and Social Avoidance and Distress-General (SAD-General). Higher scores indicate higher levels of social anxiety. Internal consistency based on Cronbach's alpha has previously been reported as .91 for FNE, .83 for SAD-New, and .76 for SAD-General (La Greca & Lopez, 1998). The Portuguese version of the SAS-A (Pechorro, Ayala-Nunes, Nunes, Maroco, & Gonçalves, in press) was used. Internal consistency for the present study, estimated by Cronbach's alpha, was .92 for the total school sample, .92 for the male school sample, and .92 for the female school sample.

The Basic Empathy Scale (BES; Jolliffe, & Farrington, 2006) is a 20-item self-report measure designed to assess empathy in youths. The BES was developed as a concise and coherent scale with the aim of measuring two distinct factors: affective empathy and cognitive empathy. Each item is scored on a five-point ordinal scale (from 1 = *Strongly disagree* to 5 = *Strongly agree*). The BES has been used with pre-adolescents and adolescents aged 9–18 years old. Scores are calculated by reverse-scoring the positively worded items and then summing the items to obtain the total score and the factors scores. Higher scores indicate an increased presence of empathic characteristics. The BES was validated among Portuguese youth samples (Anastácio, Vagos, Nobre-Lima, Rijo, & Jolliffe, 2016; Pechorro, Ray, Salas-Wright, Maroco, & Gonçalves, 2015). The Portuguese version of the BES (Pechorro, Ray et al., 2015) was used. The internal consistency for the current study, estimated by Cronbach's alpha, was .92 for the total school sample, .92 for the male school sample, and .90 for the female school sample.

A CD scale was also created based on the 15 items used to assess CD (see e.g., Skilling, Quinsey, & Craig, 2001). The 15 dichotomous items (coded 0 = *No*; 1 = *Yes*) were summed to obtain a total continuous score. Thus, higher scores indicate a higher number of indicators of CD. Based on the Kuder-Richardson coefficient (i.e., alpha for dichotomous items) the internal consistency of the CD scale was .77 for the total school sample, .81 for the male school sample, and .72 for the female school sample.

A questionnaire was constructed to describe the socio-demographic characteristics of the participants. This questionnaire included variables such as participants' age, nationality, ethnic group, and highest level of schooling completed. Some questions regarding alcohol abuse, and drug use during the last year were also

included (coded as five point ordinal variables from 0 = *Almost never/Never* to 4 = *Almost always/Always*).

Procedures

Authorization to validate the YPI-S among Portuguese youth was obtained from the first author of the original YPI (Andershed et al., 2002). The original translation of the YPI-S into the European Portuguese language commonly spoken in Portugal by adolescents and young adults was previously conducted (Pechorro, Andershed et al., 2015). During the translation and retroversion of the YPI-S appropriate procedures (e.g., avoiding item bias or differential item functioning) were followed. The questionnaire was then independently back-translated into English. The original and the back-translated items were compared for non-equivalence of meaning and items were revised when any discrepancies in meaning were detected until no semantic differences were identified between the English version and the Portuguese version.

Authorization to assess youth in the school context was obtained from the General Directorate of Education of the Portuguese Ministry of Education (DGE–ME). All subjects gave their informed consent for inclusion before they participated in the study. The study was approved by the Ethics Committee of the DGE-ME. Parental permission was obtained for all underage children and informed consent was obtained from participants who were 18 years of age or older. The participants, students from randomly selected public schools of the Lisbon, Algarve, and Coimbra regions, were informed about the nature of the study and asked to voluntarily participate. Not all young people agreed or were able to participate; reasons for this included refusal to participate, inability to participate due to not understanding the Portuguese language, and self-reported reading difficulties. Participants who were unwilling or unable to collaborate were excluded, so the final number of participants included in the present

study was 782, with a participation rate of approximately 87%. The measures were administered in an appropriate classroom group setting using a paper–pencil method for collecting the data. The forensic sample of male youth originated from the Portuguese juvenile detention centers managed by the Portuguese Ministry of Justice, with the measures being administered by means of individual face-to-face interviews in an appropriate setting (for more details see the previous study by Pechorro, Andershed et al., 2015).

