



A comparison of latent profiles in antisocial male offenders

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ABSTRACT

Purpose: Within forensic settings, the tools used to evaluate subtypes of antisocial offenders (e.g. interview-based measures such as the Psychopathy Checklist) are expensive and time consuming. The purpose of the present study was to identify and validate distinct antisocial profiles in male offenders using questionnaires. In the future, this approach could help us identify antisocial profiles in a cost-effective way.

Method: First, we investigated the robustness and replicability of the profiles reported by previous profiling studies by performing latent profile analysis using the Self-Report Psychopathy Short-Form. Second, we studied how these profiles were linked to personality correlates that have been used to differentiate between groups of antisocial offenders. Third, we investigated how each profile was related to a broad range of behaviours seen in antisocial populations.

Result: Four antisocial profiles were identified: *generic offenders*, *impulsive-antisocial traits offenders*, *non-antisocial psychopathic traits offenders*, and *psychopathic traits offenders*. The validity of these profiles was supported by their links with external personality and behavioural correlates.

Conclusion: Consistent with previous research using interview-based measures, these findings provide support for the presence of four distinct antisocial profiles based on self-report psychopathy scores in male offenders. Furthermore, findings provide relatively extensive and multifaceted characterizations of each profile.

Antisocial behaviour is a heterogeneous construct that covers a wide range of behaviours that cause harm to others. There is evidence supporting the existence of different subtypes of antisocial individuals (for an overview see Brazil, Dongen, Maes, Mars, & Baskin-Sommers, 2016). These subtypes of individuals engage in different types of behaviours (DeLisi et al., 2011; Odgers et al., 2007; Patrick, Hicks, Krueger, & Lang, 2005; Vincent, Vitacco, Grisso, & Corrado, 2003) and purportedly represent the outcome of different etiological pathways (Baskin-Sommers, Curtin, & Newman, 2015). One way researchers and clinicians attempt to differentiate subtypes of antisocial individuals is to distinguish between antisocial individuals with and without psychopathy (Brazil et al., 2016; Kiehl & Hoffman, 2011). Psychopathy is considered as a severe disorder typified by interpersonal-affective dysfunctions (e.g., lack of empathy, manipulateness) combined with severe antisocial behaviour and an erratic lifestyle. Psychopathy is linked to increased chance of recidivism (McCuish, Corrado, Hart, & DeLisi, 2015), excessive use of aggression, and large financial costs to society (Kiehl &

Hoffman, 2011).

Currently, the dominant approach to differentiate between psychopathic- and non-psychopathic antisocial individuals is based on the framework developed by Hare and colleagues (1980). Driven by the idea that there was no appropriate measure to diagnose antisocial individuals at the time, Hare developed the Psychopathy Checklist (Hare, 1980), and later on the Psychopathy Checklist-Revised (PCL-R; Hare, 2003; Hare et al., 1990). The PCL-R is a semi-structured interview that can be combined with criminal records to derive a score that indicates the extent to which psychopathic characteristics are present in an individual. An individual is diagnosed with psychopathy if the total score of the PCL-R is ≥ 30 in the U.S., or ≥ 26 in Europe (Cooke & Michie, 1999). As this framework incorporates antisocial features as a separate component (or facet) that is embedded within the construct of psychopathy, it allows for the quantification of broad range of antisocial behaviours that are not unique to psychopathy (see also Brazil et al., 2016 for an overview of studies using the PCL-R for subtyping antisocial

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individuals).

The PCL-R score represents the combination of four dimensions or facets believed to constitute psychopathy. The “interpersonal” facet concerns arrogant and deceitful interpersonal style, which is characterized by superficial charm, grandiosity, manipulative behaviour and deceitfulness. The “affective” facet captures the degree of disturbed affective experience, which encompasses callousness, lack of empathy, failure to accept responsibility and lack of remorse or guilt. The “lifestyle” facet describes an impulsive-irresponsible behavioural style, which is typified by impulsivity, boredom, sensation seeking, a parasitic lifestyle, irresponsibility, and lack of goals. Finally, the “antisocial” facet encompasses aggressiveness, early behaviour problems, juvenile delinquency and criminal versatility (Hare & Neumann, 2005). These facets are inter-related and load on a set of second-order factors, forming an Interpersonal-Affective Factor (Factor 1; F1) and a Lifestyle-Antisocial Factor (Factor 2; F2). Whereas the Interpersonal-Affective factor captures the core features that are unique to psychopathy, the Lifestyle-Antisocial factor represents a more general set of antisocial tendencies that can be found across several subtypes of antisocial individuals (Hansen, Johnsen, Thornton, Waage, & Thayer, 2007; Hare, 2003). The PCL-R framework is well supported in a wide variety of samples and is now regarded as the most reliable method to measure psychopathic traits (Hare, Clark, Grann, & Thornton, 2000; Hare & Neumann, 2006; Neumann, Schmitt, Carter, Embley, & Hare, 2012).

Using the PCL-R framework, researchers also propose further distinctions based on scores within the factors of the PCL-R and external correlates (see Brazil et al., 2016). One of the most prominent distinctions is that between primary and secondary psychopathy, which has been defined in various ways. For instance, primary psychopathy has been described as antisocial individuals that score relatively high on F1 traits compared to F2 traits, whereas secondary psychopathy has been characterized by relatively high F2 traits relative to F1 traits (Skeem, Poythress, Edens, Lilienfeld, & Cale, 2003; Wong & Hare, 2006). A second distinction highlights how these subtypes differ based on levels of anxiety: primary psychopathy defined as a high PCL(-R) total score and a low level of anxiety and secondary psychopathy defined as a high PCL(-R) total score with a high level of anxiety (Lykken, 1995; Skeem, Johansson, Andershed, Kerr, & Loudon, 2007). Finally, primary and secondary psychopathy are distinguished based on differences in behavioural motivation. Primary psychopathy is typified by an underactive behavioural inhibition system (BIS) in those scoring above the PCL-R cutoff score, while secondary psychopathy concerns an overactive behavioural activation system in these individuals (BAS; Newman, MacCoon, Vaughn, & Sadeh, 2005; Ross et al., 2007). Another common approach to distinguishing subtypes within psychopathy is by focusing on the expression of emotion (Hicks, Markon, Patrick, Krueger, & Newman, 2004; Hicks & Patrick, 2006) and externalizing behaviour (a common factor underlying antisocial behaviour and disinhibitory behaviours, such as substance dependence), where F1 traits were negatively associated with low negative affectivity and low externalizing behaviours, and F2 traits were positively associated with high negative affectivity and high externalizing behaviours (Patrick et al., 2005). While these approaches have been immensely helpful in identifying and parsing the heterogeneity of psychopathy, many of these proposals are based on theoretical assumptions (e.g., Murphy & Vess, 2003; Skeem et al., 2003), use diverse methodologies (e.g. cluster analysis, latent variable- and person-centered approaches), and have different sample selection procedures (e.g. including violent offenders, psychopathic offenders, sex offenders or mixed offenders) (Neumann, Vitacco, & Mokros, 2016).

In order to address these limitations, recent studies employ structural equation modeling as a quantitative approach to subtyping of antisocial individuals, broadly, and more specifically within the construct of psychopathy. For example, Skeem et al. (2007) performed a model-based cluster analysis on a sample of Swedish male offenders with a PCL-R score ≥ 28 . The clustering was based on the four PCL-R

facet scores and a self-report measure of trait anxiety. The analysis resulted in two clusters with one type (60% of the sample) scoring high on PCL facets 1–3 (interpersonal, affective, lifestyle), but low on anxiety and the other type (40% of the sample) showing a moderate score on PCL facets 1–3 and high on anxiety. Notably, the antisocial facet did not differ between the two clusters. A more recent study by Mokros et al. (2015) used Latent Class Analysis (LCA) on PCL-R data from male offenders with a high PCL-R score (> 27). Three subtypes were obtained: manipulative (Latent Class 1), aggressive (Latent Class 2) and sociopath (Latent Class 3). The manipulative and aggressive classes reflected early clinical conceptualizations of psychopathy and were proposed to represent empirically derived variants of primary psychopathy that differ in the manifestation of F1 and F2 traits. Moreover, the sociopath class was believed to reflect secondary psychopathy as this latent class was characterized by social deviance, and low expression of the affective features of psychopathy. Whereas these previous studies were conducted using offender samples with high PCL-R scores, some recent studies have examined the full range of PCL-R scores in mixed offender (Hare, 2016) and sex offender (Krstic et al., 2017) samples. These studies provided evidence for the existence of four latent classes: psychopaths, callous-conning offenders, sociopaths and general offenders. The general offenders were at the low end of the psychopathic spectrum, and the psychopaths were at the high end of the spectrum. The sociopaths showed mainly elevated F2 traits, while elevated F1 traits were the most prominent features of the callous-conning offenders. Taken together, findings from these studies suggest that antisocial behaviour can be subtyped by using psychopathy measures, and these subtypes represent different profiles with regard to psychopathic traits.

