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Conflict of Interest

Xiang Li declares that she has no conflict of interest. Wei Teng Chan declares that she has no conflict of interest. Rebecca P. Ang declares that she has no conflict of interest. Vivien S. Huan declares that she has no conflict of interest.

Assessment of Psychopathic Traits in Singaporean Adolescents: Validation of the Antisocial Process Screening Device (APSD)

Abstract

There is little knowledge available concerning psychopathic traits in Asian adolescents; a lack of a suitable measurement instrument for assessing psychopathy in Asian societies may account for this. This study aimed to validate a widely used scale in the West — the Antisocial Process Screening Device (APSD) — in Singaporean school-based and at-risk adolescents. Using an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA), this study examined the two-factor (i.e., grandiose-manipulative/impulsive traits and callous-unemotional traits) and three-factor (i.e., grandiose-manipulative traits, impulsivity, and callous-unemotional traits) models of the APSD in 1,027 school-based and 113 at-risk adolescents. School samples are adolescents from three secondary schools, while at-risk samples are adolescents who manifest different types of delinquent behaviors and are either placed in more structured settings or need closer supervision although they have not violated the law. Gender invariance was further tested in the school-based sample by conducting a multigroup CFA. The convergent validity of the APSD was also investigated in the school-based sample. For the school-based adolescents, the APSD revealed that the three-factor model provided a superior fit over the two-factor model and the factorial invariance across gender. Significant relationships between the three dimensions of the APSD and aggression and delinquency support the convergent validity of the APSD. As for the at-risk adolescents, both the two- and three-factor models were acceptable, but the two-factor model was preferred as it was parsimonious and it aligned with the conceptualized characteristics of psychopathic traits. Findings suggest that the APSD is a reliable and sound instrument for measuring psychopathic traits in Asian school-based and at-risk adolescents.

Keywords: Psychopathic traits; adolescents; validation; factor analysis; gender invariance.

Assessment of Psychopathic Traits in Singaporean Adolescents: Validation of the Antisocial Process Screening Device (APSD)

Psychopathy is a multidimensional construct including a variety of personality domains and behavioral characteristics (Lynam et al. 2008). Cleckley (1941) initially described psychopaths to be superficially charming, egocentric, insincere, and lacking in shame. Hare (1991) expanded the notion of psychopathy by specifying an antisocial tendency as an additional core characteristic of psychopaths. Due to the emergence of psychopathic traits in childhood (Loney et al. 2007) and the stability of psychopathic traits from childhood to adulthood (Lynam et al. 2007), the concept of psychopathy that has gained momentum in adult offender samples has been extended to children and adolescents (Frick et al. 1994). However, the application of the construct of psychopathy to children and adolescents remains controversial in concept, methodology, and practice (Edens et al. 2001; Salekin and Lynam 2010; Vincent and Hart 2002). Some researchers argued that psychopathic traits observed in children and adolescents may reflect developmental features (e.g., egocentricity) at a certain stage, and that these are not enduring but could lead to the false identification of psychopathy (Seagrave and Grisso 2002). Although the construct applied to the young is still debated, a majority of empirical studies have accepted and extended the construct of psychopathic traits to children and adolescents in a bid to better understand this phenomenon (e.g., Frick et al. 1994; Fung et al. 2010; Lynam et al. 2007; Salekin 2008; Salekin 2016a).

In view of the stable association between psychopathic traits and antisocial behaviors, Fite et al. (2009b) found that children and adolescents with psychopathic traits tend to display more serious aggressive acts. There is a significant association between psychopathic traits and a high level of reactive and proactive aggression in adolescents (Perenc and Radochonski 2014). Raine et al. (2006) further revealed a stronger relationship between psychopathy and proactive than reactive aggression in school-based adolescents. In addition to aggression,

psychopathic traits are also related to delinquent behaviors (Asscher et al. 2011). Specifically, previous studies (e.g., Fite et al. 2009b; Fung et al. 2010; Goodwin et al. 2015; Kimonis et al. 2007; Muñoz and Frick 2007; Pechorro et al. 2015) have documented significant association between grandiose-manipulative (GM) traits and reactive aggression (*r*s from .50 to .68), proactive aggression (*r*s from .46 to .60), and delinquency (*r*s from .40 to .49); significant association between impulsivity and reactive aggression (*r*s from .40 to .57), proactive aggression (*r*s from .30 to .55), and delinquency (*r*s from .37 to .50); and significant association between callous-unemotional (CU) traits and reactive aggression (*r*s from .28 to .33), proactive aggression (*r*s from .23 to .39), and delinquency (*r*s from .32 to .37). Pechorro et al. (2014) found that adolescents with high psychopathic traits were more likely to start their criminal activities and become involved in the justice system earlier in life compared with adolescents who had low psychopathic traits. Salekin (2008) also found a positive prediction between psychopathic traits and recidivism among adolescents. Against this background, the early identification and prevention of psychopathic features become important, and the need for a reliable instrument to measure psychopathic traits in adolescents is urgent.

