



Contents lists available at ScienceDirect

# Personality and Individual Differences

journal homepage: [www.elsevier.com/locate/paid](http://www.elsevier.com/locate/paid)

## Psychopathic traits in adolescence: Associations with the revised Reinforcement Sensitivity Theory systems

Annelore Roose<sup>a,b</sup>, Patricia Bijttebier<sup>b,\*</sup>, Laurence Claes<sup>b</sup>, Scott O. Lilienfeld<sup>c</sup><sup>a</sup> Research Assistant of the Research Foundation, Flanders, Belgium<sup>b</sup> Department of Psychology, University of Leuven, Belgium<sup>c</sup> Department of Psychology, Emory University, Atlanta, United States

### ARTICLE INFO

#### Article history:

Received 2 August 2010

Received in revised form 21 September 2010

Accepted 22 September 2010

Available online 28 October 2010

#### Keywords:

Reinforcement Sensitivity Theory

Psychopathic traits

Adolescents

BIS/BAS scales

### ABSTRACT

The present study aims to expand work on psychopathic traits and the Reinforcement Sensitivity Theory (RST, Gray & McNaughton, 2000). We investigated the associations between BIS/BAS sensitivity and psychopathy factors – measured by means of the Antisocial Process Screening Device (APSD, Frick & Hare, 2001) and the Youth Psychopathic Traits Inventory (YPI, Andershed, Kerr, Stattin, & Levander, 2002) – in a community sample of 830 adolescents. The Callous and Unemotional (CU) factor was inversely related to the Fight Flight Freeze System (FFFS), BIS-Anxiety, and BAS Reward-Responsiveness. Moreover, the association between FFFS and CU was mediated by BIS-Anxiety. The Impulsivity/Irresponsible factor of psychopathy showed a positive association with BAS Drive and Fun-Seeking, suggesting that this factor is especially associated with disinhibited approach behavior. The Manipulative/Narcissism factor was positively related to BAS Drive and Reward-Responsiveness, suggesting that this dimension is mainly related to the tendency to pursue appetitive goals and to experience positive emotions after rewarding activities. Our results support the validity of three separable factors of psychopathy in adolescents using the constructs of the revised RST.

© 2010 Elsevier Ltd. All rights reserved.

### 1. Introduction

Psychopathy is a serious personality disorder composed of interpersonal, affective, and behavioral traits (Hare, 1991) that predicts violence, high rates of recidivism, and poor institutional adjustment (Leistico, Salekin, DeCoster, & Rogers, 2008). Until recently, most psychopathy research has been conducted in adult samples. However, there is increasing interest in childhood precursors of psychopathy (Lynam, 1996). Although it is probably premature to talk about a psychopathic disorder in childhood, certain psychopathy-like traits can be identified in childhood that predict dimensions of psychopathy in early adulthood (Loney, Taylor, Butler, & Iacono, 2007) and designate a particularly severe group of antisocial youth (Frick & White, 2008).

Consistent with the adult literature, two- and three-factor structures have been derived from youth measures of psychopathic traits. Most two-factor solutions include Callous/Deceitful and Impulsivity/Irresponsible factors (Corrado, Vincent, Hart, & Cohen, 2004; Frick, O'Brien, Wootton, & McBurnett, 1994), whereas three-factor solutions comprise Callous/Unemotional, Manipulative/Narcissistic, and Impulsive/Irresponsible factors (Forth, Kosson, & Hare, 2003; Frick, Bodin, & Barry, 2001). In youth samples, the

three-factor model is often regarded as the solution of choice (Frick, Barry, & Bodin, 2000). Personality traits in general and psychopathic traits in particular are the developmental outcome of transactional processes involving temperament and environment (Rothbart, 2007). As such, associations with temperament may be promising avenues for understanding the developmental roots of psychopathic traits.