Notably, the vast majority of the current empirical research on subtyping of psychopathy predominantly has been based on the PCL (-R). However, administering and scoring the PCL-R requires a relatively large time and financial investment. Therefore, self-report questionnaire measures of psychopathy are gaining popularity in forensic research, especially in studies that are interested in subtyping psychopathic traits in the general population (e.g., Collins, Fanti, Salekin, & Andershed, 2017). The Self-Report Psychopathy checklist (SRP; Hare, 1985) is a well-known self-report questionnaire for psychopathic traits which uses a similar four-dimensional structure to the PCL-R. The SRP is significantly associated with the PCL-R (latent $r = 0.68$) and has been shown to be valid across genders (Neumann & Hare, 2008; Neumann & Pardini, 2014). However, to date, there are no studies addressing the suitability of self-report measures for subtyping of adult offenders based on psychopathic features.

The main purpose of the present study was to identify different antisocial profiles in a sample of male offenders and investigate how these profiles differ based on general personality factors and other traits linked to criminogenic factors. To achieve this, we (1) performed latent profile analysis (LPA)¹ on the SRP-Short Form and compared our results with the three only previous studies that employed LPA in adult offenders, (2) studied how the profiles differed on descriptive and personality factors traditionally believed to be relevant for distinguishing among subtypes based on levels of psychopathy (e.g., anxiety, valence of affect, motivational tendencies), and (3) sought to further extend previous studies on subgrouping in adult offenders by also obtaining a more detailed view of how the profiles differed on externalizing behaviours commonly seen in antisocial offender populations (i.e., aggression, disinhibition, substance abuse). Based on previous research

¹ LPA is a data-driven approach that classifies individuals or cases into homogenous groups (i.e., latent profiles) based on conditional probabilities. This is in contrast with the majority of the subtyping studies that have used hypothesis-driven analyses and are dependent on strong a priori assumptions. Given that there have only been three studies examining PCL-based subtypes of offenders using LCA in incarcerated adult offenders and that these studies differed in the number of latent classes identified, it is important to test whether these results are stable and replicate when using alternative measures of psychopathy derived from the PCL-R.

(Hare, 2016; Krstic et al., 2017), we expected to identify four different profiles that are similar to previously identified subtypes. Regarding the external variables, we hypothesized that the profile with the lowest SRP scores was characterized by low scores on negative affectivity (Hicks et al., 2004) and externalizing behaviour (Hicks & Patrick, 2006) and a low amount of (violent) crimes (Patrick et al., 2005). Furthermore, we expected that the profile with high scores on antisocial behaviour to be associated with high rates of violent crimes (Hare, 2003; Vittaco, Neumann, & Jackson, 2005). Finally, we predicted that the profile with the highest SRP scores should be linked to a high amount of crimes (Hicks & Patrick, 2006), low anxiety scores (Skeem et al., 2007) and high negative affectivity and reward sensitivity (Newman et al., 2005; Ross et al., 2007).

1. Methods

1.1. Participants

The current study used behavioural data from 576 male offenders that were institutionalized in maximum security prisons throughout Wisconsin. Participants ranged in age from 18 to 45 years ($M = 31.31$, $SD = 7.13$). In terms of race, 389 participants (67.5%) self-identifying as White, 142 participants (24.7%) as Black, 17 (3%) as Hispanic, 3 (0.5%) as Native American, one (0.2%) as Asian and two (0.3%) as a mix of two or more races. Procedures were approved by the Institutional Review Board at the University of Wisconsin (IRB SE-2011-0358).

1.2. Questionnaires

1.2.1. Psychopathy

Psychopathic traits were assessed with the short form of the Self-Report Psychopathy scale (SRP-SF; Paulhus, Neumann, & Hare, 2015). This measure was designed to assess the four facets of psychopathy as described by Hare's PCL-R framework; interpersonal manipulation (e.g., "Sometimes you need to pretend that you like someone to get what you want"), affective callousness (e.g., "I never feel guilty over hurting others"), erratic lifestyle (e.g., "I've often done dangerous things just for the thrill") and overt antisociality (e.g., "Sometimes I carry a weapon (knife or gun) to protect myself"). A total of 29 questions were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). The full version SRP is strongly correlated ($r = 0.92$) with the SRP-SF (Paulhus et al., 2015) and the PCL-R (Neumann, Hare, & Pardini, 2015). The SRP and SRP-SF both have good basic psychometric properties (Neumann et al., 2012), are theoretically sound (Carré, Fisher, Manuck, & Hariri, 2012), and have robust latent structures (Neumann & Pardini, 2014; Williams, Paulhus, & Hare, 2007). Internal consistency in our sample was high for the total score (Cronbach's $\alpha = 0.88$), and acceptable for the factor scores (interpersonal $\alpha = 0.80$, affective $\alpha = 0.67$, lifestyle $\alpha = 0.70$, antisocial $\alpha = 0.63$).

1.2.2. External correlates

A set of measures was selected as external correlates due to their relevance for subtyping of psychopathy. Anxiety was measured with the Welsh Anxiety Scale (WAS; Welsh, 1952), which consists of 39 items that are rated on a true/false scale. Motivational tendencies were measured with the Behavioural Inhibition/Behavioural Activation scales (BIS/BAS; Carver & White, 1994). This measure consists of 20 items measuring four scales: BIS, BAS – Reward Responsiveness, BAS – Drive, and BAS – Fun Seeking. The items were rated on a 4-point Likert scale (1 = strongly agree, 4 = strongly disagree) (Jorm et al., 1998). Where the BIS scale is related to neuroticism and negative affect, the BAS scale is more related to extraversion and positive affect (Carver & White, 1994). The three BAS subscales load strongly on the second-order BAS scale. Therefore, we only included the higher-order BAS scale in our analysis. General affectivity was assessed with two subscales of

the Multidimensional Personality Questionnaire (MPQ; Tellegen & Waller, 2008). The brief version of this questionnaire consists of 155 items that measure three subscales: Positive Affectivity; Negative Affectivity and Constraint. The Positive Affectivity subscale consists of four lower-order scales (Well-Being, Social Potency, Achievement, and Social Closeness). Negative Affectivity has three lower-order factors (Stress Reaction, Alienation, and Aggression), as does Constraint (Control, Harm Avoidance, and Traditionalism). The Constraint subscale was not taken into account in the current analysis. Externalizing behaviour was measured with a brief version of the Externalizing Spectrum Inventory (ESI; Krueger, Markon, Patrick, Benning, & Kramer, 2007) in a subgroup ($N = 355$) of the total sample. The ESI is a well validated self-report questionnaire that is used to measure disinhibitory behaviours and traits in both clinical and research settings (Venables & Patrick, 2012; Widiger & Sankis, 2000). The brief version used in the current study encompasses 100 items that form 18 subfactors, which ultimately measures three superordinate factors: Disinhibition, Callous Aggression and Substance Abuse.

1.2.3. Descriptive variables

Intelligence and number of offenses were also analyzed given prior indications that antisocial subgroups could differ on these variables (Kandel et al., 1988; Laurell, Belfrage, & Hellström, 2010). Intelligence was measured with the Wechsler Adult Intelligence Scale IV (WAIS-IV; Wechsler, 2008), which is considered to be one of the best measures of general intellectual functioning. Offending was assessed using the number of violent and non-violent crimes convictions.

1.3. Statistical analysis

1.3.1. Latent profile analysis (LPA)

In the present study, we conducted LPA, in which the variables used to generate classes (or profiles) are continuous instead of categorical. LPA is an extension of Latent Class Analysis and estimates the probability of an individual or case to belong in one class versus another class based on a set of observable characteristics. One of the assumptions of LPA is that the variables are independent within each latent class, as correlations between variables are explained through the structure of the classes. Statistical criteria are used to determine the number of classes that best describe the data (Bauer & Curran, 2004).

