

Volume 43, issue 7, November 2007 ISSN 0191-8869



PERSONALITY AND INDIVIDUAL DIFFERENCES

AN INTERNATIONAL JOURNAL OF RESEARCH INTO THE STRUCTURE AND DEVELOPMENT OF PERSONALITY, AND THE CAUSATION OF INDIVIDUAL DIFFERENCES

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Person. Individ. Diff. is indexed/abstracted in:
ASSIA, Curr. Cont. Soc. & Behav. Sci., PASCAL-CNRS Data, Psychol. Abstr., PsycINFO, PsycLIT, Res. Alert, Soc. Sci. Cit. Indx.
Also covered in the abstract and citation database SCOPUS®.
Full text available on ScienceDirect®.

ISSN 0191-8869
43(7) 1641-1966 (2007)

OFFICIAL JOURNAL OF THE INTERNATIONAL SOCIETY FOR THE STUDY OF INDIVIDUAL DIFFERENCES (ISSID)

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Personality and Individual Differences 43 (2007) 1644–1655

PERSONALITY AND
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Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionalized young adults

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Received 31 August 2006; received in revised form 31 March 2007; accepted 16 April 2007

Available online 17 July 2007

Abstract

Gray's two-factor model represents motivation in terms of a behavioral inhibition (BIS) and a behavioral activation system (BAS). Although this model has theoretical links to psychopathy, few studies have examined this relationship. In a sample of 326 noninstitutionalized young adults, we examined the relationship of the BIS/BAS dimensions to multiple indices of primary and secondary psychopathy. Across measures of psychopathy, primary but not secondary was related to BIS standing, whereas indices of both psychopathic dimensions demonstrated robust, positive relationships to the BAS. Generally, results support Newman, MacCoon, Vaughn, and Sadeh (2005) distinction between primary and secondary psychopathy on the basis of the BIS. However, positive associations of all psychopathy measures with BAS indices emphasize the role of a common BAS in psychopathy.

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Keywords: Behavioral inhibition; Behavioral activation; Personality; Psychopathy

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1. Introduction

Based on the psychobiology of animal learning, Gray (1970, 1987) proposed a theoretical model encompassing two primary motivational systems: the behavioral inhibition system (BIS) and the behavioral activation system (BAS). The BIS represents apprehensive motivation and is sensitive to conditioned signals of punishment, frustrative nonreward and novelty. In contrast, the BAS is appetitive and sensitive to conditioned signals of reward and nonpunishment. At the trait level, Gray's (1987) two factors of BIS and BAS translate into anxiety and impulsivity, respectively. A theory of normal adaptation, Gray's model is drawing increased interest from psychopathy researchers. A personality disorder, psychopathy has been the subject of considerable theorizing vis-à-vis Gray's original model.¹

Although three-factor (Cooke & Michie, 2001) and four-facet (Hare, 2003) models of psychopathy have been recently advanced, factor analytic studies of psychopathy measures have generally supported a two-factor model (Benning, Patrick, Hicks, Blonigen, & Krueger, 2003; Hare, 1991; Harpur, Hare, & Hakstian, 1989; Lynam, Whiteside, & Jones, 1999). Broadly, these dimensions represent the theoretical distinction between primary and secondary psychopathy (Levenson, Kiehl, & Fitzpatrick, 1995; Brinkley, Schmitt, Smith, & Newman, 2001). Though primary and secondary psychopathy remain open constructs, primary psychopathy represents the core emotional deficits and interpersonal manipulation in psychopathy, whereas secondary psychopathy may represent nonessential but associated characteristics, including antisociality and neurotic tendencies (Karpman, 1941). Using multiple measures of each construct, we examine the relationship of Gray's two-factor model of BIS and BAS in relation to primary and secondary psychopathy.

2. Gray's original BIS/BAS and psychopathy

Fowles (1988), building on Gray's initial formulation, hypothesized that both an overactive BAS and an underactive BIS are related to "behavioural excess, in the sense of doing things that potentially lead to trouble" (p. 421). An overactive BAS would lead to more frequent approach responses irrespective of potential punishments. Similarly, an underactive BIS would result in more frequent approach responses due to a person's lower sensitivity to punishment that, in turn, leads to reduced inhibition. Thus, high-impulsive and low-anxious personalities are both prone to risky and disinhibited behavior in approach-avoidance conflicts. Characterized by disinhibition and risk-taking, psychopathy has been hypothesized by Lykken (1957) to result from low fear, as a core emotional marker. Although fear and anxiety represent different constructs (Gray, 1987), Lykken (1995) used Gray's model for underpinning differences between primary and secondary psychopathy. Lykken suggests that primary psychopathy is associated with a hyporeactive, weak BIS and normal (i.e., average) BAS. Fowles (1980) similarly points to the role of the BIS in primary psychopathy. In contrast, Lykken (1995) views secondary psychopathy as resulting from an overactive BAS, but normal BIS.