Compared to other popular screening measures of psychopathy, such as the Child Psychopathy Scale with 41 items (Lynam 1997) and the Youth Psychopathic Traits Inventory with 50 items (Andershed et al. 2002), the Antisocial Process Screening Device (APSD) is a short and easily administered screening instrument. Originally designed for use with parents and teachers, the APSD was further developed into a parallel self-report scale by changing the items from a third-person to a second-person format (Caputo et al. 1999). Both the self-report and parent-report versions have been validated in school-based and at-risk adolescent samples (e.g., Bijttebier and Decoene 2009; Frick et al. 2000; Fung et al. 2010; Vitacco et al.

2003), and a moderate correlation was found between the self-report and parent-report APSD (Muñoz and Frick 2007).

The factor structure of the APSD was initially assessed by Frick et al. (1994) in 95 clinic-referred children, and two distinct but related dimensions termed as impulsivity/conduct problems (I/CP) and callous-unemotional (CU) traits were identified. In addressing the limitations of the initial validation attempt of the APSD (e.g., a small sample size, clinic-referred samples, and primarily males), Frick et al. (2000) further validated the APSD in 1,136 community children and 160 clinic-referred children. They found that the two-factor model (i.e., GM/impulsive traits and CU traits), which was quite similar to the I/CP-CU structure, was more appropriate for the clinical sample; whereas the three-factor model (i.e., GM traits, impulsivity, and CU traits) was more appropriate for the community sample as GM/impulsive factor could be separated into GM traits and impulsive traits in community children. Grandiose-manipulative (GM) traits are characterized by a display of grandiosity and superiority, the exploitation of others, deliberately lying and purposely misleading others, and an excessive need of admiration (Ang and Raine 2009; Salekin 2016b). GM traits are also known as narcissism in the research literature. With reference to the construct of psychopathy, it is important to note that GM traits may be even more appropriate than narcissism in describing one of the three dimensions (e.g., Salekin 2016a; Salekin 2016b). Hence, the term of GM traits instead of narcissism is used in this paper. Impulsivity is marked by poor behavioral control and an inability to delay gratification (Vazire and Funder 2006). CU traits are described as displaying shallow emotion, a lack of empathy, and irresponsibility (Frick et al. 2014). A strong and significant relationship between GM traits and impulsivity has been revealed by a meta-analytic study (Vazire and Funder 2006). GM traits and impulsivity are positively related in both school-based and at-risk adolescents but this association is stronger in the at-risk group (Dong et al. 2014). Males and females were

found to exhibit different clinical symptoms of psychopathic traits (Salekin et al. 1998), but the findings of gender differences in psychopathic traits were not consistent. Some scholars found that males reported higher scores in GM traits, impulsivity, and CU traits than did females (e.g., Frick et al. 2000), yet other scholars did not find gender differences in psychopathic traits (e.g., Verona et al. 2010).

In line with Frick et al. (2000), many studies have found the three-factor model to have a better fit than the two-factor model in school-based adolescents. For example, Fung and her colleagues (2010) have validated the APSD in Hong Kong secondary school students using parent report. They found that the three-factor APSD model shows the best model fit indices and the three dimensions have significant relationships with aggression and delinquency. Consistent with the findings of Frick et al. (2000), a superior fit of the two-factor model compared to the three-factor model was observed in clinic-referred children (Fite et al. 2009a) and in arrested adolescents (Falkenbach et al. 2003). However, some other findings contradicted Frick et al.'s (2000) results. De Wied et al. (2014) found the two-factor model to be more suitable for school-based adolescents; and Vitacco et al. (2003) found that the three-factor model was preferred for adolescent offenders. The lack of a clear and stable factor structure is thought to be the biggest limitation of the APSD (Kotler and McMahon 2010).

The factor structure of the APSD in school-based and at-risk adolescents is debatable, and no study has validated the APSD in an at-risk adolescent sample in Asian societies. Psychopathy is important in clinical psychology given that its expression could be shaped by culture (Cooke and Michie 1999). Singapore is a unique Asian society in terms of its history (as British colony), geography (as an island city-state-country), and culture (diverse ethnicities including Chinese, Malay, Indian, and Eurasian) (Ang et al. 2012). Furthermore, Singapore is a westernized Eastern Asian society largely rooted in Confucian culture,

combining both Western cultural and modernized Eastern orientations (Luo et al. 2014). The validation of the APSD in Singapore can examine the generalizability of the empirical findings obtained from Western samples and help Asian professionals better understand, identify, and design better intervention programs for adolescents. We aimed to explore whether the factor structures of the APSD proposed by Frick et al. (2000) can be applied to both school-based and at-risk adolescents in Singapore. As the findings of gender differences in psychopathic traits were inconclusive, we also examined the gender invariance. Finally, we tested the convergent validity of the APSD in school-based adolescents.

