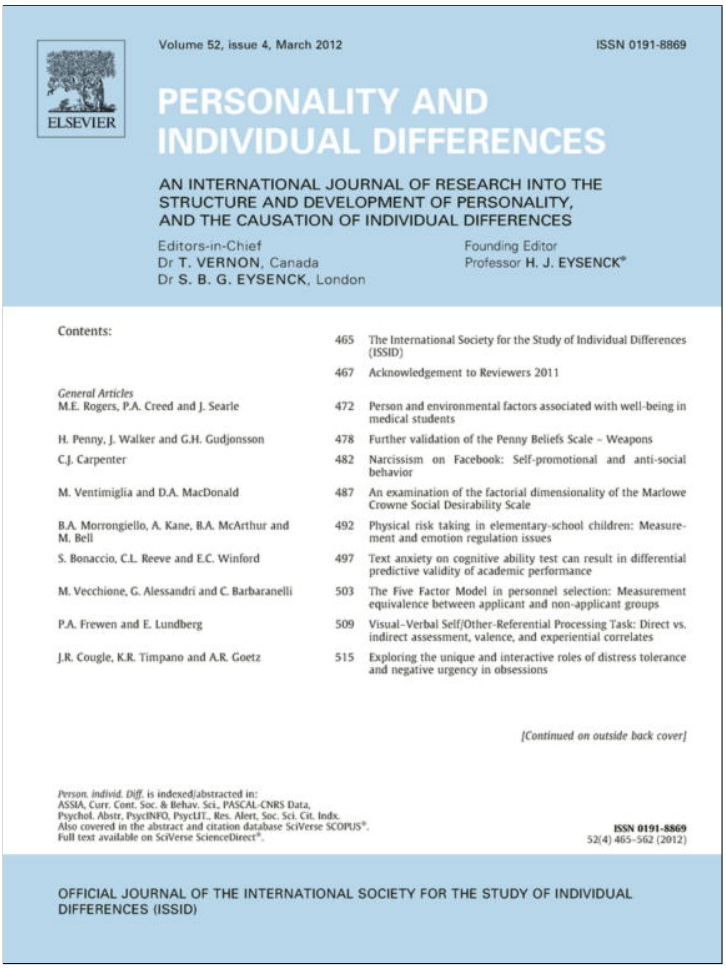

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# Throwing light on the dark side of personality: Reinforcement sensitivity theory and primary/secondary psychopathy in a student population

Katie A. Hughes [a], Roger A. Moore [a], Paul H. Morris [a], Philip J. Corr [b,*]

[a] Department of Psychology, Portsmouth University, Portsmouth PO1 2UP, United Kingdom
[b] School of Psychology, University of East Anglia, Norwich Research Park, Norwich, NR4 7TJ, United Kingdom

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ABSTRACT

In a student sample, we examined two major issues in relation to primary/secondary subtypes of psychopathy and the reinforcement sensitivity theory of personality: the roles played by (a) fear (related to the fight-flight-freeze system, FFFS) and anxiety (related to the behavioural inhibition system, BIS), and (b) different aspects of the behavioural approach system (BAS). Largely consistent with Corr's (2010a) proposal concerning the neuropsychological deficits associated with the psychoticism–psychopathy continuum, results confirmed that low BIS activity was associated with both primary and secondary psychopathy; whereas low FFFS activity was associated with only primary psychopathy. In relation to the BAS, reward sensitivity and drive were positively related to primary psychopathy; whereas Fun Seeking was negatively related to primary psychopathy but positively related to secondary psychopathy. These results represent a more nuanced picture of FFFS/BIS/BAS and dispositional psychopathy in a student sample. Specifically, they challenge the view that low BIS is preferentially associated with primary psychopathy and a high BAS is preferentially associated with secondary psychopathy. Further work is needed to confirm that these findings extend to clinical and forensic psychopathy populations.