Following these theorists, Newman et al. (2005) proposed that long-standing operationalizations of primary and secondary psychopathy using the Psychopathy Checklist-Revised (PCL-R;

¹ In this study, we focused on Gray's original BIS/BAS model, which was the focus of Newman et al.'s (2005) study, rather than the revised Response Sensitivity Theory proposed by Gray and McNaughton (2000).

Hare, 1991) combined with scores on the Welsh Anxiety Scale (WAS) might be supported by differential associations between psychopathic groups and Gray's BIS and BAS dimensions. Using a median split on the WAS, Newman et al. (2005) classified high PCL-R and low WAS scorers as primary psychopaths. In contrast, high PCL-R and high WAS scorers were classified as secondary psychopaths. Compared with other offenders, primary psychopaths exhibited an underactive BIS and normal BAS; secondary psychopaths exhibited an overactive BAS and modestly overactive BIS. However, unpredicted findings for a weakened BIS in the secondary psychopathy control group and overactive BIS in the primary psychopathy comparison group may point to a methodological weakness using anxiety, in part, to determine psychopathic groups. Nonetheless, we know of no other studies specifically addressing the role of the BIS and BAS in psychopathy.

3. Current study

Although the PCL-R remains the gold-standard in psychopathy measurement, researchers have pointed to the "... strong need for empirical research to address the validity of alternative methods for identifying primary and secondary psychopathy" (p. 320; Newman et al., 2005). Because any single measure of a construct is contaminated by measurement error (Cronbach & Meehl, 1955), we used a multi-measure approach to assess the constructs of primary and secondary psychopathy. Similarly, we also used a multi-measure approach in determining individual differences in standing on the BIS/BAS constructs. For both sets of measures (e.g., psychopathy and the BIS/BAS), we used factor analysis to determine the latent constructs of interest. In an undergraduate sample, Carver and White's BIS and BAS scales and scales from the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) were included along with the State-Trait Anxiety Inventory (STAI) to represent Gray's BIS/BAS model. Rather than representing differences in primary and secondary psychopathy by separating high-psychopathy individuals using the WAS (or another measure of anxiety and neuroticism), we included only measures of psychopathy designed to assess either primary or secondary psychopathy. For each factor, we included four indices of primary and secondary psychopathy, embodied in four self-report scales of psychopathy: the Levenson Self-Report Psychopathy scales (LSRP; Levenson et al., 1995), the Antisocial Process Screening Device (APSD; Frick & Hare, 2001); Hare's Self-Report Psychopathy Scale – 3rd Edition (SRP-III; Paulhus, Hemphill, & Hare, in press), and the Psychopathic Personality Inventory (PPI-R; Lilienfeld & Widows, 2005). As predicted by Fowles (1980), Lykken (1995), and Newman et al., we hypothesized that primary psychopathy would be associated with a weak BIS. Like Lykken and Newman et al., we also believed that a strong BAS would be associated with secondary psychopathy.

4. Method

4.1. Participants

The initial study sample consisted of 337 undergraduate students from the Jaume I University (Castellón, Spain). To eliminate invalid test profiles, we employed the following exclusionary cri-

teria for the PPI-R: Cannot Say >5 and scores > 3.0 standard deviations above the mean on Deviant Responding, Inconsistency (10 item pairs), or Inconsistency-40 (40 item pairs) from the PPI-R. This procedure excluded 11 participants. The final sample had 182 female (55.8%) and 144 male (44.2%) students (Mean age = 20.3; Sd = 2.8).