Mplus 7 (Muthén & Muthén, 1998–2015) was used to run the LPA and identify subtypes in our sample ($n = 567$) based on SRP-SF scores. The four SRP facets (interpersonal-INT, affective-AFF, antisocial-ANT, and lifestyle-LIF) were used as observed variables for the LPA model. The optimal number of classes was defined based on a set of statistical criteria: the Bayesian information criterion (BIC), the Lo-Medel-Rubin (LMR) statistic, the posterior probabilities, and the entropy value (Nylund, Asparouhov, & Muthén, 2007). The model with the lowest BIC value was considered the best model. The LMR is considered as a likelihood ratio test between models with a different number of latent classes. It tests $k - 1$ classes compared to k classes and results in a chi-square value that indicates whether the $k - 1$ class model should be rejected in favor of the k class model. The posterior probabilities are considered to determine the accuracy of the classification and the entropy value (ranges from zero to one) gives an indication of the amount of diversity of the latent classes. Both posterior probability and entropy imply satisfactory fit when values exceed 0.70 (Muthén, 2000; Nagin, 2005). Because LPA might result in some individuals being misclassified (Bakk, Tekle, & Vermunt, 2013), scores of all participants were inspected and classification errors were corrected when necessary. After correction, the model was retested and the fit measures based on the corrected model are reported.

1.3.2. Pairwise comparisons

Following the LPA, questionnaires were imported to the statistical analysis program JASP (JASP Team, 2016, Version 0.8.0.0) and the

profiles were compared on several personality and behavioural measures. A one-way Analysis of Variance (ANOVA) was conducted to test for significant differences ($\alpha = 0.05$) between item averages of the latent classes. Post-hoc comparisons were further conducted to obtain all possible pairwise comparisons between the profiles. Standard Bonferroni correction was used to account for multiple comparisons.

In addition, we repeated the analyses using Bayesian independent *t*-tests and calculated Bayes Factors (BF) to determine how likely to be true the results obtained with each group comparison were, given the data. Some advantages of using Bayesian statistics are that it can provide a quantification of the evidence supporting of the null-hypothesis, rather than only against it (Wetzels, Odekerken-Schröder, & Van Oppen, 2009), and this statistical approach does not suffer from the drawbacks of classical testing, such as the need to correct for multiple comparisons and reliance on various assumptions (Morey, Rouder, Verhagen, & Wagenmakers, 2014). We considered an effect to be strongly supported only when both analytical approaches yielded a similar result.

2. Results

2.1. Latent profile analysis

To identify the optimal number of groups to retain, models with one to five classes were estimated using LPA. To obtain the best possible solution, we repeated this procedure by using automatic, random, and user-specified starting values, and by relaxing the default equality constraints used in Mplus (i.e., means and variances of the latent class indicators). The BIC statistic increased from Class 4 (BIC = 13,235.01) to Class 5 (BIC = 13,247.89) and decreased from Class 3 (BIC = 13,279.73) to Class 4. In addition, the LMR statistic fell out of significance for the five-class model ($p = .26$). Thus, the 4-class model better represented the data based on the BIC and LMR statistics. The mean posterior probability scores ranged from 0.85 to 0.90 and the entropy value was 0.76, suggesting that the identified classes were well separated.

The four-class model included a group referred to as the *generic offenders* of 256 male offenders whom scored low on all facets of the SRP (INT: $M(SD) = 13.15(3.15)$, AFF: $M(SD) = 14.53(2.76)$, LIF: $M(SD) = 17.28(4.30)$, ANT: $M(SD) = 16.33(3.28)$). The second group of 89 male offenders, labeled as *impulsive-antisocial traits offenders*, scored high on the antisocial facet of the SRP and relatively low on three other facets of the SRP (INT: $M(SD) = 16.77(3.26)$, AFF: $M(SD) = 17.17(2.69)$, LIF: $M(SD) = 21.61(4.36)$, ANT: $M(SD) = 25.99(2.64)$). The third group, referred to as the *non-antisocial psychopathic traits offenders*, included 121 male offenders whom scored low on the antisocial facet of the SRP and relatively high on the other three facets of the SRP (INT: $M(SD) = 19.80(3.87)$, AFF: $M(SD) = 20.15(3.03)$, LIF: $M(SD) = 22.62(3.95)$, ANT: $M(SD) = 19.44(3.07)$). The last group was labeled as *psychopathic traits offenders* and consisted of 101 male offenders whom scored high on all facets of the SRP (INT: $M(SD) = 23.01(4.20)$, AFF: $M(SD) = 23.00(3.06)$, LIF: $M(SD) = 25.31(3.93)$, ANT: $M(SD) = 27.75(3.53)$). Additional analyses indicated that there were no differences across groups based on age ($\chi^2(81) = 99.67, p = .08$) and race (white vs. others: $\chi^2(15) = 14.66, p = .48$). Means and standard deviations of the psychopathic subscales for each profile are represented in Table 1 (for BFs see Table 2). An overview of the latent profiles is shown in Fig. 1.

3. Descriptive and personality correlates of the latent profiles

Means were compared across the latent profiles (see Table 1, for BFs see also Table 2). The results on inter-variable correlations are provided in the supplementary material (Table S1). Anxiety measures showed that the *generic offenders* scored significantly lower on anxiety than the

other profiles. Negative affectivity differed significantly across all profiles. The *generic offenders* reported lowest negative affectivity, followed by the *impulsive-antisocial traits offenders*, the *non-antisocial psychopathic traits offenders* and the *psychopathic traits offenders*. Motivational tendencies were measured with BIS and BAS. The *generic offenders* scored significantly higher on BIS than the *psychopathic traits offenders*. The *impulsive-antisocial traits offenders* and *non-antisocial psychopathic traits offenders* did not show any significant differences in motivational tendencies compared to the other profiles. The BAS score was significantly higher in the *psychopathic traits offenders* compared to the other profiles. The *non-antisocial psychopathic traits offenders* reported a significantly higher BAS score than the *generic offenders* and the *impulsive-antisocial traits offenders*. Offending was measured as violent- and non-violent crime rates. The *non-antisocial psychopathic traits offenders* and the *psychopathic traits offenders* reported a significantly higher number of violent crimes compared to the other profiles. The *non-antisocial psychopathic traits offenders* reported a significantly higher number of violent crimes compared to the *generic offenders*. The latter profile also reported a lower number of non-violent crimes compared to the other profiles. Intelligence and positive affectivity scores did not differ among profiles. The scores on the external variables for each of the latent classes are visualized in Fig. 2.

A representative subset of the total sample ($N = 355$; *generic offenders* = 161, *impulsive-antisocial traits offenders* = 57, *non-antisocial psychopathic traits offenders* = 73, *psychopathic traits offenders* = 64) filled in the ESI to measure externalizing behaviours (see Table 3, for BFs see Table 4). The *psychopathic traits offenders* scored significantly higher on disinhibition compared to the *non-antisocial psychopathic traits offenders* and the *generic offenders*. The *impulsive-antisocial traits offenders* scored significantly higher than the *generic offenders*. The latter profile scored significantly lower on disinhibition compared to all other profiles. The level of callous aggression was the highest in the *psychopathic traits offenders*, while the *generic offenders* scored lower compared to the other profiles. The *generic offenders* scored significantly lower on substance abuse compared to the *impulsive-antisocial traits offenders* and the *psychopathic traits offenders*.

4. Discussion

The main purpose of the present study was to identify and characterize different antisocial subtypes in a general male offender sample based on a self-report measure of psychopathic traits by using latent profile analysis. Four antisocial profiles were identified: *generic offenders*, *impulsive-antisocial traits offenders*, *non-antisocial psychopathic traits offenders*, and the *psychopathic traits offenders*. The *generic offenders* scored relatively low on all dimensions of the SRP. The *impulsive-antisocial traits offenders* scored high on the antisocial and lifestyle facets, whereas the other dimensions were relatively low. The *non-antisocial psychopathic traits offenders* showed relatively high scores on the interpersonal, affective and lifestyle dimensions, whereas the score on the antisocial facet was low. In contrast to the *generic offenders*, the *psychopathic traits offenders* showed high scores on all dimensions of the SRP.

4.1. LPA results on the SRP-SF

Our first aim was to investigate the robustness of the previously reported findings on PCL-based profiles obtained using LCA by replication of this method while using the SRP-SF. Overall, our LPA outcomes resemble prior findings obtained in a large North American male offender sample ($N = 4865$) using the PCL-R (Hare, 2016). The *impulsive-antisocial traits offenders* and the *non-antisocial psychopathic traits offenders* in our sample appear to parallel that groups that Hare (2016) labeled as primary (high F1) and secondary (high F2) psychopaths in his study. Despite the similarities, there were some differences with respect to the lifestyle facet. Hare (2016) and Krstic et al. (2017)

Table 1
Means and standard deviations of the SRP factor scores and external variables for each profile.