## 1. Introduction

The relationship between normal factors of personality and clinical/forensic psychopathy has been intensively researched within a dimensional model of personality and psychopathology. Study of diagnosed (often incarcerated) psychopaths is valuable but so too is the study of non-clinical/forensic samples in the general population. These latter samples provide important information on how normal personality segues to pathological types. Characteristics of psychopathy are well known, comprising extremes of egocentricity, lack of remorse, inability to learn from negative consequences, and impulsive and maladaptive behaviour. Tacit in this characterisation is the existence of emotional, motivational and learning deficits, as well as more 'character' flaws. Indeed, as noted by Corr (2010a), it is possible that there are individuals with all the core neuropsychological deficits of the psychopath but none of the other morbid features (e.g., need for control, sexual predation, and aggression). Arguably, such individuals would be high on the normal dimension of psychoticism. As noted by Roose, Bijttebier, Claes, and Lilienfeld (2011), psychopathy-like traits are evident from early adulthood and, along with personality traits in general, develop via interactions between temperament and the environment (Rothbart, 2007). Therefore, measuring traits in community samples of young people is appropriate for understanding the developmental roots of later personality, including its pathological varieties.

The current research is a follow-up of the theoretical proposal of Corr (2010a) who developed a neuropsychological model of the 'psychoticism–psychopathy dimension': implicit in this proposal is the claim that the normal dimension of psychoticism and the clinical/forensic types of psychopathy have common neuropsychological roots.

One fecund area of psychopathy research has been Gray's (1987) reinforcement sensitivity theory (RST) of personality (notably, Fowles, 1980; Lykken, 1995), which in its revised form postulates three major neuropsychological systems: one positive, the behavioural approach system (BAS); and two negative, the fight-flight-freeze-system (FFFS) and the behavioural inhibition system (BIS) (Gray & McNaughton, 2000). The BAS is activated by appetitive stimuli; the FFFS by aversive stimuli; and the BIS by conflicting stimuli (e.g., co-activation of FFFS and BAS). Before discussing the roles played by RST constructs, it is important to differentiate two forms of psychopathy.

It has long been recognised that, at least, two types of psychopathy exist, namely primary and secondary (Karpman, 1941, 1949). Primary psychopathy is related to innate fearlessness and impaired socialisation. In contrast, secondary psychopathy is related to neuroticism and susceptible to depression, anxiety and guilt (Karpman,

* Corresponding author.
*E-mail address:* p.corr@uea.ac.uk (P.J. Corr).

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1948). Unlike primary psychopaths, those of the secondary type are thought to have an adequately developed conscience as well as the capacity for empathy. Their reckless behaviour is assumed to be mediated by hyperactive reward sensitivity rather than fearlessness per se. Evidence supports this two-type differentiation (Blackburn, 1979; Hare, 1970; for a discussion, see Dolan et al. (in press)).

Perhaps the best developed theory of the relations between RST and psychopathy types is Lykken's (1995). His theory relates primary psychopathy to a weak BIS and a normal BAS, and secondary psychopathy to a strong BAS and a normal BIS. According to this theory, secondary psychopathy behaviour results from stronger than normal responses to reward. In contrast, primary psychopathy behaviour is a reflection of disinhibition in the face of potential threats and cues of punishment. Corr (2010a) provided a summary of the extant literature: primary psychopathy is often associated with low fear and anxiety, whereas secondary psychopathy is often associated with high BAS scores, especially on the Fun Seeking (impulsivity) factor.

Now, revised RST (Gray & McNaughton, 2000; McNaughton & Corr, 2004, 2008; for a summary, see Corr, 2008, 2009) has amended the FFFS and BIS. Especially, the BIS is no longer sensitive to aversive stimuli per se, which is the primary role of the FFFS. In revised RST, the BIS is related to anxiety and the FFFS to fear. This new conceptualisation presents a problem for the extant RST–psychopathy literature. Although Lykken's theory relates primary psychopathy to a lack of fear, it has often been measured by various BIS (i.e., anxiety-related) measures. Thus, there remains confusion over the roles played by fear and anxiety in the two psychopathy subtypes. In addition, there are also questions concerning the associations of different components of reward sensitivity with primary psychopathy: primary psychopathy seems to be motivated by reward sensitivity too. This confusion is manifest in current debates in the psychopathy literature (e.g., Newman & Malterer, 2009; Poythress, Skeem, Lilienfeld, Douglas, & Edens, 2009; Poythress et al., 2008). In the light of revised RST, the aim of this article is to throw new empirical lights on these dark corners of psychopathy research.