5. Measures

5.1. Gray's behavioral inhibition and activation systems

Behavioral Inhibition and Activation Scales (BIS/BAS; Carver & White, 1994). The BIS/BAS scales are a 20-item questionnaire designed to measure the sensitivity of these two motivational systems. The BIS scale consists of 7 items measuring apprehensive anticipation (e.g., “I worry about making mistakes”). In addition, the BAS is composed of three subscales: Drive (4 items; e.g., “When I want something, I usually go all-out to get it”); Fun-Seeking (4 items; e.g., “I often act on the spur of the moment”); Reward Responsiveness (5 items; e.g., “When I get something I want, I feel excited and energized”). All items are Likert scaled (4 points) with anchors of “strongly agree” (4) and “strongly disagree” (1). This instrument has shown adequate reliability, a replicable factor structure, and convergent and discriminant validity (Campbell-Sills, Liverant, & Brown, 2004). Coefficient alpha was .74 for BIS, .59 for BAS – Reward Responsiveness, .70 for BAS – Drive, and .66 for BAS – Fun-Seeking in the current study.

Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ; Torrubia, Ávila, Moltó, & Caseras, 2001). The SPSRQ is a 48 yes/no response item questionnaire containing two scales: Sensitivity to Punishment (SP; 24-items; e.g., “Comparing yourself to people you know, are you afraid of many things?”), and Sensitivity to Reward (SR; 24 items; e.g., “Do you generally give preference to those activities that imply an immediate gain?”). Coefficient alpha was .86 for the SR and .79 for the SP scales.

Spielberger's Trait Anxiety Scale (STAI-T; Spielberger, Gorsuch, & Luschene, 1970). The STAI-T has 20 items measuring trait anxiety as a general aspect of personality (e.g., “I try to avoid facing a crisis or difficulty”). Each item is rated in a Likert scale, ranging from 1 (“almost never”) to 4 (“almost always”), with higher scores indicating higher level of anxiety. Coefficient alpha was .89 for the trait scale.

5.2. Psychopathy indices

Antisocial Processes Screening Device (APSD; Frick & Hare, 2001). The APSD is a 20-item measure that was created to assess the construct of psychopathy indexed in the PCL-R in an instrument suitable for children and adolescents. Like the PCL-R, each item is scored on a 0 (*not at all true*) to 2 (*definitely true*) scale. Six items comprise the Callous/Unemotional traits scale (coefficient alpha = .54), and ten items comprise the Impulsive/Conduct problems scale (coefficient alpha = .64). Participant self-ratings on Callous/Unemotional traits are inversely related to empathy and fearfulness (Pardini, Lochman, & Frick, 2003) whereas self-ratings of Impulsive/Conduct problems have been associated with behavioral dysregulation (Pardini et al., 2003). The three-factor solution published in Frick, Bodin, and Barry (2000), as cited in Benning,

Patrick, Salekin, & Leistico, 2005) was not used because of the unacceptably low congruence coefficient that was reported for Impulsivity (.68), indicating factor over-extraction (cf. Benning et al., 2005). ASPD Callous/Unemotionality was used as an observed index of primary psychopathy whereas ASPD Impulsive/Conduct Problems was used as an observed index of secondary psychopathy.

Levenson Self-Report Psychopathy (LSRP) Scales (Levenson et al., 1995). The LSRP is a 26-item measure, developed to assess psychopathic attitudes and beliefs via self-report. Numerous studies support the factor structure, reliability, and validity of the LSRP (Brinkley et al., 2001; Levenson et al., 1995; Lynam et al., 1999; Ross, Lutz, & Bailley, 2004). Additionally, the Spanish adaptation exhibits a comparable factor structure, mean scores, and validity vis-à-vis psychopathy-related measures and established nomological networks (e.g., the Five Factor Model; Costa & McCrae, 1992) of personality (see Ross, Moltó et al., under review). Two subscales are designed to measure both factors of the PCL-R in noninstitutionalized young adults. The primary psychopathy subscale consists of 16 items measuring an inclination to lie, lack of remorse, callousness, and manipulateness (sample item = “I enjoy manipulating other people’s feelings”). Coefficient alpha for the current sample was .83. The secondary psychopathy subscale consists of 10 items measuring impulsivity, frustration tolerance, quick-temperedness, and lack of long-term goals (sample item = “I find myself in the same kinds of trouble, time after time”). Coefficient alpha in the current sample was .65.