Variables	GE	IA	NA	PS	F	Partial η^2
	M (SD)	M(SD)	M(SD)	M(SD)		
SRP Interpersonal	13.15 ^a (3.15)	16.77 ^b (3.26)	19.80 ^c (3.87)	23.01 ^d (4.20)	228.09	0.54
SRP Affective	14.53 ^a (2.76)	17.17 ^b (2.69)	20.15 ^c (3.03)	23.00 ^d (3.06)	253.53	0.57
SRP Lifestyle	17.28 ^a (4.30)	21.61 ^b (4.36)	22.62 ^b (3.95)	25.31 ^c (3.93)	109.78	0.37
SRP Antisocial	16.33 ^a (3.28)	25.99 ^c (2.64)	19.44 ^b (3.07)	27.75 ^d (3.53)	416.72	0.69
WAIS IQ	98.40 (12.13)	97.54 (11.59)	98.94 (11.58)	98.85 (12.37)	0.25	0.00
APD	5.88 ^a (3.04)	10.22 ^c (3.46)	8.25 ^b (3.67)	11.37 ^c (3.63)	79.75	0.30
Violent crimes	3.35 ^a (3.43)	7.04 ^c (8.80)	3.37 ^{ab} (3.36)	4.87 ^b (3.92)	14.72	0.09
Non-violent crimes	9.61 ^a (10.67)	15.01 ^b (15.70)	14.03 ^b (10.64)	15.49 ^b (15.13)	8.28	0.05
Welsh-anxiety	9.84 ^a (7.85)	14.59 ^b (8.95)	14.18 ^b (8.17)	16.80 ^b (8.99)	20.79	0.10
MPQ-positive	65.24 (14.62)	66.22 (13.40)	66.27 (15.99)	67.59 (15.73)	0.60	0.00
MPQ-negative	39.11 ^a (15.88)	51.92 ^b (15.95)	57.53 ^c (16.59)	67.40 ^d (15.29)	87.20	0.34
BIS	18.46 ^b (3.29)	18.39 ^{ab} (3.57)	17.54 ^{ab} (3.83)	17.25 ^a (3.74)	3.81	0.02
BAS	36.86 ^a (4.71)	38.10 ^a (5.05)	39.89 ^b (5.19)	41.68 ^c (5.50)	24.78	0.13

Note. Means with different superscripts differ significantly from each other ($P < .05$). GE = generic offenders. IA = impulsive-antisocial traits offenders. NA = non-antisocial psychopathic traits offenders. PS = psychopathic traits offenders.

found a significant difference on the lifestyle dimension between the groups they labeled as primary and the secondary, while our results showed similar scores on the lifestyle facet for the *impulsive-antisocial traits offenders* and the *non-antisocial psychopathic traits offenders*. However, it is important to keep in mind that we are the first to use a questionnaire measure for subtyping of antisocial behaviour and we should, therefore, remain cautious when comparing results with previous subtyping studies.

4.2. Psychopathic personality correlates

The second aim was to investigate possible group differences in personality traits proposed to be relevant for distinguishing between antisocial profiles. The results showed that the *generic offenders* had significantly lower levels of anxiety compared to the other groups, but that the other groups did not differ from each other. That is, anxiety levels do not seem to differentiate well among subtypes of antisocial offenders in our sample, and our sample of *psychopathic traits offenders* included high-anxious individuals with psychopathic traits. At first this may seem to counter the general belief that psychopathy should be related to reduced trait anxiety. However, the possibility that anxiety plays a limited role in defining psychopathy has been highlighted before (Neumann & Hare, 2008; Neumann, Johansson, & Hare, 2013), and the results of a meta-analysis also have pointed out that anxiety is weakly related to psychopathy (Decuyper, De Pauw, De Fruyt, De Bolle, & De Clercq, 2009). Note, however, that we did not analyze the role of

anxiety within the group of *psychopathic traits offenders*, so there is still a possibility that anxiety scores differentiate among subtypes *within* the psychopathic traits group (Lykken, 1995; Skeem et al., 2007).

Negative emotional tendencies form a second factor that has been proposed to play a discriminatory role (Hicks et al., 2004; Hicks & Patrick, 2006). Our results pointed out that negative affectivity was low in the *generic offenders* and high in the *psychopathic traits offenders*. On one hand, this is in agreement with the suggestion that higher F2 traits are linked to increased negative affectivity in *psychopathic traits offenders* (Hicks et al., 2004; Hicks & Patrick, 2006), on the other hand this group also showed high F1 traits. However, as mentioned earlier, the *psychopathic traits offenders* seem to mainly include high-anxious psychopathic individuals as their anxiety score is higher compared to the *generic offenders*. This could be an explanation for the higher negative affectivity scores in the *psychopathic traits offenders*. A small effect was found when comparing the *impulsive-antisocial traits offenders* with the *non-antisocial psychopathic traits offenders*, in which the latter group showed higher scores on negative affectivity. This could seem counterintuitive, because the *non-antisocial psychopathic traits offenders* show more F1 traits compared to the *impulsive-antisocial traits offenders*, and increased F1 traits have been linked to decreased negative affectivity (Hicks & Patrick, 2006). However, this finding converges with the suggestions that non-psychopathic antisociality is linked to increased prevalence of conditions characterized by elevated negative affect, such as anxiety and mood disorders (Blair, 2012; Verona, Patrick, & Joiner, 2001).

Table 2
Bayes factors (BF) for the pairwise comparisons between profiles of the SRP factor scores and external variables.

Variables	G vs. IA		G vs. NP		G vs. P		IA vs. NP		IA vs. P		NP vs. P	
	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d
SRP Interpersonal	3,17E+15	-1.14	7,29E+48	-1.96	1,83E+74	-2.84	1,06E+06	-0.84	4,72E+19	1.64	7,66E+05	0.80
SRP Affective	9,95E+10	-0.96	1,22E+49	-1.97	5,97E+78	-2.97	1,84E+09	-1.03	1,61E+27	2.02	1,91E+08	0.94
SRP Lifestyle	1,12E+12	-1.00	4,32E+23	-1.27	7,27E+41	-1.91	6,43E-01	-0.25	2,21E+06	0.90	1,52E+04	0.68
SRP Antisocial	5,44E+76	-3.08	1,17E+14	-0.97	1,46E+93	-3.41	1,73E+35	2.26	1,36E+02	0.56	8,90E+43	2.53
WAIS IQ	1,60E-01	0.07	1,38E-01	-0.05	1,40E-01	-0.04	2,19E-01	-0.12	2,10E-01	0.11	1,55E-01	-0.01
APD	5,26E+20	-1.38	5,08E+07	-0.73	6,35E+33	-1.71	1,22E+02	0.55	1,43E+00	0.32	4,19E+06	0.85
Violent crimes	1,63E+05	-0.70	1,23E-01	0.01	4,63E+01	-0.42	3,81E+02	0.59	1,50E+00	-0.33	1,17E+01	0.42
Non-violent crimes	4,88E+01	-0.45	8,81E+01	-0.42	3,51E+02	-0.49	1,77E-01	0.08	1,65E-01	0.03	2,10E-01	0.11
Welsh-anxiety	2,79E+03	-0.58	9,25E+03	-0.55	1,46E+09	-0.85	1,64E-01	0.05	5,69E-01	0.25	1,55E+00	0.31
MPQ-positive	1,60E-01	-0.07	1,47E-01	-0.07	3,00E-01	-0.16	1,56E-01	0.00	1,94E-01	0.09	1,77E-01	0.08
MPQ-negative	1,19E+07	-0.81	5,53E+18	-1.14	2,43E+36	-1.80	2,22E+00	-0.34	2,08E+07	0.99	1,45E+03	0.62
BIS	1,40E-01	0.02	1,77E+00	0.27	7,64E+00	0.35	5,10E-01	0.23	1,16E+00	-0.31	1,72E-01	-0.07
BAS	9,40E-01	-0.26	1,85E+05	-0.62	5,52E+11	-0.97	2,27E+00	-0.35	1,18E+03	0.68	2,38E+00	0.34

Note. G = generic offenders. IA = impulsive-antisocial traits offenders. NP = non-antisocial psychopathic traits offenders. P = psychopathic traits offenders. Bayes Factors are indicated as BF > 10 (very strong); 3 < BF < 10 (strong) and BF < 3 (weak).