Several studies have examined relations between traits of psychopathy and BIS/BAS sensitivity (for a summary, see Bijttebier, Beck, Claes, & Belguim, 2009). Of these studies, three used community samples of undergraduates (Hundt, Kimbrel, Mitchell, & Nelson-Gray, 2008; Kimbrel, Nelson-Gray, & Mitchell, 2007; Ross et al., 2007) and two used both undergraduates and inmates (Ross, Benning, Patrick, Thompson, & Thurston, 2009; Uzieblo, Verschuere, & Crombez, 2007). In all studies, BAS sensitivity (either as a global measure or aspects of it) was positively related to both types of psychopathy. These results stand in contrast to previous work on psychopathic inmates, where a general absence of heightened BAS is found among primary psychopaths. However, this result might be due to the fact that the comparison groups have been non-psychopathic inmates, who might also have elevated levels of the BAS as compared with the general population (Kimbrel et al., 2007).

Very few studies have differentiated FFFS: fear and BIS:anxiety when investigating RST relations. Following the theoretical rationale provided by Corr (2010a), one recent exception has been Roose et al. (2011) who examined a three-factor model of psychopathy. They found that a callous and unemotional (CU) factor was negatively related to the FFFS/fear, BIS/anxiety and BAS-Reward Responsiveness – this CU–FFFS association seemed to be mediated by the BIS. The manipulative/narcissism (MN) factor was positively related to BAS Drive and Reward-Responsiveness. These two factors are similar to primary psychopathy – the different findings for BAS Reward Responsiveness suggests that the relationship between primary psychopathy and this BAS factor may depend on the specific content of the psychopathy measures (i.e., the balance of CU/MN items). In contrast, a factor more related to secondary psychopathy, impulsivity/irresponsibility (II), was positively related to BAS Drive and Fun-Seeking.

On the basis of a review of the literature and postulation of a neuropsychological model of core deficits in psychopathy, Corr (2010a) hypothesized: (a) that psychopathy, of all types, is related to a dysfunctional BIS; (b) that primary psychopathy is related to low fear; (3) and that secondary psychopathy is related to an overactive BAS, especially the Fun-Seeking (impulsivity) factor. Concerning primary psychopathy it was noted that there is evidence for an overactive BAS too, as evidenced by their predatory, goal planning behaviour (i.e., they have BAS 'drive' and appear to be reward sensitive); however, it was not clear which of the sub-scales of the BAS may be implicated.

Concerning the BIS, in revised RST, it is a widely distributed neural system, with different processes and subsystems. It is no longer possible to see the low/high BIS activity as relating simply to low/high anxiety. It is quite possible that an underactive BIS produces a failure to detect goal-conflict and initiate the processes involved in risk assessment and resolution of this conflict. This failure may, via instrumental consequences, lead to the experience of aversive stimuli and thus the induction of negative emotions. Therefore, it is not a contradiction to say that an underactive BIS can lead to heightened negative emotional experiences. (For a discussion of the fractionation of the BIS, see Corr, 2010b, 2011.)

### 1.1. Predictions

It was predicted that dispositional measures of both primary and secondary psychopathy would be associated with an underactive BIS, leading: (a) to failure to detect goal-conflict, and (b) to a failure to modify behaviour and learn from experience. In addition, it was predicted that primary psychopathy would be further characterised by low fear (FFFS), and secondary psychopathy would be further characterised by high BAS Fun Seeking. Given the previous literature, associations between primary psychopathy and components of the BAS were expected, and these were examined in an exploratory manner.

## 2. Method

### 2.1. Participants

One hundred and ninety-two (84 male) participants (mean age 22, SD = 4.7) from a UK university student population were recruited and tested.