Method

Participants

School-based sample. One-thousand and twenty-seven (1,027) adolescents (male = 576, female = 414, and gender unidentified = 37) ranging between Grade 7 and Grade 9 were recruited. The participants' ages ranged from 12 to 19 (M = 14.10, SD = 1.15). The ethnic identification was as follows: 65.4% Chinese, 20.8% Malay, 6.7% Indian, 1.1% Eurasian, and 6% other ethnic groups.

At-risk sample. One hundred and thirteen (113) at-risk adolescents (male = 34 and female = 79) whose age ranged from 11 to 16 (M = 14.35, SD = 1.10) were recruited. Of the participants, there were 54% Chinese, 37.1% Indian, 7.1% Malay, and 1.8% other ethnic groups. Two criteria were used to select the samples for the at-risk adolescents: 1) they presented with different types of delinquency such as truancy and substance use, they often displayed behavioral problems, and they also lacked adequate parental supervision and monitoring; 2) they did not violate the law, but they received a court order requiring placement in more structured settings or home supervision.

Measures

Antisocial Process Screening Device (APSD). The 20-item APSD (Frick et al. 2000) was used to measure psychopathic traits in school-based and at-risk adolescents. The items were rated from 0 (*not true at all*) to 2 (*definitely true*). Except for two items (i.e., items 2 and 6) that were left unclassified, the other 18 items of the APSD consisted of three subscales: GM traits (7 items), Impulsivity (5 items), and CU traits (6 items) (Frick et al. 2000). In this study, the APSD was self-reported in the school-based adolescents and had internal consistencies of .68, .54, and .56 for GM traits, impulsivity, and CU traits, respectively; and the APSD was parent-reported in the at-risk adolescents and had internal consistencies of .58, .58, and .52, respectively.

Reactive-Proactive Aggression Questionnaire (RPQ). The 23-item RPQ (Raine et al. 2006) was used to measure reactive (11 items) and proactive (12 items) aggression. The school-based adolescents rated each item on a 3-point scale (0 = *never*, 1 = *sometimes*, and 2 = *often*) for the frequency occurrence. The Cronbach's alphas for reactive and proactive aggression were .82 and .87, respectively.

Self-Reported Delinquency Scale (SRDS). The 18-item SRDS (adapted from Elliott et al. 1985) was employed to measure the different types of delinquent behavior. Each item was rated *Yes* (1) or *No* (0). All *Yes* responses were summed to create the delinquency score ranging from 0 to 18. The Cronbach's alpha was .90 for the sample of school-based adolescents in this study.

Data Analytic Plan

The factor structure of the APSD in the school-based and at-risk adolescents was initially examined using an exploratory factor analysis (EFA) by SPSS 23.0 and subsequently a confirmatory factor analysis (CFA) by LISREL 8.7 (Jöreskog and Sörbom 2004). With respect to EFA, principal component analysis (PCA) with varimax rotation was performed. The criteria, such as factor loading, eigenvalue, and scree test, were used to decide the

number of extracted factors. Regarding CFA, null, one-factor, two-factor, and three-factor models were tested and evaluated by the comparative fit index (CFI), the incremental fit index (IFI), the non-normed fit index (NNFI), the root mean square error of approximation (RMSEA), the Akaike information criterion (AIC), and the Bayesian information criterion (BIC). Diagonally weighted least squares (DWLS) estimation was employed due to its fit for ordinal data (Jöreskog 2005). CFI, IFI and NNFI $\geq$ .95 is considered a good fit (Hu and Bentler 1999). RMSEA $\leq$ .05 is indicative of a close fit (Browne and Cudeck 1993). A model with the lowest AIC and BIC values represents the best fitting model (Geiser 2012).

The measurement and structural invariance across gender was examined in the school-based adolescents using a multigroup CFA (MGCFA). A model with no equality constraints was first established. In a sequential manner, six progressively restrictive invariance models constrained the factor loadings, item intercepts, error variances, factor variances and covariances, and factor means equally across gender (Vandenberg and Lance 2000). Because of the over-sensitivity of $\Delta\chi^2$ to misfit, ΔCFI $\leq$ 0.01 recommended by Cheung and Rensvold (2002) was adopted to indicate the invariance. Lastly, the RPQ and SRDS were adopted to evaluate the convergent validity of the APSD using correlation and regression analyses.

Procedure

The Institutional Review Board of Nanyang Technological University approved this study. Participation was voluntary. For the school-based adolescents, approvals from the Ministry of Education in Singapore and the respective school principals were obtained. The questionnaires were completed anonymously by the students. All participants were invited from three randomly-selected secondary schools, which are located in neighborhood estates and are the most common type of school in Singapore. For the at-risk adolescents, we worked

with the relevant justice agencies to identify them. The parents of the at-risk adolescents gave their consent and completed the APSD.