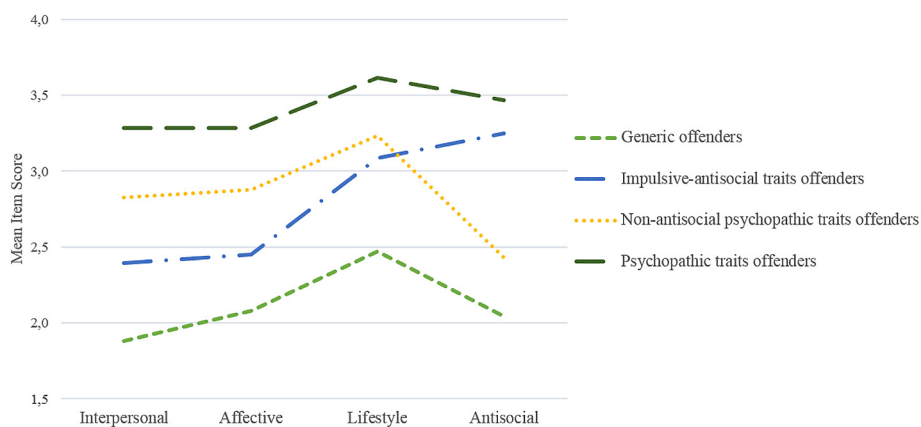


Fig. 1. Latent profiles of antisocial behaviour in male offenders. Mean item score of each latent profile on the SRP factors.

Another factor proposed to have discriminative power in populations with antisocial tendencies is behavioural motivation (Book & Quinsey, 2004; Newman et al., 2005). An underactive BIS has been suggested to explain a lack of fear for punishment in psychopathy (Gray, 1970; Patrick, 1994), while an overactive BAS has been linked to the hypersensitivity to reward often seen in psychopathy (Arnett, Smith, & Newman, 1997; Gorenstein & Newman, 1980). Consistent with this previous research, our findings point out that *psychopathic traits offenders* have an underactive BIS and overactive BAS compared to *generic offenders* (Hoppenbrouwers, Neumann, Lewis, & Johansson, 2015). Furthermore, *non-antisocial psychopathic traits offenders* showed an overactive BAS, while scores on the BIS were not different compared to other groups. The lifestyle dimension, which covers impulsive behaviour, was high in the *non-antisocial psychopathic traits offenders*. As high impulsivity rates are associated with a strong BAS (Franken, Muris, & Rassin, 2005), this finding was in the expected direction. The results for the *impulsive-antisocial traits offenders* indicate that the behavioural motivational system seems to play a less prominent role in differentiating these individuals from the other groups.

4.3. Externalizing behaviour and criminogenic factors

Externalizing was also proposed to be an important factor that is supposed to differ among subgroups of antisocial individuals (Patrick et al., 2005). Therefore, our third aim was to obtain a more detailed perspective on how each profile relates to externalizing behaviours commonly seen in antisocial offender populations. The *impulsive-*

antisocial traits offenders and the *non-antisocial psychopathic traits offenders* showed a similar profile regarding externalizing, although the *impulsive-antisocial traits offenders* showed more physical aggression. In general, the *generic offenders* showed less externalizing compared to the other groups, especially relative to the *psychopathic traits offenders*. Similar to negative affectivity, high externalizing in the *psychopathic traits offenders* is suggested to be related to the elevated levels of F2 traits found in this latent profile (Patrick et al., 2005). Compared to all other groups, the *psychopathic traits offenders* showed significantly higher scores on the disinhibition and callous-aggression subscales of the ESI. While it is unsurprising that the *psychopathic traits offenders* generally show more externalizing behaviour than the other groups, we had not expected aggression-related tendencies to be lower in the *impulsive-antisocial traits offenders* compared to the *psychopathic traits offenders*. However, the ESI measures callous aggression, which is suggested to predict elevated levels of psychopathy and non-psychopathic antisociality, but to a lesser extent (Venables & Patrick, 2012). With regard to the subfactor substance use, there was no clear pattern of differences among the groups, which could be due to the fact that substance abuse is common across antisocial populations (Estévez & Emler, 2011). However, when we take the second-order factors of substance abuse into account, we do see a difference in the variables that measure more severe drug use (Drug use and Marijuana problems) between the *generic offenders* and the *impulsive-antisocial traits offenders* and the *psychopathic traits offenders*. This is in line with previous studies that suggested that the most antisocial and violent offenders also have the most severe drug problems (Brennan, Stuppy-Sullivan, Brazil, & Baskin-Sommers, 2017;

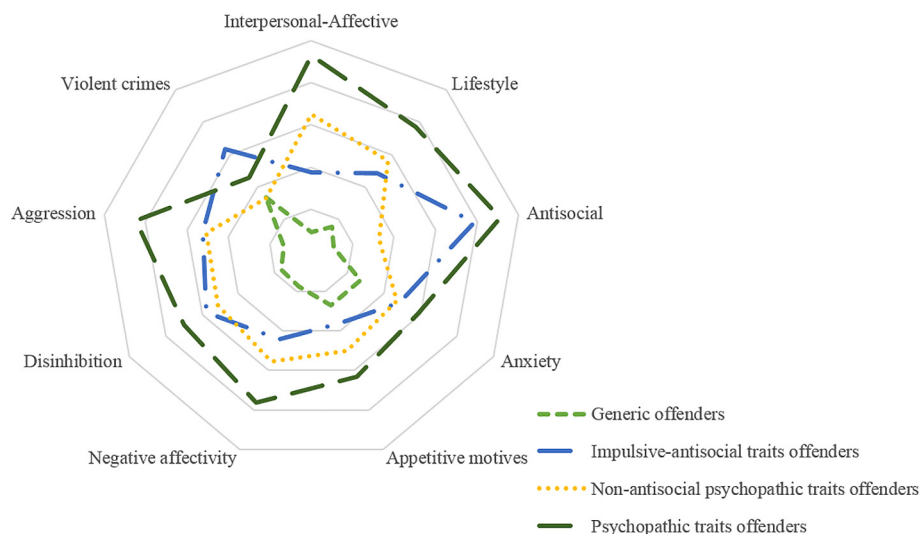


Fig. 2. Psychopathic and external correlates of the latent profiles. Mean z-scores of each latent profile on the SRP factors and a selection of the external correlates. Interpersonal-affective, lifestyle, antisocial (SRP), anxiety (Welsh anxiety), appetitive motives (BISBAS), negative affectivity (MPQ), disinhibition, aggression (ESI), and violent crimes.

Table 3
Means and standard deviations of the externalizing measures for each profile.

Variables	GE	IA	NA	PS	F	Partial η^2
	M (SD)	M (SD)	M (SD)	M (SD)		
<i>ESI-Disinhibition</i>	2.23 ^a (0.57)	2.99 ^{bc} (0.45)	2.84 ^b (0.50)	3.14 ^c (0.48)	49.52	0.3
Irresponsibility	2.17 ^a (0.67)	2.72 ^b (0.62)	2.57 ^b (0.67)	2.71 ^b (0.72)	16.01	0.12
Impatient urgency	2.40 ^a (1.10)	3.19 ^b (0.99)	3.24 ^b (0.83)	3.48 ^b (0.69)	25.72	0.18
Problematic impulsivity	2.40 ^a (0.68)	3.14 ^{bc} (0.55)	2.89 ^b (0.60)	3.25 ^c (0.63)	35.97	0.24
Fraud	1.61 ^a (0.61)	2.44 ^{bc} (0.86)	2.22 ^b (0.65)	2.58 ^c (0.73)	42.23	0.27
Boredom proneness	2.76 ^a (1.05)	3.14 ^{ab} (1.03)	3.08 ^{ab} (0.97)	3.45 ^b (0.77)	8.34	0.07
<i>ESI-Callous Aggression</i>	1.71 ^a (0.46)	2.35 ^b (0.53)	2.32 ^b (0.47)	2.87 ^c (0.50)	95.97	0.45
Low empathy	1.24 ^a (0.50)	1.44 ^a (0.69)	1.79 ^b (0.77)	2.40 ^c (0.93)	46.55	0.29
Relational aggression	1.64 ^a (0.55)	2.12 ^b (0.70)	2.20 ^b (0.58)	2.64 ^c (0.74)	42.2	0.27
Excitement seeking	1.80 ^a (0.92)	2.18 ^{ab} (1.11)	2.37 ^b (0.99)	2.83 ^c (0.87)	19.59	0.15
Destructive aggression	1.63 ^a (0.65)	2.30 ^b (0.77)	2.05 ^b (0.70)	2.64 ^c (0.82)	33.04	0.22
Physical aggression	1.81 ^a (0.71)	2.87 ^c (0.65)	2.48 ^b (0.72)	3.18 ^d (0.62)	73.79	0.39
Honesty	1.86 ^a (1.02)	2.46 ^b (1.21)	2.43 ^b (1.17)	2.83 ^b (1.15)	13.41	0.1
Rebelliousness	2.01 ^a (0.93)	3.11 ^b (0.99)	2.93 ^b (0.92)	3.61 ^c (0.58)	58.49	0.34
<i>ESI-Substance Abuse</i>	6.11 ^a (2.30)	7.20 ^b (2.34)	6.58 ^{ab} (2.25)	7.17 ^b (2.36)	4.39	0.04
Alcohol problems	16.50 (7.95)	18.98 (8.14)	17.60 (7.80)	19.20 (8.14)	1.99	0.02
Drug use	2.46 ^a (0.97)	3.17 ^b (0.85)	2.84 ^b (0.91)	3.14 ^b (0.97)	11.91	0.09
Marijuana problems	1.91 ^a (1.24)	2.70 ^b (1.75)	2.08 ^{ab} (1.22)	2.48 ^b (1.39)	6.64	0.05
Marijuana use	3.56 ^a (0.97)	3.94 ^b (0.29)	3.77 ^{ab} (0.74)	3.84 ^{ab} (0.54)	3.89	0.03

Note. Means with different superscripts differ significantly from each other ($P < .05$). GE = generic offenders. IA = impulsive-antisocial traits offenders. NA = non-antisocial psychopathic traits offenders. PS = psychopathic traits offenders.