Analytic Plan

The data were analyzed using SPSS v24 (IBM SPSS, 2016) and EQS 6.3 (Bentler & Wu, 2015). SPSS was used to explore the factor structure of the YPI-S, namely to perform Principal Components Analysis (PCA) with Varimax rotation. EQS was used to perform Confirmatory Factor Analysis (CFA) with the robust estimation methods. Goodness-of-fit indices were calculated including Satorra-Bentler chi-square/degrees of freedom, comparative fit index (CFI), incremental fit index (IFI), and root mean square error of approximation (RMSEA). A chi-square/degrees of freedom value < 5 is considered acceptable, a value ≤ 2 is considered good, and a valued of 1 is considered very good (Maroco, 2014; West, Taylor, & Wu, 2012). A CFI $\geq .90$ and RMSEA $\leq .08$ indicate adequate fit whereas a CFI $\geq .95$ and RMSEA $\leq .06$ indicate good model fit. The incremental fit index, also known as Bollen's IFI, is relatively insensitive to sample size where values $\geq .90$ are considered acceptable.

The CFA was performed on the ordinal items and standardized loadings above .30 were considered. Modification indexes were considered to check if any suggestion of model modification would significantly improve the measurement model. Polychoric correlations were used together with robust methodologies to perform the CFA because they provide a more accurate estimate (Byrne, 2006). Measurement invariance was

evaluated and the S-Bχ^2 difference test was used to determine if the constraints significantly deteriorated the model (Millsap & Olivera-Aguilar, 2012). A Microsoft Excel spreadsheet provided by Bryant and Satorra (2012) was used to perform this difference test (http://www.econ.upf.edu/satorra/). Cronbach's alpha (α) and omega (ω) coefficients (considered satisfactory if above .70), mean inter-item correlations (MIIC; considered good if within the .15-.50 range), and corrected item-total correlation ranges (CITCR; considered adequate if above .20) were used to assess reliability (Clark & Watson, 1995; Nunnally & Bernstein, 1994). The omega coefficient was used in the present research because it is currently considered a better estimator of reliability compared to alpha because alpha tends to underestimate reliability (see Revelle & Zinbarg, 2009). Pearson correlations were used to analyze associations between scale variables and Spearman correlations were used to analyze associations between ordinal variables and scale variables (Leech, Barrett, & Morgan, 2015). Correlations were considered low if below .20, moderate if between .20 and .50, and high if above .50.

Results

Our first step in examining the psychometric properties of the YPI-S among the current school sample was to explore its factor structure using PCA with Varimax rotation. The Kaiser–Myer–Olkin measure of sampling adequacy (.85) and Bartlett Test of Sphericity (χ^2=4011.79; $p\leq$.001) indicated the suitability of the data for exploratory factor analysis. Preliminary PCA was undertaken using a criterion of greater than or equal to .30 as the level of loading significance (Nunnally & Bernstein, 1994), with the results suggesting a three-factor solution. A three-component solution was subsequently forced with the components accounting for 46.27% of the common variance in scale items. All the items loaded on their respective factors without significant cross-loadings,

with the exception of item 5 that did not reach a .30 value and instead loaded significantly on the Callous-Unemotional factor (.41).

The next step was to test the 3-factor first-order structure proposed for this instrument by means of CFA. The following goodness of fit indices were obtained: male sample S-Bχ^2 / df = 2.26; IFI = .96; CFI = .95; RMSEA = .06 (.05-.07); female sample S-Bχ^2 / df = 3.73; IFI =.92; CFI = .92; RMSEA = .08 (.07-.09); and total sample S-Bχ^2 / df = 4.01; IFI = .95; CFI = .95; RMSEA = .06 (.05-.07). Based on these appropriate goodness-of-fit indices we found support for the 3-factor first-order model (Maroco, 2014; West et al., 2012). We reported the loadings for the 3-factor first order inter-correlated model in Table 1 for the male sample, female sample, and the combined total sample of male and female youth from the community. All loadings were above .30, with the exception of item 5 for the female sample.

[Insert Table 1]

Then we tested for measurement invariance across sample type (males from the school sample versus males from the forensic sample) and gender (males versus females from the school sample) using the 3-factor model. We compared the configural model (no constrains included) with the model where factor loadings are equally constrained across groups weak (i.e., weak or metric invariance) and with the model where factor loadings and covariances equally constrained across groups (i.e., strong or scalar invariance). We were able to find support in terms of goodness-of-fit indices only regarding sample type because the ΔS-Bχ2(df) values were non-significant in the comparison of the nested models and the ΔCFI between the models was below the .01 cut-off. This suggests that the constraints specified do hold and leads us to assume that the models do share equivalence sample type, but not across gender (Byrne, 2006).