Results

Descriptive Analyses

The internal consistency, mean value, standard deviation, skewness value, and kurtosis value of the APSD are reported in Table 1. According to Kline (1998), the skewness less than 3.0 and the kurtosis less than 10.0 are within acceptable limits, indicating that skewness and kurtosis values are not a concern in this study. The independent *t*-tests suggested that the at-risk adolescents displayed a much higher level of psychopathic traits than the school-based adolescents.

Factor Analysis and Gender Invariance in the School-based Adolescents

Prior to a confirmatory factor analysis, we first conducted an exploratory factor analysis. The value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was .796 and Bartlett's test of sphericity was significant: χ^2 (153, n = 1,027) = 2117, ρ < .001, suggesting that the sample and correlation matrix were appropriate to proceed with factor analysis. Based on a combination of methods (e.g., factor loadings > .35, eigenvalues > 1.0, and scree plot) and theoretical interpretability, a three-factor model was supported. The first three principal components (eigenvalues 3.20, 2.03, and 1.42) have accounted for 36.91% variance. It was noted that the item-total correlation of item 19 and CU traits was negative (i.e., −.25) and that of item 20 was quite low (i.e., .17), and therefore, the modification indices suggested excluding both items to improve the internal consistency. Removing these two items from the CU traits subscale is supported by many previous studies that have documented that items 19 and 20 perform poorly (e.g., Colins et al. 2014; Poythress et al. 2006a). The internal consistency of CU traits increased to .56 from .35 after removing items 19 and 20.

The model fit indices of Frick et al.'s (2000) 18-item APSD are reported in Table 2. Due to the low internal consistency of CU traits caused by item 19 and item 20, these two items were not taken into account in the following analyses about the school-based sample. For the school-based adolescents, the three-factor structure of the 16-item APSD showed a good model fit: $SB\chi^2(101, n = 1{,}027) = 351$, $p < .001$, CFI = .959, IFI = .959, NNFI = .951, and RMSEA = .049 (90% *CI*: 0.044 - 0.055). The latent factor correlations were as follows: APSD-GM and APSD-impulsivity, $r = .82$ ($p < .001$); APSD-impulsivity and APSD-CU, $r = .17$ ($p < .05$); and APSD-GM and APSD-CU, $r = .15$ ($p < .05$). The chi-square difference between the three-factor model and the two-factor model was significant ($\Delta SB\chi^2 = 50$, $p < .001$). All model fit indices confirmed the superiority of the three-factor model over the two-factor, one-factor, and null models (see Table 3).

To test gender invariance, the independent best-fitting models for males and females were established first (Byrne 2006). We found that the three-factor model was best for boys: $SB\chi^2(101, n = 576) = 252$, $p < .001$, CFI = .951, IFI = .951, NNFI = .942, and RMSEA = .051; and girls: $SB\chi^2(101, n = 414) = 207$, $p < .001$, CFI = .965, IFI = .966, NNFI = .959, and RMSEA = .050. Subsequently, seven successively restrictive invariance models were tested, suggesting the gender invariance according to $\Delta CFI \leq .01$ (see Table 4).

Factor Analysis in the At-risk Adolescents

The value of the Kaiser-Meyer-Olkin (KMO) was .614 and Bartlett's test of sphericity was significant: χ^2 (153, $n = 113$) = 357, $\rho < .001$, indicating that the data were appropriate for factor analysis. A two-factor model was preferred according to multiple criteria, such as factor loadings > .35, eigenvalues > 1.0, scree plot, and theoretical interpretability. The two factors extracted (eigenvalues 3.30 and 2.10) explained 30% of the total variance of the APSD scores. The reliability of CU traits was very low ($\alpha = .17$) due to the fact that the item-total correlation of item 19 and CU traits was negative (i.e., −.40) and that of item 20 was

quite low (i.e., .01). With the removal of items 19 and 20, the internal consistency increased to .52.