DeLisi, Vaughn, Salas-Wright, & Jennings, 2015; Sacks et al., 2009).

Finally, with regard to offending, the *non-antisocial psychopathic traits offenders*, *impulsive-antisocial traits offenders* and the *psychopathic traits offenders* significantly higher rates for both violent and non-violent crime than the *generic offenders*, which is consistent with previous findings (Hare & Neumann, 2008; Porter, Birt, & Boer, 2001). The *impulsive-antisocial traits offenders* scored significantly higher on violent crimes compared to the other profiles, possibly reflecting the poor behavioural control believed to typify these individuals (DeLisi, Tostlebe, Burgason, Heirigs, & Vaughn, 2016; Morgan & Lilienfeld, 2000).

Taken together, our findings showed that the *generic offenders* were characterized by relatively lower levels of psychopathic traits and lower scores on the external correlates examined. *Impulsive-antisocial traits offenders* were typified by aggressive-, impulsive- and irresponsible behaviour, and they committed the highest amount of violent crimes compared to the other profiles. The *non-antisocial psychopathic traits*

offenders were characterized by relatively high scores on the interpersonal, affective and lifestyle facets of psychopathy, but also on measures of anxiety, negative affect and externalizing. In contrast, they scored low on antisocial behaviour and violent crimes. The *psychopathic traits offenders* were characterized by high scores on all facets of psychopathy as well as on anxiety, negative affect, motivational tendencies and externalizing. The characteristics of the latter group were similar to that of the *non-antisocial psychopathic traits offenders*, but the *psychopathic traits offenders* showed significantly higher rates of criminal and aggressive behaviours.

Before concluding, it is important to note limitations of the present study. First, the present study only included observable measures of behaviour and self-reported personality. This approach does not clearly identify biological and cognitive disturbances that may underlie antisocial and psychopathic behaviours. It is important not to conflate mechanism and behaviour, and future research should combine

Table 4
Bayes factors (BF) for the pairwise comparisons between profiles of the externalizing measures.

Variables	G vs. IA		G vs. NP		G vs. P		IA vs. NP		IA vs. P		NP vs. P	
	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d	BF	Cohen's d
<i>ESI-Disinhibition</i>	1,13E+11	-1.24	6,44E+07	-0.95	1,32E+01	-0.46	7,64E-01	0.31	7,32E-01	0.31	4,13E+01	0.60
Irresponsibility	8,23E+04	-0.84	5,29E+02	-0.60	5,35E+04	-0.79	4,16E-01	0.23	1,95E-01	-0.02	3,50E-01	0.20
Impatient urgency	4,36E+03	-0.73	3,26E+05	-0.81	1,25E+12	-1.08	1,96E-01	-0.05	9,70E-01	0.35	9,16E-01	0.32
Problematic impulsivity	2,07E+09	-1.14	4,74E+04	-0.75	3,68E+12	-1.27	2,71E+00	0.43	3,04E-01	0.18	3,16E+01	0.58
Fraud	2,27E+10	-1.20	1,49E+08	-0.97	9,19E+16	-1.50	6,35E-01	0.29	3,06E-01	0.18	1,28E+01	0.53
Boredom proneness	2,10E+00	-0.36	1,48E+00	-0.31	4,59E+03	-0.71	2,20E-01	0.06	9,87E-01	0.35	2,75E+00	0.42
<i>ESI-Callous Aggression</i>	4,14E+12	-1.33	3,39E+14	-1.31	8,51E+16	-1.50	2,00E-01	0.06	8,15E+04	1.02	1,49E+07	1.14
Low empathy	1,68E+00	-0.35	1,08E+07	-0.90	3,39E+22	-1.77	4,57E+00	-0.47	2,71E+06	1.16	4,23E+02	0.72
Relational aggression	2,89E+04	-0.80	2,45E+08	-0.99	3,00E+19	-1.62	2,33E-01	-0.12	1,62E+02	0.72	1,48E+02	0.67
Excitement seeking	3,20E+00	-0.39	7,33E+02	-0.61	9,12E+12	-1.13	3,06E-01	-0.18	4,77E+01	0.65	6,53E+00	0.49
Destructive aggression	4,37E+06	-0.96	9,00E+02	-0.62	2,53E+18	-1.42	1,98E-01	0.34	2,28E+00	0.43	1,30E+03	0.78
Physical aggression	8,51E+15	-1.52	3,97E+07	-0.94	1,90E+27	-1.99	1,48E+01	0.55	4,94E+00	0.49	6,40E+05	1.03
Honesty	6,33E+01	-0.56	1,01E+02	-0.53	3,39E+06	-0.92	1,91E-01	0.03	7,48E-01	0.32	1,20E+00	0.35
Rebelliousness	4,33E+09	-1.16	2,92E+08	-0.99	1,28E+25	-1.89	3,07E-01	0.18	3,58E+01	0.63	1,04E+04	0.89
<i>ESI-Substance Abuse</i>	1,26E+01	-0.47	4,13E-01	-0.21	2,38E+37	-2.50	5,60E-01	0.27	1,95E-01	-0.01	5,14E-01	0.26
Alcohol problems	1,08E+00	-0.31	2,43E-01	-0.14	1,80E+00	-0.34	9,84E-01	0.17	1,96E-01	0.03	3,44E-01	0.20
Drug use	8,11E+03	-0.76	7,14E+00	-0.41	3,71E+03	-0.70	1,33E+00	0.37	1,98E-01	-0.04	8,06E-01	0.31
Marijuana problems	8,41E+01	-0.57	2,47E-01	-0.14	1,12E+01	-0.45	2,36E+00	0.42	2,52E-01	-0.14	7,99E-01	0.31
Marijuana use	8,13E+00	-0.45	4,91E-01	-0.22	1,39E+00	-0.32	7,43E-01	0.31	4,09E-01	-0.23	2,27E-01	0.12

Note. G = generic offenders. IA = impulsive-antisocial traits offenders. NP = non-antisocial psychopathic traits offenders. P = psychopathic traits offenders. Bayes Factors are indicated as BF > 10 (very strong); 3 < BF < 10 (strong) and BF < 3 (weak).

measures across multiple levels of analysis to develop etiologically-based behavioural profiles (Brazil et al., 2016). Second, although the identified profiles were based on psychopathy scores, we cannot draw conclusions that are specific to the subtyping of psychopathy. The theoretical framework provided by the PCL-R incorporates antisocial and lifestyle features as components that are embedded within the construct of psychopathy (i.e., F2). Therefore, as the antisocial behaviours captured by F2 can be seen in a broad range of antisocial individuals, they are thus not considered to be unique to psychopathy (Brazil et al., 2016; Kimonis, Fanti, Isoma, & Donoghue, 2013; Kimonis, Goulter, Hawes, Wilbur, & Groer, 2017). While there is an advantage to differentiating antisocial and psychopathic subtypes based on antisocial behaviour, this approach also limits our ability to look within psychopathy to identify unique presentations of antisocial behaviour not associated with other type of offenders. Finally, the present study evaluated a combination of statistical parameters, namely the BIC, LMR and entropy value, to determine the optimal number of classes. According to Tein, Coxe, and Cham (2013), the inter-class distance (or Cohen's d) of the indicators should not be lower than 0.8. Except for three comparisons, the Cohen's d was > 0.8. The three effect sizes that were < 0.8 were SRP lifestyle (Cohen's d = -0.25) for *impulsive-antisocial traits offenders vs. non-antisocial psychopathic traits offenders*, SRP lifestyle (Cohen's d = 0.68) for *non-antisocial psychopathic traits offenders vs. psychopathic traits offenders*, and SRP antisocial (Cohen's d = 0.56) for *impulsive-antisocial traits offenders vs. psychopathic traits offenders*. In a situation where most of the indicators have an inter-class distance of Cohen's d < 0.8, the correct number of classes is more difficult to detect and the results are therefore less valid. However, in the present study the mean Cohen's d was > 0.8 (mean Cohen's d for indicators is 1.58).