An essential framework in the temperament literature is the Reinforcement Sensitivity Theory (RST, Gray, 1970), which posits that two primary motivational systems underlie behavior. The Behavioral Inhibition System (BIS) is activated by aversive stimuli; its activation leads to an interruption of ongoing behavior and increased arousal and attention. The Behavioral Activation System (BAS) is activated by appetitive stimuli; its activation gives rise to approach behavior. Carver and White (1994) found that BAS comprises three subscales: Reward-Responsiveness (the degree to which reward leads to positive emotions), Drive (actively pursue appetitive goals), and Fun-Seeking (impulsively engage in potentially rewarding activities). Initial explanations of psychopathy by means of the RST framework suggested that psychopaths possess a weak BIS combined with a normal BAS (Gray, 1970). Lykken (1995) extended this hypothesis by distinguishing primary from secondary psychopathy. Karpman (1941) described primary psychopaths as showing the core emotional and interpersonal features of psychopathy, and secondary psychopaths as showing pronounced

\* Corresponding author. Tel.: +32 0 16 32 59 88; fax: +32 0 16 32 59 16.

E-mail address: [Patricia.Bijttebier@psy.kuleuven.be](mailto:Patricia.Bijttebier@psy.kuleuven.be) (P. Bijttebier).

impulsivity and hostility. Lykken proposed that primary psychopathy is associated with a weak BIS and average BAS, whereas secondary psychopathy is associated with a hyperactive BAS and average BIS. In their review, Bijttebier, Beck, Claes, and Vandereycken (2009) concluded that “the available research evidence suggests that BAS hypersensitivity represents a vulnerability factor to both primary and secondary psychopathy, whereas BIS hypoactivity is specifically related to primary psychopathy” (p. 425).

However, the studies conducted thus far have important limitations. First, associations between psychopathic traits and sensitivity of the RST subsystems have been studied almost exclusively in adults or undergraduates. Given the broad consensus that psychopathy has its roots in childhood, it is difficult to ignore the importance of studying temperamental correlates of psychopathic traits in youth samples. Roose, Bijttebier, Decoene, Claes, and Frick (2010) showed that, in adolescents, the Callous/Unemotional factor is negatively related to BIS and BAS Reward-Responsiveness, but positively related to BAS Fun-Seeking and BAS Drive. These findings underscore the fact that reliance on the total BAS score could obscure differential correlates of the three BAS subscales.

Second, most studies investigating associations of RST systems with psychopathy have relied on a two-dimensional conceptualization of psychopathic traits. However, especially in youth samples, most researchers now consider the three-factor model as the solution of choice (Frick et al., 2000).

Third, none of the previous studies took into account the revised RST (Gray & McNaughton, 2000), which posits two BIS dimensions: a revised BIS (referred to as BIS-Anxiety) and a Fight Flight Freeze System (FFFS). The FFFS mediates fear and adopts the punishment system role that in the original RST was attributed to the BIS. BIS-Anxiety mediates anxiety, incorporates regulatory influences, and is responsible for the resolution of goal conflict. According to Poythress et al. (2008, p. 733), Lykken (1995) hypothesis regarding primary psychopathy should be interpreted in terms of “weak FFFS” rather than “weak BIS-Anxiety.” Corr (2010), however, argued that deficits in both FFFS and BIS-Anxiety can be expected. The former deficit would account for low fear, whereas the latter deficit would account for cognitive inflexibility and response modulation problems. Also, Heym and Lawrence (2010) demonstrated in a study of 212 undergraduates that the negative association between Psychoticism and FFFS was mediated by BIS-Anxiety. Given that psychoticism is associated with callousness and lack of empathy (Eysenck, Pearson, Easting, & Allsopp, 1985), a similar meditation hypothesis can be put forward for psychopathic traits.

Yet no instruments are designed explicitly to evaluate the BIS-Anxiety and FFFS distinction. Worth mentioning in this respect is a study in which the BIS subscale (Carver & White, 1994) was split into BIS-Anxiety and FFFS (Heym, Ferguson, & Lawrence, 2008). To our knowledge, however, no study (neither in adult nor in pre-adult samples) has investigated associations of psychopathic traits with BIS-Anxiety and FFFS sensitivity of the revised RST systems.

