# Can we use Hare's psychopathy model within forensic and non-forensic populations? An empirical investigation.

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## Abstract

Although psychopathy construct (SRP-SF) was assessed among various samples, prior research did not investigate whether the model proposed by Hare and colleagues can be used to capture psychopathy scores derived from forensic and non-forensic populations. The main objective of the current study was to test dimensionality, construct validity, and factorial invariance of the SRP-SF within prison ($N$ = 730) and student ($N$ = 2,506) samples. Our results indicate that the SRP-SF measure cannot be used in the same way within forensic and non-forensic samples, which may be due to the inclusion of criminal/antisocial traits as an integral part of psychopathy.



*Key words:* Self-Report Psychopathy Scale-Short Form; Prisoners; Students; Multitrait-multimethod modeling; Factorial invariance

Although there is a lack of an agreed definition of the construct of psychopathy (O'Kane, Fawcett, and Blackburn 1996), it is often presented as a constellation of interpersonal (e.g., deceitfulness, superficial charm, grandiosity), affective (e.g., lack of empathy, remorse, or guilt), lifestyle (e.g. impulsivity, irresponsibility), and behavioral (e.g., social deviance, criminality) features (Hare and Neumann 2008). The beginning of the modern conceptualization of psychopathy has been marked by the publication of Cleckley's (1941) *Mask of sanity*, in which the prototypical psychopath was depicted as someone who is egocentric, lacks insight into the emotions of others, demonstrates deficiency in emotional reactions, and does not experience the feelings of remorse and regret. The Cleckleyan characterization of psychopathy has served as the foundation for creating the Psychopathy Checklist (PCL; Hare 1980) and its updated form, the Psychopathy Checklist – Revised (PCL-R; Hare 1991, 2003).

The PCL-R (Hare 1991) is a 20-item clinician-administered measure, scored on the basis of interview and case history information. Prior research demonstrated the instrument's validity and reliability among offender and non-offender samples, regardless of participants' age and gender (e.g., Forth and Burke 1998; Forth and Mailloux 2000; Grann, Långström, Tengström, and Kullgren 1999; Rutherford, Cacciola, Alterman, and McKay 1996; Salekin, Rogers, and Sewell 1997); and its predictive utility for violent recidivism (see Debowska, Boduszek, Dhingra, DeLisi 2016; Dhingra and Boduszek 2013 for a review; Hart, Kropp, and Hare 1988; McCuish, Corrado, Hart, and DeLisi 2015; Serin 1996; Serin and Amos 1995; Serin, Peters, and Barbaree 1990) and sexual reoffending (Furr 1993; Olver and Wong 2015; Quinsey, Rice, and Harris 1995; Rice, Harris, and Quinsey 1990). The PCL-R scores were most often suggested to be best captured by a four-factor model, reflecting interpersonal, affective, lifestyle, and antisocial characteristics (e.g., León-Mayer, Folino, Neumann, and Hare 2015; Mokros *et al*. 2011; Neumann, Hare, and Johansson 2013; Neumann, Hare, and

Pardini 2014). However, a recent critical review of psychopathy measurement revealed inconsistent findings regarding the underlying factor structure of the measure, which has been explained by methodological and conceptual limitations of prior research (see Boduszek and Debowska 2016).

Further, the usefulness of the PCL-R for assessing psychopathy among participants drawn from the general population is restricted, due to the lack of clinical history information for such samples (Lilienfeld and Fowler 2007). With this limitation in mind, Hare and colleagues created a self-report analogue of the PCL(-R), the Self-Report Psychopathy Scale (SRP). The first version of the SRP (Hare, 1985) consisted of 29 items, however, it failed to adequately address the core features of psychopathy, such as callousness and dishonesty (Lilienfeld and Fowler 2007). In the second version of the scale, the SRP-II, 60 items were included, 31 of which formed the core of the scale and aligned with two original oblique factors of the PCL-R (affective/interpersonal and lifestyle/antisocial; Williams and Paulhus 2004); but only a moderate correlation between the SRP-II and PCL-R was reported (Hare 2003).

The latest version of the inventory, the SRP-III (also referred to as SRP-IV; Paulhus, Neumann, and Hare in press) consists of 64 items indexed on a five-point Likert scale (ranging from 1 = *strongly disagree* to 5 = *strongly agree*). Some prior research revealed good/moderate differential predictive validity of the scale facets (Debowska, Boduszek, Kola, and Hyland 2014; Gordts, Uzieblo, Neumann, Van den Bussche, and Rossi 2015; Neal and Sellbom 2012), but instances of weak (Seibert, Miller, Few, Ziechner, and Lynam 2011) and a lack of (Freeman and Samson 2012) differential predictive validity were also reported. As for the SRP-III dimensionality, the scale ratings were best represented by four- (e.g., Freeman and Samson 2012; Gordts *et al*. 2015; Neal and Sellbom 2012; Seibert *et al*. 2011) and bi-factor models (Debowska *et al*. 2014); however, three studies reported unsatisfactory model

fit parameters when using individual items as indicators (Debowska *et al*. 2014; Gordts *et al*. 2015; Neal and Sellbom 2012).

Paulhus *et al*. (in press) have also developed a shortened, 29-item form of the SRP-III, the SRP-SF, in order to reduce the administration time of the measure. The SRP-SF factor scores were positively correlated with avoidance, social, verbal, and physical bullying (Gordts *et al*. 2015) as well as externalizing and internalizing psychopathology (Neumann and Pardini 2014). Notably, Gordts *et al*. (2015) found corresponding SRP-III and SRP-SF facets to form some different associations with external criteria, indicating that the SRP-III and SRP-SF may be qualitatively different (see Boduszek and Debowska 2016 for a detailed review).

To date, all known empirical studies have identified the four-factor solution (with affective, interpersonal, lifestyle, and antisocial dimensions) as the best fit for the SRP-SF scores. However, in spite of the fact that the comparative fit index (CFI; Bentler 1990) and/or the Tucker-Lewis index (TLI; Tucker and Lewis 1973) values were below .95 (see Hu and Bentler 1999) in all of those studies, no competing model solutions were tested (Declercq *et al*. 2015; Gordts *et al*. 2015; León-Mayer *et al*. 2015; Neumann *et al*. 2014; Neumann, Schmitt, Carter, Embley, and Hare 2012). As such, the superiority of the four-factor model is in need of verification. Additionally, the paucity of factor analytic work using the SRP-SF precludes any firm conclusions from being made regarding its dimensionality. Previous findings should also be tempered by the fact that the number of scale items employed has varied across studies. For example, Gordts *et al*. (2015), in a study within a Belgian community sample, used a 28-item SRP-SF. Neumann *et al*. (2012) assessed the dimensionality of an experimental 19-item version of the SRP. Neumann *et al*. (2014) employed a 19- and 26-item scale, without explaining which items were omitted and why.