For the at-risk adolescents, the model fit indices of Frick et al.'s (2000) 18-item APSD are reported in Table 2. Given that items 19 and 20 lead to low reliability of CU traits, both of them were excluded from the at-risk sample in this study. The model fit indices of the 16-item APSD were: SBχ^2 (103, n = 113) = 119, p > .05, CFI = .977, IFI = .977, NNFI = .973, and RMSEA = .037 (90% *CI*: 0.000 - 0.064) for the two-factor model; and SBχ^2 (101, n = 113) = 119, p > .05, CFI = .973, IFI = .974, NNFI = .968, and RMSEA = .040 (90% *CI*: 0.000 - 0.066) for the three-factor model (see Table 5). The model fit indices showed that both the two- and three-factor models were acceptable and dividing one factor into two did not improve the model fit as there is no chi-square change between the three-factor model and the two-factor model. The chi-square difference between the two-factor model and the one-factor model was significant (ΔSBχ^2 = 17, p < .001), suggesting that the two-factor model is better than the one-factor model. For the three-factor model, the latent factor correlations were as follows: APSD-GM and APSD-impulsivity, r = 1.0 (p < .001); APSD-impulsivity and APSD-CU, r = .30 (p > .05); and APSD-GM and APSD-CU, r = .36 (p > .05). The perfect correlation between APSD-GM and APSD-impulsivity suggested that these two factors are not distinct. Therefore, combining them into one factor was appropriate, and the two-factor model was preferred for this at-risk adolescent sample. The correlation between APSD-GM/impulsivity and APSD-CU latent factors was .33 (p < .05).

Convergent Validity of the APSD

The RPQ and SRDS were adopted to evaluate the convergent validity of the APSD in the school-based adolescents (see Table 6). Correlation results indicated that APSD-GM and APSD-impulsivity were positively associated with reactive aggression, proactive aggression, and delinquency; and APSD-CU was only positively related to delinquency and proactive

aggression, but not reactive aggression. A *t*-test (Chen and Popovich 2002) comparing the two dependent correlations suggested that APSD-GM was more associated with proactive than reactive aggression ($t(1024) = 2.35$, $p < .05$, $d = .15$), and APSD-impulsivity was more related to reactive than proactive aggression ($t(1024) = 2.60$, $p < .01$, $d = .16$). Regression results showed that APSD-GM was the best predictor of reactive and proactive aggression, and APSD-impulsivity was most predictive of delinquency. It was noted that APSD-CU was a negative predictor of reactive aggression.

Discussion

This study attempted to validate the APSD in Singaporean school-based and at-risk adolescents. Consistent with most prior studies (e.g., Dong et al. 2014; Fung et al. 2010), the three-factor APSD model provided a better model fit than the two-factor model did in the school-based adolescents. This implies that the construct of psychopathy could be distinguished by three dimensions including GM traits, impulsivity, and CU traits in a non-referred population. The factorial invariance across gender was also supported via a multigroup CFA, suggesting that male and female school-based adolescents conceptualized psychopathic traits in a similar way. Although Fung et al. (2010) did not test factorial invariance between males and females, they found the three-factor model showed good model fits for separate samples of boys and girls. As for the at-risk adolescents, even though the two- and three-factor models had similar model fit indices and were both acceptable, the two-factor model of the APSD (i.e., GM/impulsive traits and CU traits) was the superior model over the three-factor model. This finding further supported the results of prior studies (e.g., Fite et al. 2009a; Frick et al. 2000). Raskin and Terry (1988) assumed that impulsivity was one of the core characteristics of grandiose-manipulative personality, and the two-factor structure of the APSD can be considered a special case of the three-factor structure if there is

a perfect correlation between GM traits and impulsivity (Dong et al. 2014). The two-factor model is therefore more justifiable in the at-risk adolescents.

We noted that the Cronbach's α of CU traits has been significantly improved by removing items 19 and 20 in the school-based and at-risk samples. The low internal consistency of CU traits could be explained by the negative factor loading of item 19 (i.e., "You hide your feelings or emotions from others") and the low factor loading of item 20 (i.e., "You keep the same friends"), which have also been found in some prior studies (e.g., Poythress et al. 2006a; Vitacco et al. 2003). For example, item 19 has a negative loading of −.65 on CU traits resulting in relatively low reliability of CU traits (α = .58) in Fung et al.'s study (2010). The negative loading of item 19 could have occurred because it is the only non-reversed item under CU traits. In addition, hiding feelings and emotions from others may not necessarily be interpreted as callous-unemotional in Asian children because in the Asian context, they are not encouraged to express too much emotion and feelings (Md-Yunus 2005). Similarly, for item 20, not keeping the same friends cannot be categorically classified as CU traits since some instability in friendship is a relatively common phenomenon in early adolescence (Poulin and Chan 2010) and adolescents have many opportunities (e.g., natural school transitions and extracurricular activities) to meet new friends. By removing items 19 and 20, the internal consistency of CU traits became much better and slightly more acceptable in school-based adolescents (α = .56) and in at-risk adolescents (α = .52), implying that both items cannot be part of CU traits at least in the current samples. The deletion of both items was also in line with previous studies, such as Colins et al. (2014), Douglas et al. (2008), and Poythress et al. (2006a). Although these Cronbach's αs remain low, it should be noted that these estimates for GM traits and impulsivity in this study were similar to or better than the prior published findings in school-based adolescents (e.g., Bijttebier and Decoene 2009; De Wied et al. 2014; Seals et al. 2012) and in at-risk adolescents (e.g., Lee et al. 2003;

Poythress et al. 2006a). Through a review of 11 studies, Poythress et al. (2006b) found that the range of the internal consistency estimates was from .59 to .75 for GM traits (Median = .69), .44 to .61 for impulsivity (Median = .53), and .22 to .60 for CU traits (Median = .46).