Next, we tested for partial measurement invariance across gender by removing item 5 due to its low loading (i.e., below .30) among the female sample. Following this procedure we were able to find support in terms of goodness-of-fit for partial invariance across gender (see Table 2).

[Insert Table 2]

Table 3 presents Pearson correlations between the YPI-S total and its dimensions among the male sample, the female sample, and the total combined sample. As expected, mostly positive moderate to high correlations were obtained.

[Insert Table 3]

Table 4 displays the alphas, omegas, mean inter-item correlations, and corrected item-total correlation ranges for the YPI-S among the males, females, and the combined sample. The total YPI-S scale showed good internal consistency based on alpha and omega coefficients (above the recommended cutoff value of .70), mean inter-item correlations (within the recommended value range of .15-.50), and corrected item-total correlations (above .20). However, some dimensions (e.g., Callous-Unemotional dimension, Impulsive-Irresponsible dimension) of the female sample showed low Cronbach's alphas.

[Insert Table 4]

Table 5 presents the correlations and partial-correlations between the YPI-S and other psychometric measures and variables for the male sample, the female sample, and the total combined sample. The convergent validity of the YPI-S total and its dimensions with the APSD-SR, ICU, and RPQ revealed mostly moderate to high statistically significant correlations. Discriminant validity with the SAS-A and BES in large part revealed negative or non-significant correlations. Table 5 also presents the correlations with CD symptoms, alcohol abuse, and cannabis use. As shown in the

table, the YPI-S and its dimensions mostly showed positive statistically significant correlations with all of these behaviors varying from low to moderate in magnitude.

[Insert Table 5]

In terms of known-groups validity, a comparison revealed that the males from the school sample from the forensic sample scored significantly lower than institutionalized males on the YPI-S and its dimensions, and that males from the school sample scored significantly higher than females from the school sample on the YPI-S and its dimensions with the exception of the Impulsive-Irresponsible dimension (see Table 6).

[Insert Table 6]

Discussion

The aim of the present study was to assess the psychometric properties of the YPI-S among Portuguese male and female youth, while also testing for measurement invariance with a previously collected forensic sample (Pechorro, Andershed et al., 2015). In line with previous research (Colins & Andershed, 2015; Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; van Baardewijk et al., 2010) confirmatory factor analysis showed that a three-factor model achieved an adequate fit across the several samples, namely male, female, and total sample. The results were quite similar to the ones obtained by Pechorro, Andershed et al. (2015) in a study analyzing the YPI and the YPI-S using a forensic sample of Portuguese male young offenders.

Structural equation modeling (Byrne, 2006) demonstrated strong measurement invariance of the YPI-S across sample type (school versus forensic boys samples), indicating that the models share some similarities across these groups, which in turn allows for impartial group mean comparisons (Chen, 2007; Milfont & Fischer 2010;

Millsap & Olivera-Aguilar, 2012). Partial measurement invariance was obtained across gender after excluding the item 5 of the YPI-S in the school sample. Colins et al. (2012) and Pechorro et al. (2015) previously found this item to be problematic because it obtained low standardized loadings, indicating that it may need to be revised. However, we must state that, from previous research, only one study tested for YPI-S measurement invariance across gender (Orue & Andershed, 2015), revealing that this measure was invariant across gender in a Spanish youth community sample. Thus, future research should continue to ascertain if the YPI-S is or is not invariant across gender. A possible explanation related with outcomes after item 5 exclusion could be related with cultural issues; this possibility should be further explored. Nevertheless, studies aiming to compare subjects across gender using the YPI-S must be done with caution and perhaps considering the option of excluding item 5. It is important to mention that this is the first study testing for the measuring invariance of the YPI-S in Portuguese youths.

As anticipated (Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; van Baardewijk et al., 2010), the associations between the YPI-S total score and its dimensions among the male, female, and total samples exhibited positive moderate to high significant associations. These results can be considered better than the ones previously obtained among Portuguese youths (Pechorro, Andershed et al., 2015) that found a somewhat low correlation between the YPI-S Callous-Unemotional dimension and the YPI-S Impulsive-Irresponsible dimension.