Hare Self-Report Psychopathy Scale-III (SRP-III) (Paulhus et al., in press). The SRP-III is a 40 item experimental self-report measure of psychopathy that was designed to measure the construct as embodied in the PCL-R. Each item is scored on a 1 (*disagree strongly*) to 5 (*agree strongly*) rating scale. We were particularly interested in including the SRP-III as it has subscales mapping onto Hare’s (2003) recently advanced four-facet model of psychopathy. The four SRP-III subscales are Criminal Tendencies (corresponding to Antisocial Behavior), Erratic Lifestyle, Interpersonal Manipulation, and Callous Affect. Summing scores for Interpersonal Manipulation and Callous Affect results in a score corresponding to the PCL-R Factor 1 (primary psychopathy). Similarly, summing scores for Criminal Tendencies and Erratic Lifestyle allows for determining a Factor 2 score, meant to correspond to the PCL-R Factor 2 (secondary psychopathy). In the current study, we included a Spanish translation of the SRP-III (Ross et al., in preparation). The Spanish SRP-III yields a similar four-factor structure and external correlates with the NEO Five Factor Inventory (Costa & McCrae, 1992) closely resembling findings by Williams, Paulhus, and Hare (2007) in a North American sample. Coefficient alphas for the four subscales in this sample were .81 for Criminal Tendencies, .81 for Erratic Lifestyle, .81 for Interpersonal Manipulation, .64 for Callous Affect, and .90 for the total score.

Psychopathic Personality Inventory-Revised (PPI-R) (Lilienfeld & Widows, 2005). The PPI-R is a 154-item measure developed as a self-report assessment of the core personality traits of psychopathy. Items are answered using a four-point Likert scale ranging from 1 (false) to 4 (true). The PPI-R yields a total psychopathy index, as well as scores on eight subscales (e.g., Blame Externalization, Machiavellian Egocentricity). The PPI-R also includes four validity scales: the Virtuous Responding, Deviant Responding, and the Inconsistent Responding-15 and Inconsistent Responding-40 Scales. Lilienfeld and Widows (2005) report high internal consistency for the PPI-R total score, ranging from .92 to .84, and for the eight PPI-R subscales, from .87 for Social Influence and Fearlessness in college students to .71 for the same PPI-R subscales in offenders.

For our Spanish adaptation, coefficient alpha for the PPI-R total score ranged from .87 for Fearlessness to .82 for Coldheartedness. Additionally, Benning et al. (2003) have recently reported a two-factor solution for the original PPI with the Coldheartedness subscale loading on an orphan factor. This two-factor solution, which has been replicated in the revision of the PPI-R (Lilienfeld & Widows, 2005), was the level of analysis chosen for this measure.

5.3. Procedure

Student volunteers were solicited from courses across multiple disciplines. Student volunteers completed measures in small group sessions of 20–40 students. All participants completed Spanish adaptations of the STAI-T, SPSRQ, and BIS/BAS scales as measures of Gray's two-factor model. In addition, participants also completed Spanish adaptations of the APSD, LSRP, SRP-III, and PPI-R. To minimize the potential influence of response biases, anonymity was emphasized by a random code appearing at the top of each measure. All participants were informed of their rights as a research participant, gave written consent, and provided with monetary remuneration for their time.

5.4. Data analysis

Consistent with the approach of Pastor et al. (2007), we determine composite indices based on factor analysis for the BIS and BAS constructs. The STAI-T, BIS, and SP scales were included to represent behavioral inhibition, whereas the three BAS subscales and SR scale were included to represent behavioral activation (see Pastor et al., 2007). We used two approaches to the representation of primary and secondary psychopathy in this study. One was at the scale level for each measure of psychopathy (e.g., LSRP, PPI-R) examined. Primary psychopathy was represented by PPI-R I (Fearless Dominance), SRP-III Factor 1, LSRP primary psychopathy, and the Callous/Unemotional dimension of the APSD. Secondary psychopathy was represented by PPI-R II (Self-Centered Impulsivity), SRP-III Factor 2, LSRP secondary psychopathy scale, and the Impulsive/Conduct Problems dimension of the APSD. For the PPI-R, we computed scores for Fearless Dominance (as primary psychopathy) and Self-Centered Impulsivity (as secondary psychopathy), according to the approach described in Benning et al. (2003) and Benning et al. (2005).

Secondly, to represent the constructs of primary and secondary psychopathy across measures, we conducted a second factor analysis including only psychopathy indices.² This method allowed us to minimize systematic error in the measurement of primary and secondary psychopathy, idiosyncratic to any one particular measure of the construct. Finally, to test our major hypotheses regarding the differential relationships between primary and secondary psychopathy with BIS and BAS dimensions, zero-order correlations for individual psychopathy indices and regression-based factor scores representing the composite primary and secondary dimensions, with composite BIS and BAS regression-based factor scores, were determined.