This lack of consistency significantly undermines the generalizability of research findings and the reliability of the measure.

**The current study**

The PCL-R and its progeny, including the SRP-III and SRP-SF, are the most widely used psychopathy measures in both research and clinical practice (Dhingra and Boduszek 2013; Lee and Ashton 2005). As noted above, however, there is a dearth of research into the factor structure of the SRP-SF and a lack of studies examining competing model solutions, warranting its further scrutiny. In addition, although the SRP-SF comprises 29 items, some previous studies used a reduced number of indicators, which adversely affects the generalizability of those findings (e.g., Gordts *et al*. 2015; Neumann *et al*. 2012; Neumann *et al*. 2014). Although the construct validity of the scale was assessed within community (Gordts *et al*. 2015), student (Declerq *et al*. 2015), and forensic samples (León-Mayer *et al*. 2015; Neumann *et al*. 2014; Neumann and Pardini 2014), this prior research did not investigate whether the same factorial solution of the SRP-SF can be used to capture psychopathy scores derived from forensic and non-forensic populations, through testing for invariance of model parameters.

Further, Boduszek and Debowska's (2016) recent critical review of psychopathy measurement revealed that factor analytic literature is compromised by a number of methodological limitations. In an attempt to systemize research in the field, the researchers provided a set of recommendations for future investigations. First, it was suggested that confirmatory techniques should be used to test competing model solutions, with a bi-factor model, composed of general and grouping factors (see Hyland 2015; Reise, Moore, and Haviland 2010), used as a comparison model. Second, the following fit indices should be provided to compare the competing models: CFI (Bentler 1990), TLI (Tucker and Lewis

1973), and the root-mean-square error of approximation (RMSEA; Steiger and Lind 1980). Third, the parceling technique, sometimes employed to reduce the indicator-to-factor ratio, ought to be avoided with short scales, such as the SRP-SF. Next, in a latent variable modelling context, internal consistency should be assessed using composite reliability, as opposed to Cronbach's alpha. Finally, Boduszek and Debowska's (2016) review revealed the need for more factor analytic studies assessing the reliability and dimensionality of the SRP-SF using unpublished data sets of appropriate size.

Consequently, the main objective of the current study is to test the construct validity and factor structure of the 29-item SRP-SF within student and prison samples, whilst adhering to the above recommendations. An additional goal is to verify whether the SRP-SF can be used to measure psychopathy in the same way within forensic and non-forensic populations. Given the dearth of previous factor analytic studies on the SRP-SF, we did not formulate a specific hypothesis concerning which of the models would best fit the data.

## Methods

### Participants

Based on Boduszek and Debowska (2016), minimum sample size recommended for testing construct validity of SRP-SF is 466 participants (387 minimum sample size to detect effect) with anticipated effect size = 0.1, desired statistical power level = 0.8, and probability level = 0.05 (Cohen 1988; Soper 2015).

***Sample 1*** consisted of 730 inmates (521 males and 209 females) incarcerated in four maximum security UK and US prisons. Prisoners ranged in age from 18 to 76 ($M$ = 36.48, $SD$ = 11.97, $Mdn$ = 34). The length of incarceration ranged from 1 to 564 months ($M$ = 93.54, $SD$ = 102.13, $Mdn$ = 54), with 48.82% of prisoners incarcerated for violent offenses.

***Sample 2*** consisted of 2,506 students (832 males and 1,674 females) from four large English universities. Students ranged in age from 18 to 49 (*M* = 25.59, *SD* = 7.69, *Mdn* = 23). The sample consisted of students from different variety of university faculties (21.36% from social and health sciences; 18.88% from humanities, music, and media; 17.03% from applied sciences; 16.72% from business; 10.53% from computing and engineering; 8.36% from art, design, and architecture; 6.81% from educational and professional development).

**Measure**

***Self-Report Psychopathy Scale-Short Form*** (SRP-SF; Paulhus *et al*. in press) was used to assess self-reported psychopathic traits. Based on the Psychopathy Checklist–Revised (PCL-R; Hare 1991), the SRP-SF is a 29-item measure that yields a total score as well as four subscale scores: Interpersonal Manipulation (7 items), Callous Affect (7 items), Erratic Lifestyle (7 items), and Antisocial Behavior (8 items). Items are scored on a 5-point Likert scale (1 = *strongly disagree* to 5 = *strongly agree*).

**Procedure**

The research protocol for prison study was approved by Pennsylvania Department of Corrections (USA) and National Offender Management Service in England. In terms of student population, the project was approved by all participating universities' research ethics boards. Paper version of the SRP-SF measure was delivered to selected prisons and universities. We used opportunistic sampling technique to collect data. A brief description of the study was provided to each participant along with the questionnaire. Respondents were assured about the confidentiality of their participation, and informed that they could withdraw from the study at any time without having to provide a reason for doing so. Participation was voluntary without any form of reward.

**Analytic Plan**

The dimensionality and construct validity of the SRP-SF was investigated using traditional CFA techniques, along with confirmatory bifactor analysis (see Reise, Moore, and Haviland 2010) and multitrait-multimethod modelling (MTMM, also known as correlated traits/correlated methods models, e.g., see Boduszek and Dhingra 2015). Seven alternative models of the SRP-SF latent structure were specified and tested using M*plus* version 7.4 (Muthén and Muthén 1998-2015) with MLR estimation.

Model 1 is a one-factor solution where all 29 SRP-SF items load on a single latent factor of psychopathy (see Figure 1). Model 2 is a correlated two-factor solution where items load on affective/interpersonal factor and lifestyle/antisocial factor (see Figure 2). Model 3 is a correlated four-factor solution where items load on callous affect factor, interpersonal manipulation factor, erratic lifestyle factor, and antisocial behavior factor (see Figure 3). Model 4 is a four factor solution with one higher order factor (see Figure 4). Model 5 is a four-factor solution with two higher order factors (see Figure 5). Model 6 is a bifactor conceptualization with one general factor of psychopathy and four subordinate factors described in Model 3 (see Figure 6). Model 7 is an MTMM model including two correlated method factors (described in Model 2): a factor operationalized by items reflecting affective/interpersonal traits and a factor operationalized by items reflecting lifestyle/antisocial traits, independent of whether the items belong to the four factors described in Model 3 (see Figure 7).