### 2.2. Measures

#### 2.2.1. Behavioural inhibition system/behavioural activation system scales (BIS/BAS; Carver & White, 1994)

The BIS/BAS scales encompass a 20-item self-report questionnaire designed to measure the sensitivity of the BIS and BAS motivational systems. Each item is rated on a four point Likert scale ranging from 'very true for me' to 'false for me'. The BIS scale consists of 7 items which measures a participant's anticipation and response to potentially punishing events. For this study, following Heym, Ferguson, and Lawrence (2008), a two factor model of the BIS scale was used, which separated BIS-anxiety and FFFS-fear. BIS-anxiety is related to worry about failures, conflicts etc., whilst FFFS-fear is related more directly to response to anticipated punishment contingency (Heym et al., 2008). The BAS scale consists of three subscales: Drive (DR; 4 items) assessing goal directed behaviour; Fun-Seeking (FS; 4 items) assessing impulsive behaviour motivated by immediate reward; and Reward Responsiveness (RR; 5 items) measuring motivation in anticipation of *future* reward. In the present sample, Cronbach's alpha values for BIS-anxiety and FFFS-fear were, respectively, 0.88 and 0.82. For BAS-RR,

BAS-DR and BAS-FS, the coefficient alphas were, respectively, 0.45, 0.83 and 0.92. This instrument is widely used in research, has reasonable psychometric properties, and good convergent and discriminant validity (Campbell-Sills, Liverant, & Brown, 2004). (The relatively low internal reliability of the Drive scale is problematic, and may be due to the small number of items included.)

#### 2.2.2. Levenson's Self-Report Psychopathy Scale (LSRP; Levenson, Kiehl, & Fitzpatrick, 1995)

The LSRP is a self-report instrument used to assess psychopathic attitudes and beliefs in non-clinical/forensic populations. As such, as a premorbid measure, it does not measure psychopathy per se. but dispositional attitudes/beliefs that are assumed to underlie the development of full-blown psychopathy.

The LSRP has two subscales designed to measure the core affective and interpersonal features of psychopathy associated with primary psychopathy and the antisociality factors associated with secondary psychopathy. Each item is rated on a four point Likert scale with the following options: 'agree strongly', 'agree somewhat', 'disagree somewhat' and 'disagree strongly'. The primary psychopathy subscale consists of 16 items which measure such aspects as a lack of remorse, and a proclivity to manipulate and lie. The coefficient alpha in the current sample was 0.95. The second subscale measuring secondary psychopathy consists of 10 items which measure such aspects as impulsivity and lack of long-term goals. The coefficient alpha in the current sample was 0.80. There is evidence to suggest that these scales have adequate convergent validity, internal consistency and also significant test–retest reliability (Levenson et al., 1995).

### 2.3. Procedure

Individuals on a social networking website were invited to participate in the study via e-mail. All data were collated online using surveymonkey.com, a specially developed website designed for researchers to upload questionnaires and download participants' responses. Participants started the procedure by providing basic demographic information: age, sex and consent to the study. Participant identity was not recorded so that all data remained anonymous. Participants then completed Carver and Whites (1994) BIS/BAS questionnaire followed by Levenson et al. (1995) Self-Report Psychopathy questionnaire. Both questionnaires were completed in accordance with the authors' original format (i.e., the order of questions was not changed). Ethics approval was granted by the Department of Psychology, Portsmouth University.

## 3. Results

Table 1 provides the intercorrelations for all variables. First, LSRP-defined primary and secondary psychopathy scores were not significantly correlated; and neither were either scores significantly correlated with age or sex of participant. Given the high correlations between the variables, it was decided to present the results in terms of simple zero-order correlations. (In addition, when regressions were run, the final solution depended on the method of entry/removal.)

The results were fairly clear-cut and in conformity with prediction. First, BIS:anxiety negatively correlated with both subtypes of psychopathy, whereas FFFS:fear was negatively correlated only with the primary subtype. Secondly, BAS Drive and Reward sensitivity were positively correlated with primary psychopathy, and not with secondary psychopathy. Thirdly, Fun-Seeking was negatively correlated with primary, and positively correlated with secondary, psychopathy and both coefficients were high (∼.50 s).