Item loadings of the three-factor APSD were satisfactory for the school-based sample. In the at-risk sample, item loadings of the two-factor APSD were satisfactory except for item 8 “boasts a lot about self” with the lowest factor loading on APSD-GM/impulsivity. Using parent-reported APSD, Fung et al. (2010) also found a very low factor loading of .08. Parents reporting the APSD may have accounted for this. Adolescents’ excessive boasting typically happens among peers, and as adolescents spend more time with peers than parents, this behavior may not be obvious to their parents. In other words, parents may be less able to observe their children’s excessive boasting, leading to parents to have little knowledge of this behavior and parents may underrate this item as a result.

The convergent validity of the APSD was supported by its moderate association with reactive and proactive aggression and delinquent behaviors. The significant relationship between psychopathy and reactive and proactive aggression in our work has been documented in many studies (e.g., Flight and Forth 2007; Seals et al. 2012) as these constructs share a common genetic influence (Bezdjian et al. 2011b). Confirming Rosan and Costea-Barlutiu’s (2013) findings, APSD-GM was more positively associated with proactive than reactive aggression. APSD-impulsivity was more related to reactive than proactive aggression, supporting the argument that impulsivity is a defining characteristic of reactive aggression (Flight and Forth 2007). Additionally, the high correlation between APSD-CU and proactive aggression cannot be overlooked because adolescents with a high level of CU usually have more severe and persistent antisocial behaviors (Frick et al. 2003). The significant associations between psychopathic traits and delinquency were supported by previous meta-analytic findings (Asscher et al. 2011). In line with the results of Goodwin et

al. (2015) and Fite et al. (2009b), APSD-GM was found to be the best predictor of reactive and proactive aggression. We also found that APSD-impulsivity was most highly related to delinquent acts, which lends support to a previous finding (Muñoz and Frick 2007) and also support an assumption that the impulsivity leads to criminal behavior for many psychopaths (Vincent and Hart 2002). A negative prediction between APSD-CU and reactive aggression implies that adolescents with high levels of CU traits show less reactivity to the stimuli of threat and emotional distress (Essau et al. 2006), which are the triggers of reactive aggression.

Some limitations in this study should be noted. First, the relatively small sample size of the at-risk adolescents may lead to unstable CFA models, indicating that the results regarding the CFA of the at-risk sample should be interpreted with caution. Additionally, the gender imbalance of the at-risk adolescents precludes our exploration of the gender invariance. Despite the factor structure obtained from this study is consistent with the factor structure in some previous studies in at-risk samples (e.g., Fite et al. 2009a), the findings should be replicated by a larger and gender-balanced sample. Second, different informants were invited to assess psychopathic traits in the two populations. Although self-report is efficient for a large sample size of school-based adolescents, and parent-report is feasible for at-risk adolescents who are not easily accessible, using different informants precludes the comparison of the factor structure between the two samples (e.g., invariance testing). Future work would benefit from involving both adolescents themselves and their parents as informants in a single study, which would then allow us to learn about the differences between adolescents' and their parents' views on psychopathic traits. Finally, as the RPQ and SRDS were employed in the school-based adolescents but not the at-risk adolescents, the convergent validity of the APSD in the at-risk sample cannot be investigated. Therefore, the construct validity of the APSD should be further tested in the at-risk sample.

Conclusion

As an initial attempt, this study validates the APSD in Singaporean school-based and at-risk adolescents and extends cross-cultural research by complementing the existing knowledge mainly gained from Western samples. Psychopathic traits are potential markers for antisocial behavior and delinquency concurrently and longitudinally (Muñoz and Frick 2007), resulting in a strong need for early intervention in the treatment of psychopathic traits in adolescents due to relatively ineffective attempts to alleviate and treat psychopathy in adults (Bezdjian et al. 2011a). This study validates a sound instrument for measuring psychopathic traits and makes the early screening and identification of adolescents with psychopathic traits possible. In particular, the validation in the school-based sample enhances the knowledge regarding the psychopathic traits of the general population as many current studies have only used referred samples (Seals et al. 2012). Moreover, the examination of the gender invariance provides a better understanding on psychopathic traits across gender by overcoming the limitations of most of the current studies that have only used male samples (Poythress et al. 2006b). Overall, this study contributes to and expands upon the existing literature concerning the factor structure of the APSD, thereby enhancing the understanding of psychopathic traits in Asian adolescents. With evidence of the APSD as a validated instrument across cultural settings and across types of samples, clinical professionals can have greater confidence in using the APSD to indentify psychopathic traits in adolescents and to design suitable and appropriate intervention programs.