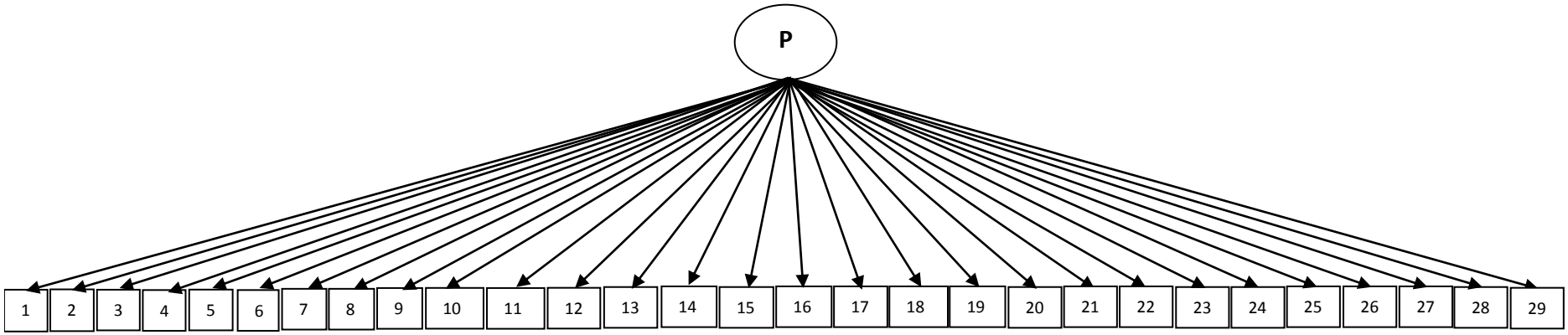


*Figure 1*. One factor solution of SRP-SF. P = Psychopathy.

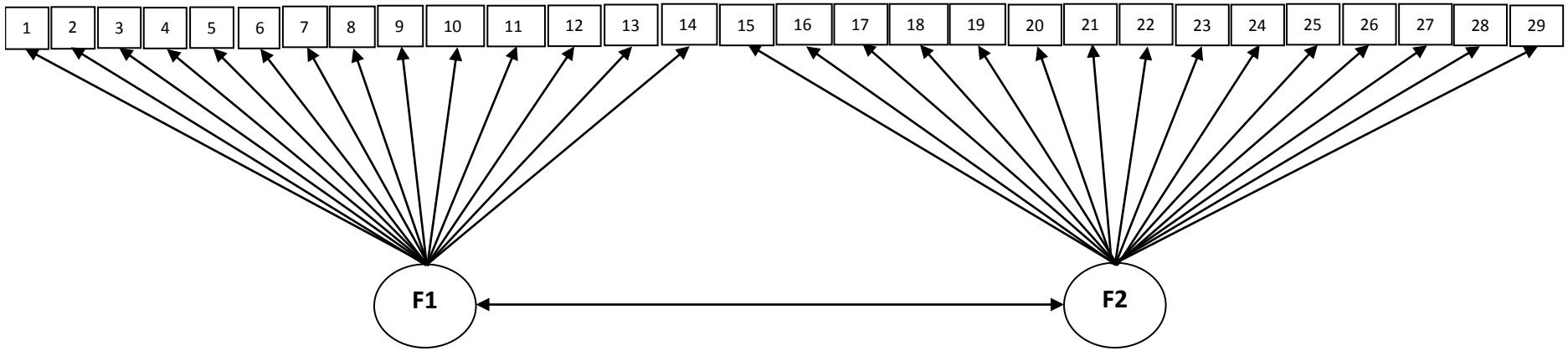


*Figure 2.* Two factor solution of SRP-SF. F1 = affective/interpersonal traits, F2 = lifestyle/antisocial traits.

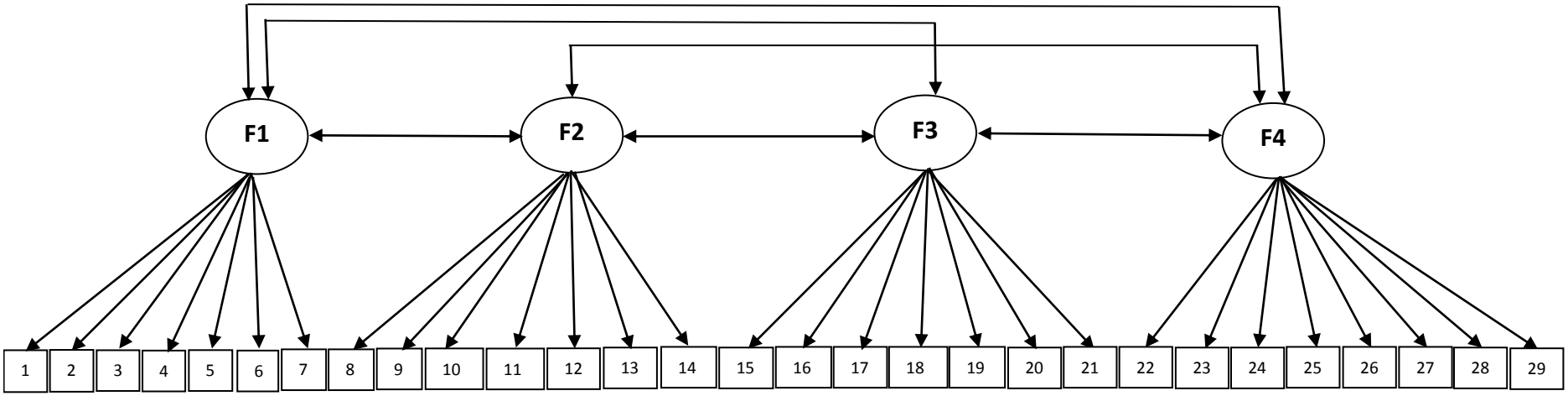


*Figure 3*. Four factor solution of SRP-SF. F1 = callous affect, F2 = interpersonal manipulation, F3 = erratic lifestyle, F4 = antisocial behavior.