In summary, the present study provides support for the presence of four distinct antisocial profiles based on self-report psychopathy scores in a male offender sample. The results are in line with previous findings that were based on clinical measures of psychopathy (Hare, 2016; Mokros et al., 2015). Furthermore, the present study provides relatively extensive and multifaceted characterizations of each profile. As this is the first subtyping study using the SRP-SF, additional studies are required for replication and to discover additional characteristics of the subtypes that we obtained. In the future, profiles that are not only well-characterized in terms of personality correlates, but also incorporate biological and cognitive dimensions, could provide a more complete view of the individual (Brazil et al., 2016).

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Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://>

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References

- Arnett, P. A., Smith, S. S., & Newman, J. P. (1997). Approach and avoidance motivation in psychopathic criminal offenders during passive avoidance. *Journal of Personality and Social Psychology*, 72, 1413–1428.
- Bakk, Z., Tekle, F. B., & Vermunt, J. K. (2013). Estimating the association between latent class membership and external variables using bias-adjusted three-step approaches. *Sociological Methodology*, 43, 272–311.
- Baskin-Sommers, A. R., Curtin, J. J., & Newman, J. P. (2015). Altering the cognitive-affective dysfunctions of psychopathic and externalizing offender subtypes with cognitive remediation. *Clinical Psychological Science*, 3, 45–57.
- Bauer, D. J., & Curran, P. J. (2004). The integration of continuous and discrete latent variable models: Potential problems and promising opportunities. *Psychological Methods*, 9, 3.
- Blair, R. J. (2012). Cortical thinning and functional connectivity in psychopathy. *The American Journal of Psychiatry*, 169, 684–687.
- Book, A. S., & Quinsey, V. L. (2004). Psychopaths: Cheaters or warrior-hawks? *Personality and Individual Differences*, 36, 33–45.
- Brazil, I. A., van Dongen, J. D. M., Maes, J. H. R., Mars, R. B., & Baskin-Sommers, A. R. (2016). Classification and treatment of antisocial individuals: From behavior to biocognition. *Neuroscience & Biobehavioral Reviews*.
- Brennan, G. M., Stuppy-Sullivan, A. M., Brazil, I. A., & Baskin-Sommers (2017). Differentiating patterns of substance misuse by subtypes of antisocial traits in male offenders. *Journal of Forensic Psychiatry & Psychology*, 28, 341–356.
- Carré, J. M., Fisher, P. M., Manuck, S. B., & Hariri, A. R. (2012). Interaction between trait anxiety and trait anger predict amygdala reactivity to angry facial expressions in men but not women. *Social Cognitive and Affective Neuroscience*, 7, 213–221.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology*, 67, 319.
- Colins, O. F., Fanti, K. A., Salekin, R. T., & Andershed, H. (2017). Psychopathic personality in the general population: Differences and similarities across gender. *Journal of Personality Disorders*, 31, 49–74.
- Cooke, D. J., & Michie, C. (1999). Psychopathy across cultures: North America and Scotland compared. *Journal of Abnormal Psychology*, 108, 58–68.
- Decuyper, M., De Pauw, S., De Fruyt, F., De Bolle, M., & De Clercq, B. J. (2009). A meta-analysis of psychopathy-, antisocial PD-and FFM associations. *European Journal of Personality*, 23, 531–565.
- DeLisi, M., Beaver, K. M., Wright, K. A., Wright, J. P., Vaughn, M. G., & Trulson, C. R. (2011). Criminal specialization revisited: A simultaneous quantile regression approach. *American Journal of Criminal Justice*, 36, 73–92.
- DeLisi, M., Vaughn, M. G., Salas-Wright, C. P., & Jennings, W. G. (2015). Drugged and dangerous: Prevalence and variants of substance use comorbidity among seriously violent offenders in the United States. *Journal of Drug Issues*, 45, 232–248.
- DeLisi, M., Tostlebe, J., Burgason, K., Heirigs, M., & Vaughn, M. G. (2016). Self-control versus psychopathy: A head-to-head test of general theories of antisociality. *Youth Violence and Juvenile Justice*, 16, 53–76.
- Estévez, E., & Emler, N. P. (2011). Assessing the links among adolescent and youth offending, antisocial behaviour, victimization, drug use, and gender. *International Journal of Clinical and Health Psychology*, 11.
- Franken, I. H., Muris, P., & Rassin, E. (2005). Psychometric properties of the Dutch BIS/BAS scales. *Journal of Psychopathology and Behavioral Assessment*, 27, 25–30.
- Gorenstein, E. E., & Newman, J. P. (1980). Disinhibitory psychopathology: A new perspective and a model for research. *Psychological Review*, 87, 301.
- Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behavioral Research and Therapy*, 8, 249–266.
- Hansen, A. L., Johnsen, B. H., Thornton, D., Waage, L., & Thayer, J. F. (2007). Facets of psychopathy, heart rate variability and cognitive function. *Journal of Personality Disorders*, 21, 568–582.
- Hare, R. D. (1980). A research scale for the assessment of psychopathy in criminal populations. *Personality and Individual Differences*, 1, 111–119.
- Hare, R. D. (1985). Comparison of procedures for the assessment of psychopathy. *Journal of Consulting and Clinical Psychology*, 53, 7.
- Hare, R. D. (2003). *The Psychopathy Checklist-Revised*. (Toronto, ON).
- Hare, R. D. (2016). Psychopathy, the PCL-R, and criminal justice: Some new findings and current issues. *Canadian Psychology/Psychologie Canadienne*, 57, 21–34.
- Hare, R. D., & Neumann, C. S. (2005). Structural models of psychopathy. *Current Psychiatry Reports*, 7, 57–64.
- Hare, R. D., & Neumann, C. S. (2006). The PCL-R assessment of psychopathy. *Handbook of Psychopathy*, 58–88.
- Hare, R. D., & Neumann, C. S. (2008). Psychopathy as a clinical and empirical construct. *Annual Review of Clinical Psychology*, 4, 217–246.
- Hare, R. D., Harpur, T. J., Hakstian, A. R., Forth, A. E., Hart, S. D., & Newman, J. P. (1990). The revised psychopathy checklist: Reliability and factor structure. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, 2, 338.
- Hare, R. D., Clark, D., Grann, M., & Thornton, D. (2000). Psychopathy and the predictive validity of the PCL-R: An international perspective. *Behavioral Sciences & the Law*, 18, 623–645.
- Hicks, B. M., & Patrick, C. J. (2006). Psychopathy and negative emotionality: Analyses of suppressor effects reveal distinct relations with emotional distress, fearfulness, and anger-hostility. *Journal of Abnormal Psychology*, 115, 276–287.
- Hicks, B. M., Markon, K. E., Patrick, C. J., Krueger, R. F., & Newman, J. P. (2004). Identifying psychopathy subtypes on the basis of personality structure. *Psychological*