It may also be noted that BIS:fear and BIS:anxiety were significantly correlated, which is to be expected on the basis of the reinforcement sensitivity theory of personality. Less expected was the significantly negative correlation between BIS:fear/anxiety and BAS Drive, although this association is not without theoretical explanation: BIS:fear/anxiety antagonise the BAS drive state and may segue to antagonise the longer-term BAS Drive trait. The finding that BAS Drive and Reward Responsiveness are positively correlated, and both are relatively independent of BAS Fun-Seeking, replicates previous research.

## 4. Discussion

Results are consistent with Corr's (2010a) neuropsychological model of the psychoticism–psychopathy continuum which postulates that all subtypes of psychopathy are associated with an underactive BIS (as measured by BIS:anxiety in this study), and what differentiates the primary and secondary types is that the primary type is most associated with a low level of (FFFS) fear, while the secondary psychopath is most associated with a high level of (BAS) Fun Seeking. It is noteworthy that the measure relating to primary psychopathy is lower in Fun Seeking impulsivity – it has been previously noted that the primary psychopath is often a controlled predator and does not necessarily act on impulse (Karpman, 1949; Levenson, 1993; Wells, 1988). It may also be claimed that the predatory planning often seen in primary psychopathy implicates a functionally adequate BAS, at least in terms of its goal-planning aspects. Rash impulsivity would be inimical to successful predatory behaviour.

Taken together with the results of Roose et al. (2011), discussed in the Introduction, FFFS/BIS may be preferentially related to callous and unemotional (CU) components of primary psychopathy, whereas the manipulative and narcissism (MN) components may be more related to BAS Drive and Reward-Responsiveness. In relation to secondary psychopathy, impulsivity and irresponsibility (II) components may be preferentially related to Fun-Seeking. It would be valuable in future research to take a multidimensional perspective on both primary and secondary psychopathy in order better to determine which RST constructs are preferentially related to which psychopathy component. Previous inconsistencies found between primary psychopathy and BAS (and its components) may be explained by the balance of CU and MN measured.

Our findings may cast new light on the older RST–psychopathy findings. Secondary psychopaths are 'BAS hyperactive' in impulsivity terms, but not in terms of reward drive or sensitivity. Primary psychopaths are sensitive to reward and are driven by reward, and this may provide the emotional impetus to their predatory behaviour. This pattern of effects shows that reward sensitivity and impulsivity aspects of the BAS are quite different processes (Corr, 2008). The differentiation between FFFS:fear and BIS:anxiety is important too: previous attempts to measure the low fear hypothesis by the use of BIS-related anxiety measures entered an unfortunate theoretical confound that has obscured the true relations.

Revised RST provides a parsimonious framework for integrating the various effects found with psychopathy. In particular, the association with low BIS scores is no longer inconsistent with the findings which show that psychopaths are not always insensitive to cues of punishment (for a review, see Wallace and Newman (2008)). Rather, they show deficits in their ability to shift attention to prevailing environmental contingencies when their attention has been captured by salient stimuli. In relation to this point, and cutting across both psychopathy subtypes, an impaired BIS seems to be associated with an impaired ability to switch attention and modulate responses which, in consequence, leads to a failure

**Table 1**
Intercorrelation matrix for demographic and personality variables.

| | LSRP: primary | LSRP: secondary | Gender | Age | BIS | | BAS | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Fear | Anxiety | Drive | Reward | Fun |
| Primary | – | −.036 | −.129 | .024 | −.593** | −.433** | .402** | .213** | −.523** |
| Secondary | | – | −.077 | −.013 | −.005 | −.280** | −.120 | −.080 | .550** |
| Gender | | | – | −.162* | .058 | .138 | .109 | .092 | .034 |
| Age | | | | – | −.109 | −.060 | .071 | −.006 | .004 |
| *BIS* | | | | | | | | | |
| Fear | | | | | – | .559** | −.446** | −.188** | .305** |
| Anxiety | | | | | | – | −.264** | .46 | .171* |
| *BAS* | | | | | | | | | |
| Drive | | | | | | | – | .451** | −.139 |
| Reward | | | | | | | | – | .16 |
| Fun | | | | | | | | | – |