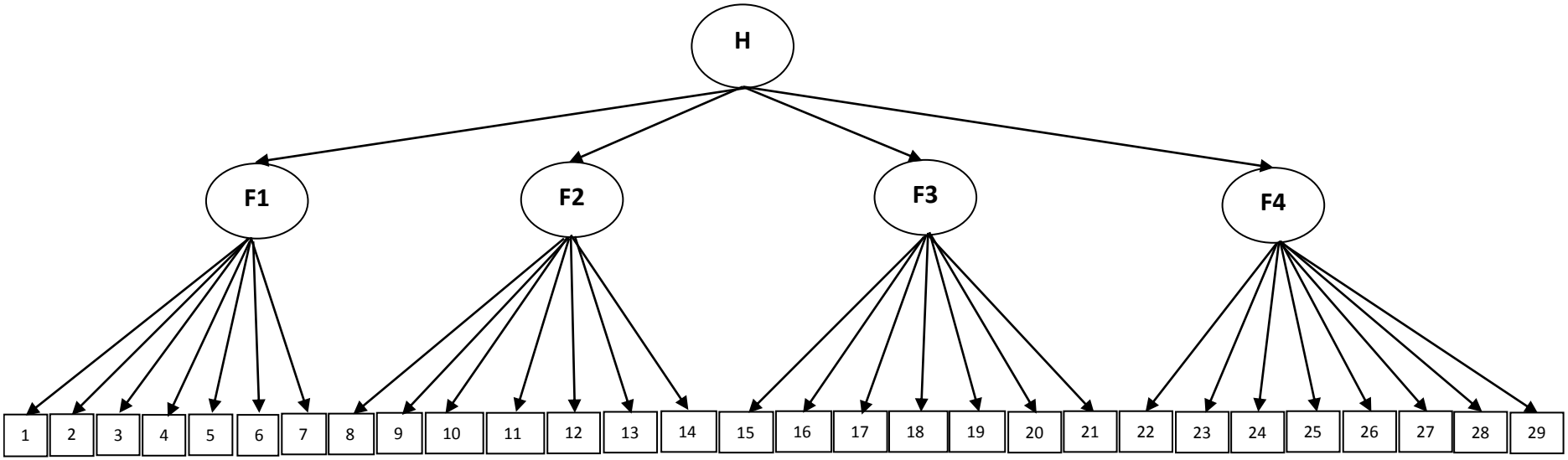


*Figure 4*. Four factors of SRP-SF with one higher order factor. F1 = callous affect, F2 = interpersonal manipulation, F3 = erratic lifestyle, F4 = antisocial behavior, H = higher order factor of psychopathy.

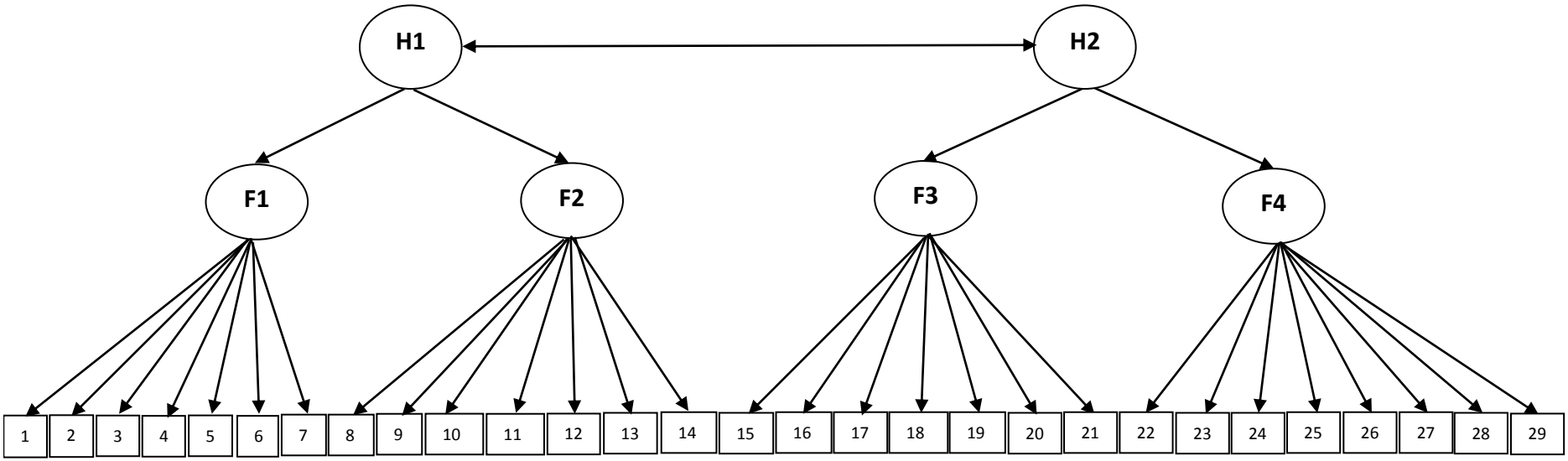


*Figure 5*. Four factors of SRP-SF with two higher order factors. F1 = callous affect, F2 = interpersonal manipulation, F3 = erratic lifestyle, F4 = antisocial behavior, H1 = affective/interpersonal higher order factor of psychopathy, H2 = lifestyle/antisocial traits higher order factor of psychopathy.