In this study, the reliability of the YPI-S total score and its dimensions, assessed by the Omega Coefficient, MIIC, and CITC (Clark & Watson, 1995; Nunnally & Bernstein, 1994) showed satisfactory values in all samples. However, the internal

consistency, as measured by the Cronbach Alpha, only achieve good reliability values across the three samples for the YPI-S total score and for the Grandiose-Manipulative factor. Callous-Unemotional and Impulsive-Irresponsible dimensions only achieved acceptable Cronbach's Alpha values for the male sample, and poor to acceptable values for the female and total samples (Kaplan & Saccuzzo, 2013). These results are in line with some previous studies (Fossati et al., 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; Ray et al., in press). The fact that reliability problems with the Callous-Unemotional and the Impulsive-Irresponsible dimensions were not exclusive of this study, makes us consider that they may be related with specific YPI-S issues rather than with translation or sample concerns. It is worth mentioning that this is the first study on the YPI-S that we are aware of using the omega coefficient, which by some is considered a better estimator of reliability than Cronbach´s Alpha (Revelle & Zinbarg, 2009).

Difficulties in assessing the affective dimension of psychopathy (Callous-Unemotional traits) are not exclusive of the YPI-S (see Kotler & McMahon, 2010 for a review), which suggest that these traits might be particularly difficult to capture. It is important to underline that the inclusion of the affective dimension of psychopathy in the DSM-5 (APA, 2013) as a specifier for conduct disorder makes a priority to: assess more precisely the reliability of screening measures of Callous-Unemotional traits; further determine its validity despite the low reliability; and/or create new and precise items to capture the affective dimension of psychopathy (e.g., Pechorro, Ribeiro da Silva et al., in press; Pihet et al., 2014; Schmitt, 1996). Moreover, future research should not rely uniquely on Cronbach Alpha, but should instead use better reliability estimators.

As expected from previous research (Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; Ray et al., in press), convergent validity of the YPI-S and its dimensions with the APSD-SR, ICU, and RPQ across the three samples revealed mostly positive moderate to high significant correlations. Criterion-related validity of the YPI-S and its dimensions with Conduct Disorder symptoms (APA, 2013) also revealed moderate associations, which are in line with previous studies reporting positive associations between the YPI-S and externalizing symptoms, including criminal behavior and delinquency (Colins & Andershed, 2015; Colins et al., 2012; Fossati et al., 2015; Orue & Andershed, 2015; Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted; Ray et al., in press). The associations of the YPI-S and its dimensions with alcohol abuse and cannabis use across the male and total samples, showed mostly positive low to moderate significant associations, which is consistent with previous research reporting a link between psychopathic traits and the use of illicit substances among male youth (e.g., Pechorro et al., 2015; Pechorro, Gonçalves et al., submitted). In the female sample, mostly positive low to moderate significant associations between the YPI-S and its dimensions by one side and alcohol abuse and cannabis use, by other side, were obtained. Similar results were also found in a recent study with female youth (Pechorro, Gonçalves et al., submitted). Despite these results, several studies (e.g., Pechorro et al., 2015) reported that the YPI-S show weaker relations with external validity variables as compared to the original YPI. Though the use of the YPI-S seems to present some advantages compared to the original version, validity in relation to other measures should be further explored and considered in future studies and in the assessment of youth in clinical/forensic settings.

Discriminant validity of the YPI-S with the SAS-A revealed the anticipated non-significant correlations (Pechorro, Gonçalves et al., submitted; Pechorro et al., 2015).

Non-significant correlations were also found between the BES total score and the YPI-S total score, the YPI-S Grandiose-Manipulative, and the YPI-S Impulsive-Irresponsible factors, in line with previous studies (Pechorro, Gonçalves et al., submitted; Pechorro et al., 2015). Since the affective dimension of psychopathy is characterized for example by a callous predisposition and a lack of empathy (APA, 2013; Dadds et al., 2009; Ribeiro da Silva et al., 2013), as expected, negative moderate correlations were found between the BES total score and the affective dimension of the YPI-S. The present results were similar to the ones previously obtained by Pechorro, Andershed et al. (2015) among Portuguese youths, despite the fact this previous study did not use the RPQ and BES to assess convergent and discriminant validity.