Compliance with Ethical Standards

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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 national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent: Informed consent was obtained from all individual participants included in the study.

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Appendix

Table 1

Descriptive Analyses of the APSD in the School-based and At-risk Adolescents

	School-based Sample					At-risk Sample					
Variables	α	Mean	SD	SK	KU	α	Mean	SD	SK	KU	*t*-test
APSD	.71	12.42	4.76	.50	.68	.70	15.35	4.72	.20	.09	-6.20^{***}
GM	.68	3.64	2.43	.74	.82	.58	4.52	2.27	.11	−.35	-3.69^{***}
Impulsivity	.54	4.03	1.82	.20	.15	.58	5.08	1.81	−.17	.07	-5.80^{***}
CU	.56	2.08	1.60	.79	.84	.52	2.20	1.53	.82	.46	−.76
GM/Imp	.73	7.67	3.67	.53	1.06	.72	9.60	3.61	−.05	−.12	-5.32^{***}
RA	.82	7.41	4.17	.46	.07	-	-	-	-	-	-
PA	.87	2.09	3.36	2.61	7.99	-	-	-	-	-	-
SRDS	.90	2.47	3.65	2.06	4.28	-	-	-	-	-	-

Note. SK = skewness; KU = kurtosis. GM = grandiose-manipulative traits; CU = callous-unemotional traits; GM/Imp = grandiose-manipulative/impulsive traits. RA = reactive aggression; PA = proactive aggression; SRDS = Self-Reported Delinquency Scale. Group 0 = school-based sample; Group 1 = at-risk sample. $^{***}p < .001$.

Table 2

Confirmatory Factor Analysis (CFA) of the 18-item APSD in the School-based Adolescent Sample and the At-risk Adolescent Sample

Models	SBχ^2/*df*	CFI	IFI	NNFI	RMSEA (90% *CI*)	AIC	BIC	Compare	ΔSBχ^2	Δdf
School-based Adolescent Sample (*n* = 1,027)										
Null model	3561/153	.500	.500	.500	.147 (.143 - .152)	3597	3686			
One-factor	980/135	.876	.876	.860	.078 (.074 - .083)	1052	1230	1 vs. 0	2581***	18
Two-factor	511/134	.945	.945	.937	.052 (.048 - .057)	585	768	2 vs. 1	469***	1
Three-factor	461/132	.952	.952	.944	.049 (.044 - .054)	539	731	3 vs. 2	50***	2
At-risk Adolescent Sample (*n* = 113)										
Null model	510/153	.550	.550	.550	.144 (.131 - .158)	546	595			
One-factor	205/135	.912	.914	.900	.068 (.048 - .086)	277	375	1 vs. 0	305***	18
Two-factor	169/134	.955	.956	.949	.049 (.020 - .070)	243	344	2 vs. 1	36***	1
Three-factor	169/132	.954	.955	.947	.050 (.022 - .071)	247	353	3 vs. 2	0	2

Note. SBχ^2 = Satorra-Bentler chi-square; *df* = degrees of freedom; CFI = comparative fit index; IFI = incremental fit index; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criterion; BIC = Bayesian information criterion. ***$p < .001$.

Table 3

Confirmatory Factor Analysis (CFA) of the 16-item APSD in the School-based Adolescent Sample (n = 1,027)

	Factor Loadings				
	Three-factor model			Two-factor model	
APSD Items	Imp	GM	CU	GM/Imp	CU
1. You blame others for your mistakes	.63			.58	
4. You act without thinking of the consequences	.58			.53	
9. You get bored easily	.28			.25	
13. You do risky or dangerous things	.54			.51	
17. You do not plan ahead or you leave things until the "last minute"	.50			.45	
5. Your emotions are shallow and fake		.54		.53	
8. You boast a lot about how good you are, the good things you have done, or the things/possessions you have		.53		.51	
10. You use or "con" other people to get what you want		.59		.57	
11. You tease or make fun of other people		.61		.60	
14. You act charming and nice to get things you want		.55		.53	
15. You get angry when corrected or punished		.53		.52	
16. You think you are better or more important than other people		.57		.55	
3. You care about how well you do at school/work			.52		.51
7. You are good at keeping promises			.41		.41
12. You feel bad or guilty when you do something wrong			.55		.55
18. You care about the feelings of others			.80		.80

Models	SB χ^2	*df*	CFI	IFI	NNFI	RMSEA (90% *CI*)	AIC	BIC	Compare	ΔSBχ^2	Δdf
Null	3130	120	.503	.503	.503	.156 (.152 - .161)	3162	3241			

One-factor	689	104	.903	.904	.889	.074 (.069 - .079)	753	911	1 vs. 0	2441***	16
Two-factor	401	103	.951	.951	.943	.053 (.048 - .059)	467	630	2 vs. 1	288***	1
Three-factor	351	101	.959	.959	.951	.049 (.044 - .055)	421	594	3 vs. 2	50***	2