² Although we could have included Coldheartedness, which has repeatedly been shown to represent a third dimension in factor analyses of the PPI (Benning et al., 2003; Ross, Moltó et al., under review), we chose to include only the two first factors of the PPI and PPI-R (Lilienfeld & Widows, 2005), believed to represent primary and secondary features of psychopathy, respectively (Ross, Benning, Thompson, & Thurston, under review).

6. Results

6.1. Factor analysis of BIS/BAS measures

Using multiple measures to represent each construct, we conducted a common factor analysis (e.g., principal axis factoring) of BIS and BAS indices. The scree plot and absolute values for eigenvalues indicated a two-factor solution (Gorsuch, 1983). Per Gray's theory, a varimax rotation was used because the BIS and BAS are theoretically independent constructs.³ The first factor was marked by BIS indices of the BIS scale, STAI-T, and SP scales (see Table 1) with an eigenvalue of 2.35 and accounted for 26.8% of the variance and covariance among indices. The second factor was marked by BAS indices of Drive, Fun-Seeking, Reward Dependence and SR scales with an eigenvalue of 1.87 and accounted for 18.5% of the variance. Eigenvalues for the third, fourth, and fifth factors were .92, .65, and .50.

6.2. Factor analysis of psychopathy measures

Similarly, we also used common factor analysis to provide a composite index of primary and secondary psychopathy. Scree plot and eigenvalues (>1.0) indicated a two-factor solution, as expected. We used a promax rotation to determine factor loadings for individual items. The advantage of using a promax rotation is that it assumes initial independence between factors but then allows for factor inter-correlation if a more parsimonious variance–covariance matrix can be obtained (cf. Benning et al., 2003). Examination of the scale loadings indicated that the first factor represented primary psychopathy with an eigenvalue of 4.37 and accounted for 50.0% of the variance. SRP-III Low Emotionality followed by PPI-R I (Fearless Dominance), LSRP Primary Psychopathy, and APSD/Callous Unemotionality marked the first factor (see Table 2). In contrast, the second factor represented secondary psychopathy with an eigenvalue of 1.13 and accounted for 9.1% of the variance. LSRP Secondary Psychopathy followed by PPI-R II (Self-Centered Impulsivity) and APSD Impulsive/Conduct Problems marked the second factor. Unexpectedly, SRP-III Social Deviance loaded on the first rather than the second factor. The first two factors were strongly correlated ($r = .67$). Eigenvalues for the third, fourth, and fifth factors were .49, .40, and .31.

6.3. Psychopathy and Gray's BIS/BAS model

Correlations between single and composite indices of primary and secondary psychopathy with BIS and BAS factor scores are reported in Table 3. With regard to individual psychopathy scales, the BIS was most strongly, negatively related to PPI-R I (Fearless Dominance) but demonstrated significant, negative relationships with all other measures of primary psychopathy. In contrast, BIS was related only to two measures of secondary psychopathy, and in opposing directions. Mean r s across domain-related psychopathy indices as well as factor scores indicated that BIS was negatively related to primary but unrelated to secondary psychopathy. For the BAS, all mea-

³ Even when an oblique rotation was used, which allows factors to correlate if it improves parsimony, these BIS and BAS factors were only correlated at $-.05$.

Table 1
Principal axis factoring analyses using varimax rotation for indices of behavioral inhibition and activation ($N = 326$)

Scale	Two-factor solution	
	Behavioral inhibition	Behavioral activation
<i>Behavioral inhibition system</i>		
Behavioral Inhibition Scale	.73	–.01
Sensitivity to Punishment	.76	–.15
Trait Anxiety Scale	.75	.16
<i>Behavioral activation system</i>		
BAS – Drive	–.08	.62
BAS – Fun-Seeking	–.04	.61
BAS – Reward Responsiveness	.23	.42
Sensitivity to Reward	–.01	.67

Factor loadings $\geq .4$ are presented in boldface.