As stated previously, only one study tested the measurement invariance of the YPI-S across gender and found that males scored higher than females (Orue & Andershed, 2015). Similar results were found in other studies using the original YPI after determining its measurement invariance (Pechorro, Ribeiro da Silva et al., in press; Pihet et al., 2014). In the present study, as the measurement invariance of the YPI-S across gender was not demonstrated (only partial measurement invariance was achieved), comparisons between females and males were performed excluding item 5 (Chen, 2007; Millsap & Olivera-Aguilar, 2012). As expected, boys from the school sample obtained higher scores than girls on the YPI-S total, YPI-S Grandiose-Manipulative dimension, and YPI-S Callous-Unemotional dimension; however, regarding the YPI-S Impulsive-Irresponsible dimension the comparison was only marginally significant. On the other side, measurement invariance of the YPI-S across sample type (boys from the school sample and boys from the forensic sample) was confirmed and comparisons could be performed trustfully (Chen, 2007; Millsap & Olivera-Aguilar, 2012). As expected from previous studies using the original YPI

(Pechorro, Ribeiro da Silva et al., in press; Pihet et al., 2014), young offenders also obtained higher scores on the YPI-S total score and its dimensions as compared to youth from community samples.

Several limitations of the present study are important to note. Firstly, due to the cross-sectional nature of the study, test-retest reliability could not be assessed; this flaw must be overcome in a future longitudinal research. Secondly, reliance only on self-report measures could have influenced some correlational results, because of methodological overlapping issues. Future research should rely on multiple assessment methods in order to overcome this limitation. Finally, cross-validations using other youth samples (e.g., clinical, forensic female) should be use in future studies in order to ascertain if results are generalizable to other populations.

This was the first study investigating the psychometric properties of the YPI-S among a large, geographically diverse school sample of male and female Portuguese youth and a sample of male young offenders while simultaneously testing for measurement invariance across gender and sample type. We conclude that the YPI-S may hold promise as a brief, time-effective, valid, and reliable self-report tool for assessing psychopathic traits in diverse samples of youth. However, some caution is recommended, because the Portuguese validation is still ongoing and few studies thus far has been performed worldwide using the YPI-S. We hope that our study may guide future research and practical use of the YPI-S.

Compliance with Ethical Standards:

This study was conducted at Psychology Research Centre, University of Minho, supported by the Portuguese Foundation for Science and Technology (FCT; Grant

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Ethical approval:

All procedures performed 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. Informed consent was obtained from all individual participants included in the study.

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Table 1

Loadings for the confirmatory 3-factor inter-correlated structure of the YPI-S

	Factor 1 M/F/T	Factor 2 M/F/T	Factor 3 M/F/T
Grandiose-Manipulative (Interpersonal)			
14. I have the ability to con people by using […].	.90/.89/.90		
15. I am good at getting people to believe me […].	.81/.90/.86		
19. I have talents that go far beyond other people's.	.42/.57/.53		
20. It's easy for me to manipulate people.	.84/.88/.87		
38. When I need to. I use my smile and my […].	.80/.81/.80		
41. I am destined to become a well-known […].	.41/.39/.42		
Callous-Unemotional (Affective)			
12. I think that crying is a sign of weakness, […].		.68/.56/.62	
17. When other people have problems.it is […].		.53/.62/.61	
25. To be nervous and worried is a sign of […].		.70/.73/.74	
39. I don't understand how people can be […].		.46/.57/.53	
44. To feel guilty and remorseful about things […].		.71/.72/.72	
45. I don't let my feelings affect me as much […].		.58/.35/.45	
Impulsive-Irresponsible (Behavioral)			
5. I have probably skipped school or work […].			.54/.*23*/.39
9. I consider myself as a pretty impulsive person.			.74/.69/.73
18. It often happens that I talk first and think later.			.63/.76/.67
29. I get bored quickly by doing the same […].			.34/.40/.36
32. It often happens that I do things without […].			.78/.85/.82
34. It has happened several times that I've […].			.54/.40/.46

Note. YPI-S = Youth Psychopathic Traits Inventory short version; M/F/T = Male/Female/Total samples

Table 2

Tests for invariance and partial-invariance of the YPI-S goodness of fit statistics