* $p < 0.05$.
** $p < 0.01$.

to learn from exposure to aversive experiences. Revised RST argues that the BIS resolves goal-conflict by increasing, through recursive loops, the negative valence of stimuli, via activation of the FFFS, until resolution occurs either in favour of approach (if the goal-conflict was either in error or the actual/perceived threat very low) or avoidance/escape (if the threat is real and imminent). It is proposed that, for primary psychopathic individuals, the activity of the BIS is unable effectively to detect and, thus, resolve this goal-conflict; and when it does detect conflict it is not properly resolved because the FFFS is underactive. Primary psychopaths thus have two major dysfunctions: underactive BIS (goal conflict detection) and FFFS (part of goal conflict resolution).

Revised BIS theory highlights a complex BIS system. It comprises multiple sub-systems and processes, each of which can be dysfunctional. However, a significant dysfunction in one part of the BIS is highly likely to lead to overall BIS dysfunction. In particular, the inhibition of prepotent behaviour and attentional control are different processes, reflecting different levels of processing: inhibition of prepotent control is, largely, an automatic process, while attentional control requires more controlled processes (for a discussion of the distinction between automatic vs. controlled processes in RST, see Corr, 2008, 2010b). A dysfunctional BIS would fail to provide adequate and appropriate cognitive control of executive and attentional resources, sufficient to focus on salient cognitive demands. It may also, depending on the specific sub-process involved, fail to resolve BAS–FFFS conflict (or any other kind of goal-conflict), leading to a variety of emotional and behavioural consequences.

It is, therefore, proposed that psychopathy is caused by an inability of the BIS to process effectively goal-conflict between either conflicting stimuli or conflicting responses, which in consequence leads to a general failure to resolve such conflicts and, thereby, regulate behaviour by the engagement of appropriate risk assessment processes, and the scanning of memory and the environment. In the case of primary psychopathy, where predation planning is sometimes highly developed, this dysfunction would be restricted to a deficit in the switching of attention, rather than an inability to impose a brake on prepotent behaviour. Unlike primary psychopaths, who are not excessively impulsive, and assuming some form of BIS deficit, secondary psychopaths may have specific deficit in stopping prepotent behaviour, as shown by their rash impulsiveness.

An important caveat when interpreting these results is that the sample was non-clinical/forensic and, therefore, did not have a diagnosis of psychopathy. Our findings relate to *dispositions* to different aspects of primary and secondary motivational, affective and inter-personal relations. As such we might be observing the early precursors to the development of psychopathy proper – although we have no way of knowing whether any of our sample were psychopathic. Our results, therefore, cannot be related directly to clinical/forensic psychopathy. Further work is needed here. Of interest is the possibility that the patterns observed form the foundations for the *development* of psychopathy, and that different patterns of RST associations are observed in the later stages of psychopathy. One important distinction must be between community psychopaths (i.e., those who never receive a diagnosis) and those who have behaved in ways that have attracted clinical/forensic attention – it is the latter that have received most research attention. In to this RST–psychopathy mix might also be added general cognitive ability. Thus, our pre-clinical/forensic sample may be especially germane to the question of the early motivational and affective precursors to full-blown psychopathy. Some of today's students are tomorrow's psychopaths.

Other limitations of the study include the use of self-report data from students. Although this is a viable strategy, it would be important to replicate the study with clinical samples and other forms of assessment (e.g., standardised interview). In addition, our use of questionnaire measures of fear and anxiety are not unproblematic. Although the BIS scales have been decomposed into separate FFFS-related fear and BIS-related anxiety factors (e.g., Heym et al., 2008), it would be important for future research to use additional, and more robust, measures of these constructs.