Table 2
Principal axis factoring using promax rotation for indices of primary and secondary psychopathy ($N = 326$)

Scale	Two-factor solution	
	Factor 1	Factor 2
<i>Primary psychopathy</i>		
PPI-R I: Fearless Dominance	.66	–.19
LSRP – Primary Psychopathy	.74	–.02
SRP-III Factor 1: Low Emotionality	.87	.01
APSD: Callous/Unemotionality	.67	–.02
<i>Secondary psychopathy</i>		
PPI-R II: Self-Centered Impulsivity	.25	.74
LSRP – Secondary psychopathy	–.32	1.01
SRP-III Factor 2: Social Deviance	.50	.29
APSD: Impulsive/Conduct Problems	.38	.49

Note: Factor loadings $\geq .4$ are presented in boldface. APSD = Antisocial Processes Screening Device. LSRP = Levenson Self-Report Psychopathy Scale. PPI-R = Psychopathic Personality Inventory-Revised. SRP-III = Hare Self-Report Psychopathy Scale.

asures of psychopathy, across both primary and secondary domains, were positively correlated with BAS factor scores (range = .28 to .48). Similarly, mean r s for domain-related psychopathy indices as well as factor scores indicated largely congruent, moderate to strong effects for the BAS in primary and secondary psychopathy.

7. Discussion

Using a multi-measure approach for examining relationships between Gray's two-factor BIS/BAS model and psychopathy, we found that the BIS factor was negatively related to measures of primary psychopathy whereas the BAS factor was positively related to measures of both primary and secondary psychopathy. Although Fowles (1980) attributed psychopathy solely to a

Table 3

Correlations of behavioral inhibition and activation factors with psychopathy-related variables ($N = 326$)

Psychopathy indices	Behavioral inhibition	Behavioral activation
<i>Primary psychopathy</i>		
PPI-R I: Fearless Dominance	-.69**	.55**
LSRP – Primary Psychopathy	-.22**	.50**
SRP-III Factor 1: Low Emotionality	-.38**	.48**
APSD: Callous/Unemotionality	-.31**	.32**
Mean r	-.40**	.46**
<i>Secondary psychopathy</i>		
PPI-R II: Self-Centered Impulsivity	-.05	.52**
LSRP – Secondary psychopathy	.22**	.28**
SRP-III Factor 2: Social Deviance	-.33**	.54**
APSD: Impulsive/Conduct Problems	-.09	.51**
Mean r	-.06	.46**
<i>Psychopathy factor scores</i>		
Factor 1 (Primary) Psychopathy	-.41**	.60**
Factor 2 (Secondary) Psychopathy	.02	.50**

Note: * $p < .01$, ** $p < .001$. APSD = Antisocial Processes Screening Device. LSRP = Levenson Self-Report Psychopathy Scale. SRP-III = Hare Self-Report Psychopathy Scale. PPI-R = Psychopathic Personality Inventory-Revised. Significant differences between correlations for psychopathy indices across BIS and BAS factors using Steiger's (1980) test for differences between dependent samples are indicated in *italics*.

weak BIS, this study's results are more consistent with findings by Pickering and Gray (1999), suggesting that primary psychopathy is represented by a strong BAS as well as a weak BIS (see Blackburn, 2006). Not unlike Agreeableness in the Five Factor Model (Widiger & Lynam, 1998), robust positive associations for the BAS with primary and secondary psychopathy indices suggest that the BAS may represent a common core that cuts across the two factors of psychopathy. Further, the fact that Agreeableness reflects many features of the BAS (e.g., anger, frustration, and hostility; Carver, 2004) provides additional support for the BAS across dimensions of psychopathy. Similarly, common associations of the Extraversion facet of Excitement-Seeking (representing an increased appetitive drive) across indices of primary and secondary psychopathy (see Ross et al., 2004) are also indicative of the broader role of the BAS in psychopathy.

In contrast, the BIS may represent a factor that distinguishes between primary and secondary psychopathy in Gray's model. Reflecting low trait anxiety, weakened BIS appears to reflect a core feature of primary psychopathy in original writings by Cleckley (1941/1976). The issue of anxiety in psychopathy has been controversial with some studies finding negative relationships with PCL-R factor 1 and positive with factor 2 (Harpur et al., 1989), and others reporting no relationship (Schmitt & Newman, 1999). However, we found a weakened BIS associated with factor analytic representations for primary but not secondary psychopathy. As Fowles and Dindo (2006) point out, "... at least until recently, Gray regarded anxiety as the core of the BIS". Consequently, current findings indicating an underactive BIS in primary psychopathy – using no explicit means to identify low-anxious psychopaths – clearly support a low-anxious construal of the primary psychopathy construct, as originally described by Cleckley.