Model	S-Bχ^2(df)	ΔS-Bχ^2(df)	*CFI	*RMSEA (90% C.I.)
Sample type (school vs. forensic)				
No constrains (configural model)	514.27(264)	--	.95	.06(.05-.06)
Factor loadings constrained	527.93(279)	11.90(15)^{ns}	.95	.06(.05-.06)
Factor loadings and factor covariances constrained	522.17(285)	16.98(21)^{ns}	.95	.05(.05-.06)
Cross-gender (male vs. female)				
No constrains (configural model)	798.62(264)	--	.93	.07(.07-.08)
Factor loadings constrained	837.69(279)	38.86(15)***	.93	.07(.07-.08)
Factor loadings and factor covariances constrained	836.49(285)	35.72(21)*	.93	.07(.07-.08)
Cross-gender (male vs. female) without item 5				
No constrains (configural model)	650.66(232)	--	.94	.07(.06-.07)
Factor loadings constrained	668.18(246)	18.11(14)^{ns}	.94	.07(.06-.07)
Factor loadings and factor covariances constrained	667.89(252)	16.27(20)^{ns}	.94	.07(.06-.07)

Note. S-Bχ^2(df) = Satorra-Bentler chi-square (degrees of freedom); *CFI = robust Comparative Fit Index; *RMSEA = robust Root Mean Square Error of Approximation; C.I. = confidence interval

*** $p \leq .001$ level; ** $p \leq .01$ level; * $p \leq .05$ level; *ns*=non-significant

Table 3

Pearson correlation matrix for the YPI-S and its dimensions

	YPI-S total	YPI-S G-M	YPI-S C-U	YPI-S I-I
Male/Female				
YPI-S total	1			
YPI-S G-M	.81***/.79***	1		
YPI-S C-U	.78***/.74***	.45***/.37***	1	
YPI-S I-I	.77***/.78***	.44***/.41***	.39***/.39***	1
Total sample				
YPI-S total	1			
YPI-S G-M	.81***	1		
YPI-S C-U	.78***	.45***	1	
YPI-S I-I	.77***	.43***	.39***	11

Note. YPI-S = Youth Psychopathic Traits Inventory short version; YPI-S G-M = Grandiose-Manipulative dimension; YPI-S C-U = Callous-Unemotional dimension; YPI-S I-I = Impulsive-Irresponsible dimension

*** $p \leq .001$ level

Table 4

Cronbach´s alphas, omega coefficients, mean inter-item correlations, and corrected item-total correlation ranges for the YPI-S and its dimensions

	Alpha	Omega	MIIC	CITCR
Male/Female samples				
YPI-S total	.84 / .82	.90 / .89	.23 / .20	.27-.63/.27-.57
YPI-S G-M dimension	.81 / .82	.86 / .88	.41 / .43	.38-.69/.35-.71
YPI-S C-U dimension	.72 / .65	.78 / .75	.30 / .24	.36-.53/.23-.52
YPI-S I-I dimension	.70 / .65	.77 / .73	.28 / .24	.24-.60/.20-.59
Total sample				
YPI-S total	.84	.90	.23	.26-.61
YPI-S G-M dimension	.82	.88	.44	.39-.71
YPI-S C-U dimension	.70	.78	.28	.34-.53
YPI-S I-I dimension	.67	.75	.26	.26-.60

Note. YPI-S = Youth Psychopathic Traits Inventory short version; G-M = Grandiose-Manipulative dimension; C-U = Callous-Unemotional dimension; I-I = Impulsive-Irresponsible dimension; Alpha = Cronbach's Alpha; Omega = Omega coefficient; MIIC = mean inter-item correlation; CITCR = corrected item-total correlation range

Table 5

Correlations and partial-correlations of the YPI-S with other measures and variables