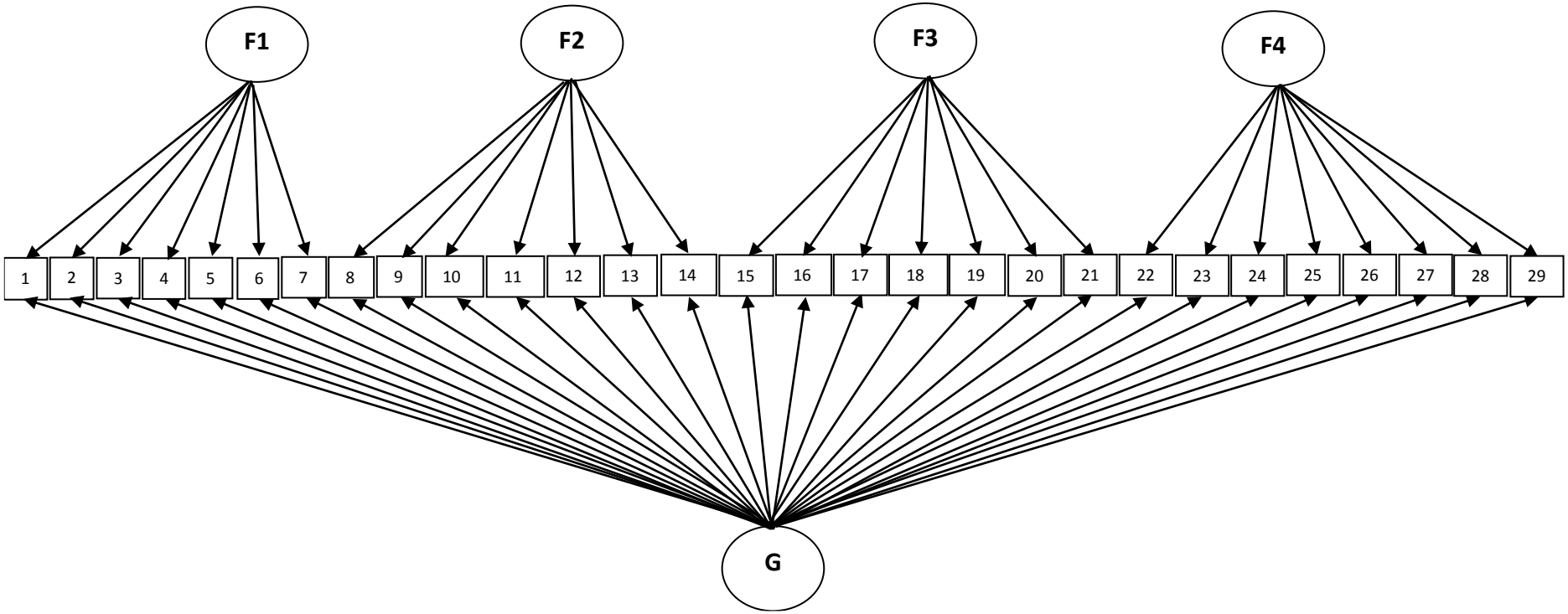


*Figure 6*. Bifactor solution of SRP-SF. F1 = callous affect, F2 = interpersonal manipulation, F3 = erratic lifestyle, F4 = antisocial behavior, G = general factor of psychopathy.

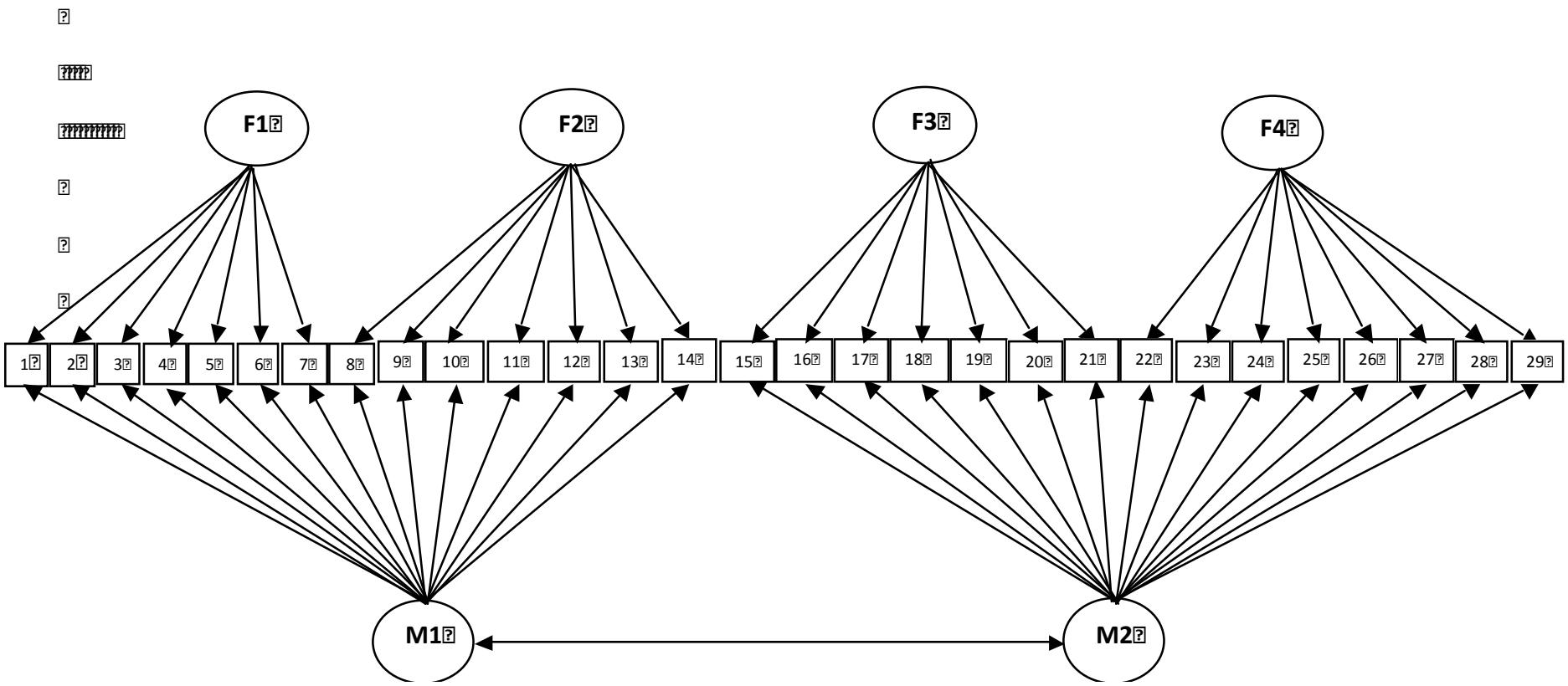


*Figure 7*. Multitrait-multimethod solution of SRP-SF. F1 = callous affect, F2 = interpersonal manipulation, F3 = erratic lifestyle, F4 = antisocial behavior, M1 = affective/interpersonal method factor, M2 = lifestyle/antisocial traits method factor.

The overall fit of each model and the relative fit between models were assessed using a range of goodness-of-fit statistics: the $\chi 2$ statistic, the Comparative Fit Index (CFI; Cronbach 1990), and the Tucker Lewis Index (TLI; Tucker and Lewis 1973). For CFI and TLI, values above 0.95 indicate good model fit (Bentler 1990; Hu and Bentler 1999). In addition, the Root Mean Square Error of Approximation (RMSEA; Steiger 1990) with 90% confidence interval is presented. Ideally, this index should be less than 0.05 to suggest good fit (Bentler 1990; Hu and Bentler 1999). Furthermore, the Bayesian Information Criterion (BIC) was used to evaluate the alternative models, with the smaller value indicating the best-fitting model.