Although differences between our findings and those of Newman et al. (2005) may partly rest in the use of anxiety scales (e.g., the WAS) to differentiate psychopathic types by Newman et al., it is more likely that other factors account for differences in BAS activity for primary psychopathy between studies. Two notable points of departure include the basic means of determining psychopathy as well as the nature of the study samples. In the current study, participants were chosen from community-dwelling young adults enrolled in university courses. This inclusion method may have diminished the power of the confound of antisociality, ubiquitous (75–85% of inmates) in prison settings (Hare, 1991). Although diminished by using a subclinical sample, common relationships between psychopathy dimensions and the BAS may, in part, reflect common ‘antisocial’ or factor 2 variance *shared* between study measures of primary and secondary psychopathy. After all, both factors were highly inter-correlated. Consequently, future studies should attempt to partial out such common variance in examining the unique relationships of primary and secondary psychopathy vis-à-vis Gray’s dimensions.

Acknowledgement

This study was supported by Grants from the William H. Asher and Mellon Sabbatical Supplemental Funds from DePauw University, by Grant GV-06I197/03 from the Generalitat Valenciana, and by Grant 05I005/09 from the Convenio Universidad Jaume I-Fundación Caixa Castelló. This research was also partially supported by Grant SEJ2004-06168/PSIC from the Ministerio de Ciencia y Tecnología.

References

- Benning, S. D., Patrick, C. J., Hicks, B. M., Blonigen, D. M., & Krueger, R. F. (2003). Factor structure of the Psychopathic Personality Inventory: Validity and implications for clinical assessment. *Psychological Assessment*, *15*, 340–350.
- Benning, S. D., Patrick, C. J., Salekin, R. T., & Leistico, A. R. (2005). Convergent and discriminant validity of psychopathy factors assessed via self-report: A comparison of three instruments. *Assessment*, *12*, 270–289.
- Blackburn, R. (2006). Other theoretical models of psychopathy. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp. 35–57). New York: Guilford.
- Brinkley, C. A., Schmitt, W. A., Smith, S. S., & Newman, J. P. (2001). Construct validation of a self-report psychopathy scale: Does Levenson’s self-report psychopathy scale measure the same constructs as Hare’s psychopathy checklist-revised?. *Personality and Individual Differences* *31*, 1021–1038.
- Campbell-Sills, L., Liverant, G. I., & Brown, T. A. (2004). Psychometric evaluation of the Behavioral Inhibition/Behavioral Activation Scales in a large sample of outpatients with anxiety and mood disorders. *Psychological Assessment*, *16*, 244–254.
- Carver, C. S. (2004). Negative affects deriving from the behavioral approach system. *Emotion*, *4*, 3–22.
- 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*, 319–334.
- Cleckley, H. (1941/1976). *The mask of sanity* (5th ed.). St. Louis, MO: Mosby.
- Cooke, D. J., & Michie, C. (2001). Refining the construct of psychopathy: Towards a hierarchical model. *Psychological Assessment*, *13*, 171–188.
- Costa, P. T., & McCrae, R. R. (1992). *NEO PI-R professional manual*. Lutz, FL: PAR.
- Cronbach, L. J., & Meehl, P. E. (1955). Construct validity in psychological tests. *Psychological Bulletin*, *52*, 281–302.