	YPI-S total	YPI-S G-M	YPI-S C-U	YPI-S I-I
Male				
APSD-SR	.58***	.51***(.31***)	.41***(.20***)	.45***(.26***)
ICU	.43***	.28***(.08^{ns})	.47***(.39***)	.26***(.09^{ns})
RPQ	.47***	.41***(.27***)	.31***(.08^{ns})	.38***(.22***)
SAS-A	.02^{ns}	-.08^{ns}(-.15**)	.04^{ns}(.05^{ns})	.10^{ns}(.13*)
BES	.01^{ns}	.10^{ns}(.14**)	-.16**(-.24***)	.08^{ns}(.09^{ns})
CD symptoms	.48***	.43***(.25***)	.37***(.20***)	.32***(.12*)
Alcohol	.24***	.25***(.18**)	.16**(.03^{ns})	.17**(.08^{ns})
Cannabis	.21***	.19***(.12*)	.10^{ns}(-.03^{ns})	.20***(.15**)
Female				
APSD-SR	.59***	.42***(.19***)	.39***(.17**)	.57***(.42***)
ICU	.52***	.37***(.20***)	.45***(.31***)	.37***(.16**)
RPQ	.45***	.32***(.14**)	.26***(.05^{ns})	.48***(.38***)
SAS-A	-.07^{ns}	-.18***(-.21***)	-.01^{ns}(.04^{ns})	.02^{ns}(.09^{ns})
BES	-.08^{ns}	-.04^{ns}(-.02^{ns})	-.15**(-.16**)	.01^{ns}(.06^{ns})
CD symptoms	.34***	.25***(.07^{ns})	.20***(.06^{ns})	.35***(.23***)
Alcohol	.34***	.28***(.20***)	.14**(-.07^{ns})	.37***(.30***)
Cannabis	.22***	.20***(.17**)	.08^{ns}(-.06^{ns})	.22***(.15**)
Total sample				
APSD-SR	.61***	.49***(.27***)	.43***(.21***)	.51***(.33***)
ICU	.50***	.37***(.17***)	.49***(.37***)	.32***(.11**)
RPQ	.48***	.39***(.23***)	.32***(.10**)	.43***(.28***)
SAS-A	-.05^{ns}	-.16***(-.20***)	-.01^{ns}(.04^{ns})	.05^{ns}(.12**)
BES	-.12**	-.06^{ns}(-.01^{ns})	-.23***(-.25***)	.02^{ns}(.09^{ns})
CD symptoms	.43***	.36***(.19***)	.32***(.16***)	.33***(.15***)
Alcohol	.29***	.26***(.18***)	.15***(-.03^{ns})	.27***(.19***)
Cannabis	.23***.	.21***(.15***)	.11**(-.03^{ns})	.21***(.14***)

Note. YPI-S = Youth Psychopathic Traits Inventory short version; G-M = Grandiose-Manipulative dimension; C-U = Callous-Unemotional dimension; I-I = Impulsive-Irresponsible dimension; APSD-SR= Antisocial Process Screening Device – Self-Report; ICU= Inventory of Callous-Unemotional Traits; RPQ= Reactive-Proactive Aggression Questionnaire; SAS-A= Social Anxiety Scale for Adolescents; BES = Basic Empathy Scale; CD symptoms = DSM-5 Conduct Disorder symptoms scored as a scale

*** $p \leq .001$ level; ** $p \leq .01$ level; * $p \leq .05$ level; *ns*=non-significant; partial-correlations are in parenthesis

Table 6

Descriptive statistics and ANOVAs for the YPI-S and its dimensions

	M (*SD*)	*M* (*SD*)	*F* (*p* value)	Effect size η_p^2 (power)
Sample type	Male school	Male forensic		
YPI-S total	54.91(20.04)	70.70(19.69)	87.03(≤.001)	.129(1.00)
YPI-S G-M dimension	18.46(10.26)	22.48(10.66)	20.65(≤.001)	.034(.995)
YPI-S C-U dimension	17.77(5.78)	20.24(6.04)	24.51(≤.001)	.040(.999)
YPI-S I-I dimension	18.68(7.46)	27.98(7.14)	221.70(≤.001)	.273(1.00)
Cross-gender	Male school	Female school		
YPI-S total †	17.97(7.30)	14.45(7.13)	46.54(≤.001)	.056(1.00)
YPI-S G-M dimension	5.78(3.41)	4.09(3.43)	47.62(≤.001)	.058(1.00)
YPI-S C-U dimension	6.14(3.22)	4.47(2.99)	56.69(≤.001)	.068(1.00)
YPI-S I-I dimension †	6.83(3.18)	6.44(3.22)	2.89(=.09)	.004(.397)

Note. YPI-S = Youth Psychopathic Traits Inventory short version; G-M = Grandiose-Manipulative dimension; C-U = Callous-Unemotional dimension; I-I = Impulsive-Irresponsible dimension; *M* = Mean; *SD* = Standard Deviation; η_p^2 = partial eta squared

† Item 5 excluded