- Assessment, 16, 276.
- Hoppenbrouwers, S. S., Neumann, C. S., Lewis, J., & Johansson, P. (2015). A latent variable analysis of the psychopathy checklist-revised and behavioral inhibition system/behavioral activation system factors in North American and Swedish offenders. *Personality Disorders: Theory, Research, and Treatment*, 6, 251.
- Jorm, F. A., Christensen, H., Henderson, A. S., Jacomb, P. A., Korten, A. E., & Rodgers, B. (1998). Using the BIS/BAS scales to measure behavioural inhibition and behavioural activation: Factor structure, validity and norms in a large community sample. *Personality and Individual Differences*, 26, 49–58.
- Kandel, E., Mednick, S. A., Kirkegaard-Sorensen, L., Hutchings, B., Knop, J., Rosenberg, R., & Schulzinger, F. (1988). IQ as a protective factor for subjects at high risk for antisocial behavior. *Journal of Consulting and Clinical Psychology*, 56, 224.
- Kiehl, K. A., & Hoffman, M. B. (2011). The criminal psychopath: History, neuroscience, treatment, and economics. *Jurimetrics*, 51, 355.
- Kimonis, E. R., Fanti, K. A., Isoma, Z., & Donoghue, K. (2013). Maltreatment profiles among incarcerated boys with callous-unemotional traits. *Child Maltreatment*, 18, 108–121.
- Kimonis, E. R., Goulter, N., Hawes, D. J., Wilbur, R. R., & Groer, M. W. (2017). Neuroendocrine factors distinguish juvenile psychopathy variants. *Developmental Psychobiology*, 59, 161–173.
- Krstic, S., Neumann, C. S., Roy, S., Robertson, C. A., Knight, R. A., & Hare, R. D. (2017). Using latent variable-and person-centered approaches to examine the role of psychopathic traits in sex offenders. *Personality Disorders: Theory, Research, and Treatment*.
- Krueger, R. F., Markon, K. E., Patrick, C. J., Benning, S. D., & Kramer, M. D. (2007). Linking antisocial behavior, substance use, and personality: An integrative quantitative model of the adult externalizing Spectrum. *Journal of Abnormal Psychology*, 116, 645–666.
- Laurell, J., Belfrage, H., & Hellström, Å. (2010). Facets on the psychopathy checklist screening version and instrumental violence in forensic psychiatric patients. *Criminal Behaviour and Mental Health*, 20, 285–294.
- Lykken, D. T. (1995). *The Antisocial Personalities*. Psychology Press.
- McCuish, E. C., Corrado, R. R., Hart, S. D., & DeLisi, M. (2015). The role of symptoms of psychopathy in persistent violence over the criminal career into full adulthood. *Journal of Criminal Justice*, 43, 345–356.
- Mokros, A., Hare, R. D., Neumann, C. S., Santtila, P., Habermeyer, E., & Nitschke, J. (2015). Variants of psychopathy in adult male offenders: A latent profile analysis. *Journal of Abnormal Psychology*, 124, 372–386.
- Morey, R. D., Rouder, J. N., Verhagen, J., & Wagenmakers, E.-J. (2014). Why hypothesis tests are essential for psychological science: A comment on Cumming. *Psychological Science*, 25, 1289–1290.
- Morgan, A. B., & Lilienfeld, S. O. (2000). A meta-analytic review of the relation between antisocial behavior and neuropsychological measures of executive function. *Clinical Psychology Review*, 20, 113–136.
- Murphy, C., & Vess, J. (2003). Subtypes of psychopathy: Proposed differences between narcissistic, borderline, sadistic, and antisocial psychopaths. *Psychiatric Quarterly*, 74, 11–29.
- Muthén, B. (2000). Methodological issues in random coefficient growth modeling using a latent variable framework: Applications to the development of heavy drinking. *Multivariate Applications in Substance Use Research*, 113–140.
- Nagin, D. (2005). *Group-Based Modeling of Development*. Harvard University Press.
- Neumann, C. S., & Hare, R. D. (2008). Psychopathic traits in a large community sample: Links to violence, alcohol use, and intelligence. *Journal of Consulting & Clinical Psychology*, 76, 893–899.
- Neumann, C. S., & Pardini, D. (2014). Factor structure and construct validity of the self-report psychopathy (SRP) scale and the youth psychopathic traits inventory (YPI) in young men. *Journal of Personality Disorders*, 28, 419–433.
- Neumann, C. S., Schmitt, D. S., Carter, R., Embley, I., & Hare, R. D. (2012). Psychopathic traits in females and males across the globe. *Behavioral Sciences and the Law*, 30, 557–574.
- Neumann, C. S., Johansson, P. T., & Hare, R. D. (2013). The psychopathy checklist-revised (PCL-R), low anxiety, and fearlessness: A structural equation modeling analysis. *Personality Disorders*, 4, 129–137.
- Neumann, C. S., Hare, R. D., & Pardini, D. A. (2015). Antisociality and the construct of psychopathy: Data from across the globe. *Journal of Personality*, 83, 678–692.
- Neumann, C. S., Vitacco, M. J., & Mokros, A. S. (2016). Using both variable-centered and person-centered approaches to understanding psychopathic personality. *The Clinical and Forensic Assessment of Psychopathy: A Practitioner's Guide* (pp. 14–31).
- Newman, J. P., MacCoon, D. G., Vaughn, L. J., & Sadeh, N. (2005). Validating a distinction between primary and secondary psychopathy with measures of Gray's BIS and BAS constructs. *Journal of Abnormal Psychology*, 114, 319–323.
- Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, 14, 535–569.
- Odgers, C. L., Moretti, M. M., Burnette, M. L., Chauhan, P., Waite, D., & Reppucci, N. D. (2007). A latent variable modeling approach to identifying subtypes of serious and violent female juvenile offenders. *Aggressive Behavior*, 33, 339–352.
- Patrick, C. J. (1994). Emotions and psychopathy: Startling new insights. *Psychophysiology*, 31, 319–330.
- Patrick, C. J., Hicks, B. M., Krueger, R. F., & Lang, A. R. (2005). Relations between psychopathy facets and externalizing in a criminal offender sample. *Journal of Personality Disorders*, 19, 339–356.
- Paulhus, D. L., Neumann, C. S., & Hare, R. D. (2015). *Manual for the Self-Report Psychopathy Scale* (4th ed.). Toronto, Canada: Multi-Health Systems.
- Porter, S., Birt, A. R., & Boer, D. P. (2001). Investigation of the criminal and conditional release profiles of Canadian Federal Offenders as a function of psychopathy and age. *Law and Human Behavior*, 25, 647–661.
- Ross, S. R., Moltó, J., Poy, R., Segarra, P., Pastor, M. C., & Montañés, S. (2007). Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionalized young adults. *Personality and Individual Differences*, 43, 1644–1655.
- Sacks, S., Cleland, C. M., Melnick, G., Flynn, P. M., Knight, K., Friedmann, P. D., ... Coen, C. (2009). Violent offenses associated with co-occurring substance use and mental health problems: Evidence from CJDATS. *Behavioral Sciences & the Law*, 27, 51–69.
- Skeem, J. L., Poythress, N., Edens, J. F., Lilienfeld, S. O., & Cale, E. M. (2003). Psychopathic personality or personalities? Exploring potential variants of psychopathy and their implications for risk assessment. *Aggression and Violent Behavior*, 8, 513–546.
- Skeem, J. L., Johansson, P., Andershed, H., Kerr, M., & Louden, J. E. (2007). Two subtypes of psychopathic violent offenders that parallel primary and secondary variants. *Journal of Abnormal Psychology*, 116, 395–409.
- Tein, J.-Y., Coxé, S., & Cham, H. (2013). Statistical power to detect the correct number of classes in latent profile analysis. *Structural Equation Modeling: A Multidisciplinary Journal*, 20, 640–657.
- Tellegen, A., & Waller, N. G. (2008). Exploring personality through test construction: Development of the multidimensional personality questionnaire. *The SAGE Handbook of Personality Theory and Assessment*. 2. *The SAGE Handbook of Personality Theory and Assessment* (pp. 261–292).
- Venables, N. C., & Patrick, C. J. (2012). Validity of the externalizing spectrum inventory in a criminal offender sample: Relations with disinhibitory psychopathology, personality, and psychopathic features. *Psychological Assessment*, 24, 88–100.
- Verona, E., Patrick, C. J., & Joiner, T. E. (2001). Psychopathy, antisocial personality, and suicide risk. *Journal of Abnormal Psychology*, 110, 462–470.
- Vincent, G. M., Vitacco, M. J., Grisso, T., & Corrado, R. R. (2003). Subtypes of adolescent offenders: Affective traits and antisocial behavior patterns. *Behavioral Sciences and the Law*, 21, 695–712.
- Vittaco, M. J., Neumann, C. S., & Jackson, R. L. (2005). Testing a four-factor model of psychopathy and its association with ethnicity, gender, intelligence, and violence. *Journal of Consulting and Clinical Psychology*, 72, 1165–1169.
- Wechsler, D. (2008). *Wechsler Adult Intelligence Scale-Fourth Edition (WAIS-IV)*. 22, San Antonio, TX: NCS Pearson498.
- Welsh, G. S. (1952). An anxiety index and an internalization ratio for the MMPI. *Journal of Consulting & Clinical Psychology*, 16, 65–72.
- Wetzels, M., Odekerken-Schröder, G., & Van Oppen, C. (2009). Using PLS path modeling for assessing hierarchical construct models: Guidelines and empirical illustration. *MIS Quarterly*, 177–195.
- Widiger, T. A., & Sankis, L. M. (2000). Adult psychopathology: Issues and controversies. *Annual Review of Psychology*, 51, 377–404.
- Williams, K. M., Paulhus, D. L., & Hare, R. D. (2007). Capturing the four-factor structure of psychopathy in college students via self-report. *Journal of Personality Assessment*, 88, 205–219.
- Wong, S. C.-P., & Hare, R. D. (2006). *Guidelines for a Psychopathy Treatment Program*. MHS.