## 5. Conclusion

Our findings suggest that an underactive BIS is related to both primary and secondary psychopathy: this may be viewed as a core deficit rendering psychopaths unable to detect goal conflict, resolve them, and learn from them. The differentiation of psychopathy types seems to involve a fearless-constrained form in the primary (predatory) type, and an impulsive-unconstrained form in the secondary type. Primary psychopaths seem reward sensitive and driven, but low in Fun Seeking (i.e., impulsivity); whereas, secondary psychopaths are lower in these reward sensitivity/driven traits but high in impulsive Fun Seeking. The picture painted by this study is one of a more nuanced emotional-motivation landscape of psychopathy subtypes – or, at the very least, the dispositional factors that contribute to it – and helps to explain the core neuropsychological deficits underlying manifest behaviour. In particular, the model tested here helps to reconcile previous inconsistent findings, which show that sometimes the "BIS" is related exclusively to primary psychopathy, but at other times to secondary psychopathy. As common measures of this BIS conflate revised

RST FFFS:fear and BIS:anxiety processes, these inconsistencies are to be expected and can be explained. As noted by Corr (2010a), revised RST does not provide a complete explanation of psychopathy, which entails other character dysfunctions (e.g., lack of self-directness, ego-centricity, grandiosity, schizotypical ideation, paranoia, predatory aggression), but it may have the power to throw light into some of the darker recesses of psychopathy.

## 6. Ethical statement

Ethics was approved by the Department of Psychology, University of Portsmouth, and adheres to the guidelines of the British Psychological Society.

## References


Bijttebier, P., Beck, I., Claes, L., & Belguim, L. (2009). Gray's reinforcement sensitivity theory as a framework for research on personality–psychopathology associations. *Clinical Psychology Review, 29*, 421–430.

Blackburn, R. (1979). Cortical and autonomic arousal in primary and secondary psychopaths. *Psychophysiology, 16*, 143–150.

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., & White, T. L. (1994). Behavioral inhibition, behavioural activation, and affective responses to impending reward and punishment: The BIS/BAS Scales. *Journal of Personality & Social Psychology, 67*, 319–333.

Corr, P. J. (2008). Reinforcement sensitivity theory (RST): Introduction. In P. J. Corr (Ed.), *The reinforcement sensitivity theory of personality* (pp. 1–43). Cambridge: Cambridge University Press.

Corr, P. J. (2009). The reinforcement sensitivity theory of personality. In P. J. Corr & G. Matthews (Eds.), *The Cambridge handbook of personality psychology* (pp. 347–376). Cambridge: Cambridge University Press.

Corr, P. J. (2010a). The psychoticism–psychopathy continuum: A neuropsychological model of core deficits. *Personality & Individual Differences, 48*, 695–703.

Corr, P. J. (2010b). Automatic and controlled processes in behavioural control: Implications for personality psychology (target article). *European Journal of Personality, 24*, 376–403.

Corr, P. J. (2011). Anxiety: Splitting the phenomenological atom. *Personality and Individual Differences (Special Issue: Anxiety), 50*, 889–897.

Dolan, M., Gunn, J., Kopalman, M. G., Kumari, V., Taylor, P., & Vőllm, B. (in press). Disorders of brain structure and function and crime. In J. Gunn & P. Taylor (Eds.) Forensic Psychiatry (2nd ed.). Hodder & Stoughton.

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.

Gray, J. A. (1987). *The psychology of fear and stress* (2nd ed.). Cambridge, UK: Cambridge University Press.

Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An enquiry into the functions of the septo-hippocampal system* (2nd ed.). Oxford: Oxford University Press.

Hare, R. D. (1970). *Psychopathy: Theory and research*. New York: John Wiley and Sons.

Heym, N., Ferguson, E., & Lawrence, C. (2008). An evaluation of the relationship between Gray's revised RST and Eysenck's PEN: Distinguishing BIS and FFFS in Carver and White's BIS/BAS scales. *Personality and Individual Differences, 45*, 709–715.