Tests of factorial invariance were used in order to investigate the appropriateness of SRP-SF for both forensic and non-forensic sample. Additionally, in contrast to previous research on the validation of SRP-SF, which have typically assessed the Cronbach's α, this research assessed the composite reliability (for procedure see Raykov 1997; for application in psychopathy research see Boduszek *et al*. 2016; Debowska *et al*. 2014). Values greater than .60 are generally considered acceptable (Diamantopoulos and Siguaw 2000).

## Results

Descriptive statistics for the psychopathy factors for each sample are presented in Table 1.

Table 2 presents the fit indices of the seven alternative models of the SRP-SF. Results were consistent between prison and student sample in terms of factor solution. The four-factor model suggested by previous research (Declercq *et al*. 2015; Gordts *et al*. 2015; León-Mayer *et al*. 2015; Neumann *et al*. 2014; Neumann *et al.* 2012) was rejected based on the CFI and TLI (values below .95), as well as RMSEA (value above .05) statistics. Similarly, one-factor model, correlated two-factor model, one and two higher order factors models, and

bifactor model were also rejected. Based on RMSEA (.048), the MTMM model offers a good representation of the data in the prison sample (however, CFI and TLI were below .95), and a very good representation of the data in the student sample based on all fit statistics (CFI = .96, TLI = .95, RMSEA = .039).

Table 1. *Descriptive statistics for the SRP-SF factors*

| **Variables** | ***M*** | ***SD*** | ***Mdn*** | **Min** | **Max** |
|---|---|---|---|---|---|
| ***Prison sample (N = 730)*** | | | | | |
| Callous Affect | 15.83 | 4.85 | 15 | 7 | 31 |
| Interpersonal Manipulation | 15.25 | 5.66 | 15 | 7 | 35 |
| Erratic Lifestyle | 18.86 | 5.70 | 19 | 7 | 34 |
| Antisocial Behavior | 18.91 | 5.84 | 18 | 8 | 47 |
| Affective/Interpersonal traits (Method 1) | 31.08 | 9.63 | 30 | 14 | 64 |
| Lifestyle/Antisocial traits (Method 2) | 37.85 | 10.21 | 37 | 16 | 72 |
| ***Student sample (N = 2506)*** | | | | | |
| Callous Affect | 13.58 | 5.11 | 13 | 7 | 35 |
| Interpersonal Manipulation | 14.01 | 5.49 | 13 | 7 | 35 |
| Erratic Lifestyle | 15.68 | 5.28 | 15 | 7 | 35 |
| Antisocial Behavior | 11.66 | 4.33 | 11 | 8 | 40 |
| Affective/Interpersonal traits (Method 1) | 27.61 | 9.93 | 26 | 14 | 70 |
| Lifestyle/Antisocial traits (Method 2) | 27.37 | 8.40 | 26 | 15 | 75 |

The adequacy of the MTMM model including two correlated method factors and four psychopathy factors can also be determined based on parameter estimates. As shown in Table 3, all items displayed statistically significant factor loadings on respective method factors. Further inspection of the factor loadings for the four psychopathy factors provide an important information regarding the correctness of including these latent factors in the scoring of the SRP-SF. If the items load more strongly on each of the four psychopathy

factors and less strongly on method factors, this suggests the superiority of the four factors over the method factors in the conceptualization of the factor structure of the SRP-SF, and thus its related scoring scheme. This was not the case in this particular investigation. Our results suggest that SRP-SF consists of two latent factors (affective/interpersonal traits and lifestyle/antisocial traits) while controlling for the four grouping factors (see Table 4, please note that some of the factor loadings are not statistically significant for grouping factors).

Table 2. *Fit Indices for Seven Alternative Models of the SRP-SF*

| **Models** | $\chi^2$ | ***df*** | **CFI** | **TLI** | **RMSEA** | **90% CI** | **BIC** |
|---|---|---|---|---|---|---|---|
| ***Prison sample*** | | | | | | | |
| 1 factor | 2001.12* | 377 | .88 | .87 | .059 | .056/.063 | 65649.64 |
| Correlated 2 factors | 1879.39* | 376 | .89 | .88 | .057 | .054/.061 | 65556.51 |
| Correlated 4 factors | 1746.75* | 371 | .90 | .89 | .055 | .051/.058 | 65472.20 |
| 1 higher-order factor | 1756.71* | 373 | .90 | .89 | .055 | .051/.058 | 65469.32 |
| 2 higher-order factors | 1758.99* | 372 | .90 | .89 | .055 | .051/.058 | 65473.53 |
| Bifactorial with 4 subordinate factors | 1500.09* | 348 | .92 | .90 | .051 | .047/.054 | 65385.60 |
| MTMM model | 1263.13* | 341 | .93 | .92 | .048 | .044/.051 | 65300.24 |
| ***Student sample*** | | | | | | | |
| 1 factor | 8424.38* | 377 | .85 | .84 | .071 | .069/.072 | 184809.63 |
| Correlated 2 factors | 7461.11* | 376 | .87 | .86 | .068 | .066/.069 | 184172.79 |
| Correlated 4 factors | 6202.20* | 371 | .89 | .88 | .057 | .055/.059 | 182278.42 |
| 1 higher-order factor | 6128.37* | 373 | .90 | .89 | .057 | .055/.059 | 182264.61 |
| 2 higher-order factors | 6181.74* | 372 | .89 | .88 | .057 | .055/.059 | 182270.65 |
| Bifactorial with 4 subordinate factors | 3747.51* | 348 | .94 | .93 | .045 | .043/.047 | 180561.01 |
| MTMM model | 2692.77* | 341 | .96 | .95 | .039 | .037/.041 | 180014.04 |

*Note.* $\chi^2$ = chi square goodness of fit statistic; *df* = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root-Mean-Square Error of Approximation; CI = Confidence Interval; BIC = Bayesian Information Criterion.
* Indicates $\chi^2$ are statistically significant ($p < .05$).