Note. Imp = impulsivity; GM = grandiose-manipulative traits; CU = callous-unemotional traits; GM/Imp = grandiose-manipulative/impulsive traits. SBχ^2 = Satorra-Bentler chi-square; *df* = degrees of freedom; CFI = comparative fit index; IFI = incremental fit index; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criterion; BIC = Bayesian information criterion. ***$p < .001$

Table 4

Testing for Gender Invariance: Results of the Three-factor Model in the School-based Adolescent Sample

	Overall fit indices						Comparative fit indices			
Model	SBχ^2	*df*	CFI	IFI	NNFI	RMSEA (90% *CI*)	Compare	ΔSBχ^2	Δdf	ΔCFI
Model 1	454	202	.966	.966	.959	.050 (.044 - .056)				
Model 2	497	215	.962	.962	.957	.051 (.046 - .057)	2 vs. 1	43*	13	.004
Model 3	518	228	.960	.961	.958	.051 (.045 - .057)	3 vs. 2	21	13	.002
Model 4	542	244	.959	.959	.960	.050 (.044 - .055)	4 vs. 3	24	16	.001
Model 5	548	247	.959	.959	.960	.050 (.044 - .055)	5 vs. 4	6	3	.000
Model 6	559	250	.958	.958	.960	.050 (.045 - .056)	6 vs. 5	11*	3	.001
Model 7	573	253	.956	.956	.959	.051 (.045 - .056)	7 vs. 6	14*	3	.002

Note. Model 1: configural invariance; Model 2: factor loading invariance; Model 3: item intercept invariance; Model 4: error variance invariance; Model 5: factor variance invariance; Model 6: factor covariance invariance; Model 7: factor mean invariance. $^{*}p < .05$.

Table 5

Confirmatory Factor Analysis (CFA) of the 16-item APSD in the At-risk Adolescent Sample (n = 113)

	Factor Loadings				
	Three-factor model			Two-factor model	
APSD Items	Imp	GM	CU	GM/Imp	CU
1. Blames others for own mistakes	.73			.73	
4. Acts without thinking of the consequences	.49			.49	
9. Gets bored easily	.45			.45	
13. Does risky or dangerous things	.64			.64	
17. Does not plan ahead or leave things until the “last minute”	.46			.46	
5. Emotions are shallow and fake		.30		.30	
8. Boasts a lot about self		.05		.06	
10. Uses or “cons” other people to get what they want		.69		.70	
11. Teases or makes fun of other people		.57		.58	
14. Acts charming and nice to get things		.43		.44	
15. Gets angry when corrected or punished		.61		.62	
16. Feels better or more important than other people		.55		.56	
3. Cares about schoolwork			.76		.76
7. Good at keeping promises			.55		.56
12. Feels bad or guilty when do something wrong			.35		.34
18. Cares about the feelings of others			.43		.42

Models	SB χ^2	*df*	CFI	IFI	NNFI	RMSEA (90% *CI*)	AIC	BIC	Compare	ΔSBχ^2	Δdf
Null	431	120	.542	.542	.542	.152 (.137 - .168)	463	507			
One-factor	136	104	.953	.954	.946	.052 (.022 - .075)	200	287	1 vs. 0	295***	16

Two-factor	119	103	.977	.977	.973	.037 (.000 - .064)	185	275	2 vs. 1	17^{***}	1
Three-factor	119	101	.973	.974	.968	.040 (.000 - .066)	189	285	3 vs. 2	0	2

Note. Imp = impulsivity; GM = grandiose-manipulative traits; CU = callous-unemotional traits; GM/Imp = grandiose-manipulative/impulsive traits. SBχ^2 = Satorra-Bentler chi-square; *df* = degrees of freedom; CFI = comparative fit index; IFI = incremental fit index; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; CI = confidence interval; AIC = Akaike information criterion; BIC = Bayesian information criterion. $^{***}p < .001$.

Table 6

Correlation and Regression Analysis for the Three-factor APSD Model with RPQ and SRDS in the School-based Adolescent Sample

	APSD Total	APSD-GM		APSD-Impulsivity		APSD-CU		R^2
	r	*r*	*β*	*r*	*β*	*r*	*β*	
RA	.47***	.45***	.32***	.44***	.29***	−.02	−.06*	.27***
PA	.56***	.51***	.42***	.37***	.16***	.22***	.18***	.31***
SRDS	.44***	.31***	.16***	.38***	.29***	.14***	.11***	.18***

Note. APSD = Antisocial Process Screening Device; GM = grandiose-manipulative traits; CU = callous-unemotional traits; RA = reactive aggression; PA = proactive aggression; SRDS = Self-Reported Delinquency Scale. *$p < .05$; ***$p < .001$.