- Fowles, D. C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity, and psychopathy. *Psychophysiology*, *17*, 87–104.
- Fowles, D. C. (1988). Psychophysiology and psychopathology: A motivational approach. *Psychophysiology*, *25*, 373–391.
- Fowles, D. C., & Dindo, L. (2006). A dual-deficit model of psychopathy. In C. J. Patrick (Ed.), *Handbook of Psychopathy* (pp. 14–34). New York: Guilford Press.
- Frick, P. J., & Hare, R. D. (2001). *The antisocial process screening device (APSD)*. Toronto: Multi-Health Systems.
- Gorsuch, R. L. (1983). *Factor analysis* (2nd ed.). Hillsdale, NJ: LEA.
- Gray, J. A. (1970). The psychophysiological basis of introversion-extraversion. *Behaviour Research and Therapy*, *8*, 249–266.
- Gray, J. A. (1987). *The psychology of fear and stress*. New York: Cambridge University.
- Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: an enquiry into the functions of the septo-hippocampal system*. Oxford: Oxford University Press.
- Hare, R. D. (1991). *Manual for the hare psychopathy checklist-revised*. Toronto, Ontario: Multi-Health Systems.
- Hare, R. D. (2003). *The hare psychopathy checklist-revised* (2nd ed.). Toronto, Ontario: Multi-Health Systems.
- Harpur, T. J., Hare, R. D., & Hakstian, A. R. (1989). Two-factor conceptualization of psychopathy: Construct validity and assessment implications. *Psychological Assessment*, *1*, 6–17.
- Karpman, B. (1941). On the need for separating psychopathy into two distinct clinical types: symptomatic and idiopathic. *Journal of Criminology and Psychopathology*, *3*, 112–137.
- Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutional population. *Journal of Personality and Social Psychology*, *68*, 151–158.
- Lilienfeld, S. O., & Widows, M. R. (2005). *The psychopathic personality inventory-revised (PPI-R) professional manual*. Lutz, FL: PAR.
- Lykken, D. T. (1957). A study of anxiety in the sociopathic personality. *Journal of Abnormal and Social Psychology*, *55*, 6–10.
- Lykken, D. T. (1995). *The antisocial personalities*. Hillsdale, NJ: LEA.
- Lynam, D. R., Whiteside, S., & Jones, S. (1999). Self-reported psychopathy: A validation study. *Journal of Personality Assessment*, *73*, 110–132.
- 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.
- Pardini, D. A., Lochman, J. E., & Frick, P. J. (2003). Callous/unemotional traits and social-cognitive processes in adjudicated youths. *Journal of the American Academy of Child and Adolescent Psychiatry*, *42*, 364–371.
- Pastor, M. C., Ross, S. R., Segarra, P., Montañés, S., Poy, R., & Moltó, J. (2007). Behavioral inhibition and activation dimensions: Relationship to MMPI-2 indices of personality disorder. *Personality and Individual Differences*, *42*, 235–245.
- Paulhus, D. L., Hemphill, J. F., & Hare, R. D. (in press). Scoring manual for the Hare Self-Report Psychopathy Scale-III. Toronto: Multi-Health Systems.
- Pickering, A. D., & Gray, J. A. (1999). The neuroscience of personality. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 277–300). New York: Guilford.
- Ross, S. R., Moltó, J., Poy, R., Pastor, M. C., Tormo, M.P., & Lopez, R. (in preparation). Validation of a Spanish adaptation of the Hare Self-Report Psychopathy Scale-III (SRP-III) in students and offenders.
- Ross, S.R., Benning, S.D., Thompson, A., & Thurston, A. (under review). Factors of the Psychopathic Personality Inventory: Criterion-Related Validity and Relationship to the BIS/BAS and Five-Factor Models of Personality.
- Ross, S. R., Moltó, J., Poy, R., Pastor, M. C., Segarra, P., & Montañés, S. (under review). The Levenson Self-Report Psychopathy Scale (LSRP): Cross-cultural validation in Spanish students and prison offenders. *Journal of Personality Assessment*.
- Ross, S. R., Lutz, C. J., & Bailey, S. E. (2004). Psychopathy and the Five-Factor Model in a noninstitutionalized sample: A domain and facet level analysis. *Journal of Psychopathology & Behavioral Assessment*, *26*, 213–222.
- Schmitt, W. A., & Newman, J. P. (1999). Are all psychopathic individuals low-anxious? *Journal of Abnormal Psychology*, *108*, 353–358.

- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto: Consulting Psychologist Press.
- Steiger, J. H. (1980). Tests for comparing elements of a correlation matrix. *Psychological Bulletin*, 87, 245–251.
- Torrubia, R., Ávila, C., Moltó, J., & Caseras, X. (2001). The Sensitivity to Punishment and Sensitivity to Reward Questionnaire as a measure of Gray's anxiety and impulsivity dimensions. *Personality and Individual Differences*, 29, 837–862.
- Widiger, T. A., & Lynam, D. R. (1998). Psychopathy and the five-factor model of personality. In T. Millon & E. Simonsen (Eds.), *Psychopathy: Antisocial, criminal, and violent behavior* (pp. 171–187). New York: Guilford Press.
- Williams, K., Paulhus, D., & Hare, R. D. (2007). Capturing the four-factor model of psychopathy in college students via self-report. *Journal of Personality Assessment*, 88, 205–219.