Table 3. *Standardised Factor Loadings for two method factors of the MTMM Model*

| Items | Prison sample | Student sample |
|---|---|---|
| **Method 1 (Callous/Interpersonal traits)** | | |
| 1. most people are whimps | .51*** | .55*** |
| 2. like to see fist fights | .67*** | .74*** |
| 3. don't contact family | .28*** | .58*** |
| 4. people say I'm cold-hearted | .61*** | .68*** |
| 5. love violent sport/movie | .52*** | .62*** |
| 6. never guilt over hurt people | .62*** | .73*** |
| 7. dumps friends don't need | .50*** | .69*** |
| 8. pretend be someone | .51*** | .69*** |
| 9. like scamming people | .73*** | .84*** |
| 10. push people to upset | .74*** | .78*** |
| 11. take advantage before others | .75*** | .79*** |
| 12. fake like people to get something | .65*** | .60*** |
| 13. tell people what want hear | .66*** | .51*** |
| 14. people are suckers, can fool | .63*** | .68*** |
| **Method 2 (Lifestyle/Antisocial traits)** | | |
| 15. I'm rebellious person | .48*** | .44*** |
| 16. do dangerous for thrill | .52*** | .56*** |
| 17. enjoy doing wild things | .47*** | .49*** |
| 18. rarely follow rules | .61*** | .69*** |
| 19. sex with people barely know | .50*** | .64*** |
| 20. get trouble same things | .38*** | .70*** |
| 21. mouth off without thinking | .46*** | .58*** |
| 22. gang activity | .30*** | .32*** |
| 23. trick people to give money | .43*** | .67*** |
| 24. assaulted an official | .59*** | .78*** |
| 25. broken into building | .54*** | .79*** |
| 26. convicted serious crime | .16*** | .78*** |
| 27. sometimes carry weapon | .56*** | .78*** |
| 28. threaten people to get something | .66*** | .83*** |
| 29. tried hit people with vehicle | .60*** | .77*** |

*Note.* *** $p < .001$

Table 4. *Standardised Factor Loadings for four grouping factors of the MTMM Model*

| Items | Prison sample | Student sample |
|---|---|---|
| **Callous Affect** | | |
| 1. most people are whimps | .16*** | .32*** |
| 2. like to see fist fights | .47*** | .19*** |
| 3. don't contact family | .21*** | .14*** |
| 4. people say I'm cold-hearted | .09** | .21*** |
| 5. love violent sport/movie | .58*** | .36*** |
| 6. never guilt over hurt people | .04 | .05 |
| 7. dumps friends don't need | .18*** | .14*** |
| **Interpersonal Manipulation** | | |
| 8. pretend be someone | .68*** | .04 |
| 9. like scamming people | .17*** | .03 |
| 10. push people to upset | .01 | .13*** |
| 11. take advantage before others | .02 | .15*** |
| 12. fake like people to get something | .32*** | .53*** |
| 13. tell people what want hear | .28*** | .72*** |
| 14. people are suckers, can fool | .04 | .34*** |
| **Erratic Lifestyle** | | |
| 15. I'm rebellious person | .32*** | .40*** |
| 16. do dangerous for thrill | .61*** | .52*** |
| 17. enjoy doing wild things | .57*** | .72*** |
| 18. rarely follow rules | .17*** | .26*** |
| 19. sex with people barely know | .29*** | .12*** |
| 20. get trouble same things | .17*** | .07* |
| 21. mouth off without thinking | .15*** | .30*** |
| **Antisocial Behavior** | | |
| 22. gang activity | .02 | .12*** |
| 23. trick people to give money | .68*** | .10*** |
| 24. assaulted an official | .18*** | .35*** |
| 25. broken into building | .41*** | .21*** |
| 26. convicted serious crime | .20*** | .37*** |
| 27. sometimes carry weapon | .09 | .30*** |
| 28. threaten people to get something | .27*** | .30*** |
| 29. tried hit people with vehicle | .07 | .35*** |

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

Tests of factorial invariance were conducted between prison and student sample using the MTMM solution as the baseline model in order to investigate if the SRP-SF scale can be applied in the same way to both populations. Following the procedure of Bollen (1989), a hierarchy of increasingly restrictive models was specified and tested. The test of invariance of form, or that the SRP-SF model held in both samples, was not supported, $\chi^2 = 2145.80$, $p < .001$, $df = 689$ (RMSEA = .041 [.039/.04]3; CFI = .925; TLI = .911, BIC = 177311.82, scaling correction factor = 1.364), as was the test of equal factor loadings, $\chi^2 = 2431.84$, $p < .001$ (RMSEA = .043 [.041-.045]; CFI = .913; TLI = .904; BIC = 177270.384, scaling correction factor = 1.354). Assessment of invariance in factor variances could not be conducted due to the necessity to constrain factor variances to 1.0 in order that an MTMM solution could be identified. Results indicate that the SRP-SF is factorially variant between prisoners and students ($\chi$2 difference testing using the Satorra-Bentler's Scaled Chi-Square: difference test scaling correction (CD) = 1.2215; Satorra-Bentler Scaled chi-square difference (TRd) = 299.5007; difference in degrees of freedom ($\Delta df$) = 52; $p < .001$). This can be further investigated by the inspection of factor loadings between prison and student sample. For example, in Table 3 item 3 ("I don't bother to keep in touch with my family any more") factor loading in prison sample (.28) does not reach the cut-off point of .40, whereas factor loading in student sample (.58) is acceptable. The same issue has been reported for item 20 ("I keep getting in trouble for the same things over and over"), and 26 ("I have been convicted of a serious crime"), whereas item 22 ("I have never been involved in delinquent gang activity" – *reversed item*) has very low factor loadings in both samples. Table 4 (factor loadings for grouping factors) shows similar issues with some of the factor loadings not reaching the level of significance.

In order to assess the internal reliability of the SRP-SF factors, composite reliability was performed. Composite reliability was calculated using the formula below where $\rho_c$ =

reliability of the factor score, $\lambda_i$ = standardized factor loading, and $\theta_i$ = standardized error variance:

$$\rho_c = \frac{\left(\sum_{i=1}^{m} \lambda_i\right)^2}{\left(\sum_{i=1}^{m} \lambda_i\right)^2 + \left(\sum_{i=1}^{m} (\theta_i)\right)}$$

Results suggest that the two method factors (affective/interpersonal $\rho_c$ = .889 for prison sample and $\rho_c$ = .923 for student sample; and lifestyle/antisocial $\rho_c$ = .824 for prison sample and $\rho_c$ = .921 for student sample) demonstrate good internal reliability. However, there are some significant problems with the grouping factors: callous affect ($\rho_c$ = .321 for prison sample and $\rho_c$ = .230 for student sample), interpersonal manipulation ($\rho_c$ = 267 for prison sample and $\rho_c$ = .384 for student sample), erratic lifestyle ($\rho_c$ = .463 for prison sample and $\rho_c$ = .493), and antisocial behavior ($\rho_c$ = 338 for prison sample and $\rho_c$ = .374 for student sample).