Hundt, N. E., Kimbrel, N. A., Mitchell, J. T., & Nelson-Gray, R. O. (2008). High BAS, but not low BIS, predicts externalising symptoms in adults. *Personality and Individual Differences, 44*, 563–573.

Karpman, B. (1941). On the need of separating psychopathy into two distinct clinical types: The symptomatic and the idiopathic. *Journal of Criminal Psychopathology, 3*, 112–137.

Karpman, B. (1948). The myth of the psychopathic personality. *American Journal of Psychiatry, 104*, 523–534.

Karpman, B. (1949). Psychopathy as a form of social parasitism – A comparative biological study. *Journal of Clinical Psychopathology, 10*, 160–194.

Kimbrel, N. A., Nelson-Gray, R. O., & Mitchell, J. T. (2007). Reinforcement sensitivity and maternal style as predictors of psychopathology. *Personality and Individual Differences, 42*, 1139–1149.

Levenson, M. R. (1993). Psychopaths are not necessarily impulsive, etc. *Theory and Psychology, 3*, 229–234.

Levenson, M. R., Kiehl, K. A., & Fitzpatrick, C. M. (1995). Assessing psychopathic attributes in a noninstitutionalized population. *Journal of Personality and Social Psychology, 68*, 151–158.

Lykken, D. T. (1995). *The antisocial personalities*. Hillsdale, NJ: Lawrence Erlbaum Associates.

McNaughton, N., & Corr, P. J. (2004). A two-dimensional view of defensive systems: Defensive distance and fear/anxiety. *Neuroscience and Biobehavioural Reviews, 28*, 285–305.

McNaughton, N., & Corr, P. J. (2008). The neuropsychology of fear and anxiety: A foundation for reinforcement sensitivity theory. In P. J. Corr (Ed.), *The reinforcement sensitivity theory of personality* (pp. 44–94). Cambridge: Cambridge University Press.

Newman, J. P., & Malterer, M. B. (2008). Problems with the BIS/BAS scales or Lykken's model of primary psychopathy: A reply to Poythress. *Personality and Individual Differences, 46*, 673–677.

Poythress, N. G., Skeem, J. L., Lilienfeld, S. O., Douglas, K. S., & Edens, J. F. (2009). Carver and White's (1994) BIS scale and Lykken's primary psychopath: A reply to Newman. *Personality and Individual Differences, 46*, 678–681.

Poythress, N. G., Skeem, J. L., Weir, J., Lilienfeld, S. O., Douglas, K. S., Edens, J. F., et al. (2008). Psychometric properties of Carver and White's (1994) BIS/BAS scales in a large sample of offenders. *Personality and Individual Differences, 45*, 732–737.

Roose, A., Bijttebier, P., Claes, L., & Lilienfeld, S. O. (2011). Psychopathic traits in adolescence. Associations with the revised reinforcement sensitivity theory systems. *Personality and Individual Differences, 50*, 201–2105.

Ross, S. R., Benning, S. D., Patrick, C. J., Thompson, A., & Thurston, A. (2009). Factors of the psychopathic personality inventory: Criterion-related validity and relationship to the BIS/BAS and five-factor models of personality. *Assessment, 16*, 71–87.

Ross, S. R., Molto, J., Poy, R., Segarra, P., Paster, M. C., & Montanes, S. (2007). Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionised young adults. *Personality and Individual Differences, 43*, 1644–1655.

Rothbart, M. K. (2007). Temperament, development, and personality. *Current Directions in Psychological Science, 16*, 207–212.

Uzieblo, K., Verschuere, B., & Crombez, G. (2007). The psychopathic personality inventory: Construct validity of the two-factor structure. *Personality and Individual Differences, 43*, 657–667.

Wallace, J. F., & Newman, J. P. (2008). RST and psychopathy: Associations between psychopathy and behavioural activation and inhibition systems. In P. J. Corr (Ed.), *The reinforcement sensitivity theory of personality* (pp. 398–414). Cambridge: Cambridge University Press.

Wells, R. (1988). A fresh look at the muddy waters of psychopathy. *Psychological Reports, 63*, 843–856.