## Discussion

This study was performed with two main objectives in mind. First, we sought to provide a robust assessment of the factor structure of the SRP-SF within samples of students and prisoners. Given the lack of studies testing competing model solutions of the measure, we did not formulate a specific hypothesis concerning which of the models would best fit the data. Second, we sought to further assess the SRP-SF psychometric properties by testing for the first time whether the scale is factorially invariant between prisoners and university students.

Although previous factor analytic work using the SRP-SF suggested the four-factor solution as the best model fit for data derived from community (Gordts *et al*. 2015), student

(Declerq *et al*. 2015), and forensic samples (León-Mayer *et al*. 2015; Neumann *et al*. 2014; Neumann and Pardini 2014), this prior research failed to verify the appropriateness of the model in comparison to alternative, theoretically and methodologically sound, solutions. Importantly, the fitness of the four-factor model was assessed using 29- (Declerq *et al*. 2015; León-Mayer *et al*. 2015), 28- (Gordts *et al*. 2015), 26- (Neumann *et al*. 2014), and 19-item (Neumann *et al*. 2012; Neumann *et al*. 2014) versions of the scale, which precludes direct comparisons between the studies. Equally important, despite the fact that the necessity to control for the method of assessment in testing construct validity of the PCL-R and its derivatives was demonstrated in past studies (see Boduszek and Debowska 2016; Boduszek, Dhingra, Hyland, and Debowska 2016), similar research using the SRP-SF is missing. In order to address these limitations, this study tested a series of competing models of the SRP-SF, using data drawn from large samples of prisoners and students. Including all 29 items, the SRP-SF was found to consist of two correlated factors (affective/interpersonal traits and lifestyle/antisocial traits), which explained the majority of covariation between observable indicators; while controlling for four grouping factors (callous affect, interpersonal manipulation, erratic lifestyle, antisocial behavior). In addition to providing a clearer delineation of psychopathy as a multidimensional construct, modelling both content and method-related factors has allowed for a more precise assessment of the reliability of SRP-SF scores.

In order to compare psychopathy research findings across populations, it is important to demonstrate measurement invariance, i.e., that the items from an instrument have equivalent meaning across the groups studied. Although the multitrait-multimethod (MTMM) solution was found to be superior in explaining the dimensionality of the SRP-SF among both student and prisoner samples, factor invariance testing indicated that there are sample differences on all factor structure parameters. Perusal of standardized factor loadings for the

two method factors revealed unacceptably low (below .40) values for three lifestyle/antisocial traits; specifically, *getting into trouble for the same things, being involved in gang activity,* and *having been convicted for a serious crime*. The latter item loaded strongly within the student sample, but not within the prison sample. Violence tends to be common in prison settings, with approximately 50 per cent of inmates in the United States being incarcerated for serious/violent offenses (Carson and Golinelli 2013) and 21 per cent experiencing violence whilst in confinement (Schenk and Fremouw 2012); suggesting that items inquiring into the commission of such acts do not grasp the essence of a psychopathic personality. In light of recent evidence that criminal/antisocial features constitute a likely outcome rather than an integral part of psychopathy (e.g., Boduszek and Debowska 2016; Cooke and Logan 2015; Cooke and Michie 2001; Corrado, DeLisi, Hart, and McCuish 2015; Skeem and Cooke 2010a, b), this finding was not unexpected. Further, the SRP-SF item which concerns maintaining contact with family (included in the callous/interpersonal method factor), had a factor loading below the established cut-off point of .40 among inmates. Indeed, communication with family members whilst in prison is straitened due to limited provisions of visits. Even though this specific item was designed to assess a volitional cessation of contact, our data suggest that the inmates did not necessarily interpret the item in this manner.

The current study had several limitations. First, psychopathic traits in each sample were assessed using a self-report measure. It is possible that the latent structure of psychopathy may differ depending on how it is assessed. Second, the student participants were all recruited from the UK population and thus it is unknown whether the current results will generalize to other student populations. It is important that future studies replicate these results in other adult and adolescent samples, as well as non-UK-based populations. Finally, because no other measures were administered to participants alongside the SRP-SF, we were unable to perform a test of differential predictive validity in order to verify whether the

recognized factors correlate differently with external criteria (as recommended by Boduszek and Debowska 2016).

Despite its limitations, the current study is important as it adds substantially to the literature with regard to the construct validity of the SRP-SF and is the first to test seven competing models of the underlying structure of the scale. We demonstrated that scores on the 29-item SRP-SF are best captured by two factors (affective/interpersonal traits and lifestyle/antisocial traits), while controlling for four grouping factors (callous affect, interpersonal manipulation, erratic lifestyle, antisocial behavior) among both student and prison populations. This model solution, however, was found to be factorially variant for the two groups, indicating that the measure cannot be used in the same way within forensic and non-forensic samples. This was suggested to be due to the inclusion of criminal/antisocial items, which may not be fundamental to the construct of psychopathy (see Boduszek and Debowska 2016; Cooke and Michie 2001; Skeem and Cooke 2010a, b; White and Miller 2015). The present results may have important implications for research, theory, and clinical practice. Specifically, it appears that psychopathy is more likely to be observed in forensic samples, compared with the general population, because criminal/antisocial tendencies are currently viewed as an integral part of the psychological concept[1]. Since all psychopathy measures derived from the PCL-R are weighted heavily towards behavioral expressions of the disorder, such as deviancy and maladjustment (Edens, Skeem, Cruise, and Cauffman 2001; Patrick 2007; Patrick, Hicks, Nichol, and Krueger 2007), we suggest that researchers and practitioners use the scales with caution. Future research should focus on revising the content of the scales. Advisably, however, psychopathy measures uncontaminated with criminal/antisocial items should be used (e.g., Boduszek, Debowska, Dhingra, and DeLisi

[1] Research suggests that approximately 25 per cent of prisoners meet diagnostic criteria for psychopathy (Lilienfeld and Arkowitz 2007), compared with 1 per cent of the general population (Coid, Yang, Ullrich, and Hare 2009).

2016) in order to allow for meaningful comparisons between forensic and non-forensic populations in regard to the prevalence of psychopathic traits.

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