The present study aims to examine the associations of the three factors of psychopathic traits with BAS, BIS-Anxiety, and FFFS in adolescents. Consistent with the rationale developed by Corr (2010), we anticipated negative associations of the Callous/Unemotional factor with both FFFS and BIS-Anxiety. In addition, we will examine if BIS-Anxiety mediates the association between the Callous/Unemotional factor and FFFS. Furthermore, we hypothesized positive associations of the Impulsive/Irresponsible factor with the BAS scales, especially BAS Fun-Seeking and Drive (Bijttebier et al. 2009; Corr, 2010; Roose et al., 2010). Up until now, no study has examined the associations between the Manipulative/Narcissism factor and the RST subsystems. Given that in youth, Narcissism is more closely associated with Factor 2 than Factor 1 of psychopathy (Frick et al., 1994), we expected positive associations between the Manipulative/Narcissism factor and BAS

sensitivity and left open the possibility of negative associations between this psychopathy factor and BIS-Anxiety or FFFS sensitivity (e.g., Kelsey, Ornduff, McCann, & Reiff, 2001).

## 2. Method

### 2.1. Participants

The sample consisted of 830 Dutch-speaking adolescents between 14 and 21 years old (mean age = 16.85, SD = 1.42, 73% males). There were 455 (56% males) adolescents with a mean age of 16.67 years (range 14–20; SD = 1.34) recruited from six high schools (both rural and urban) of Flanders, Belgium (response rate: 93.9%) (sample 1). Another 375 adolescents with a mean age of 17.07 years (range 14–21; SD = 1.49) were recruited from a technical education school in Flanders, Belgium (response rate: 77.4%) (sample 2). This sample was predominantly (93%) male. There was a guided sample recruitment of primarily male participants to ensure a sufficient representation of children with mild behavior problems.<sup>1</sup>

Both samples completed the same questionnaire regarding temperamental reactivity (BIS/BAS scales), but a different measure of psychopathic traits (sample 1, the Antisocial Process Screening Device; sample 2, the Youth Psychopathic traits Inventory).

### 2.2. Measures

The Youth Psychopathic Traits Inventory (YPI, Andershed et al., 2002) consists of 50 items to be answered on a four-point rating scale. Three factors emerge: Grandiose/Manipulative (GM), Callous/Unemotional (CU) and Impulsive/Irresponsible (II). The YPI correlates strongly with other psychopathy measures and displays both high test–retest reliability and positive associations with antisocial attitudes and impulsivity (Campbell, Doucette, & French, 2009). Internal consistency, factorial validity and criterion validity of the Dutch version have been established (Hillege, Das, & de Ruiter, 2009).

The self-report version of the Antisocial Process Screening Device (APSD, Frick & Hare, 2001) consists of 20 items to be answered on a three-point rating scale. Previous factor analyses revealed a three-factor structure, comprising Impulsivity (IMP), Narcissism (NARC) and Callous-Unemotional traits (CU) (Frick et al., 2000). Self-report APSD-scores are relatively stable over 3 years in a non-referred sample and are associated with antisocial behavior (Muñoz & Frick, 2007). The reliability, factorial validity, and criterion validity of the Dutch version of the APSD have been established (Bijttebier & Decoene, 2009).

The BIS/BAS scales (Carver & White, 1994) assess individual differences in reactivity of the BIS and BAS using 24 items to be rated on a four-point rating scale. Consistent with the revised RST and a recent factor analysis by Heym et al. (2008), five subscale scores were derived: BIS-Anxiety, FFFS, BAS Reward-Responsiveness, BAS Drive and BAS Fun-Seeking. The Dutch version of the BIS/BAS scales possesses adequate reliability and construct validity (Franken, Muris, & Rassin, 2005).

### 2.3. Procedure

School approval, adolescents' oral consent, and parental written informed consent were obtained. Participation was voluntary and no incentives were given. The adolescents, overseen by research

<sup>1</sup> Analyses of the differences between samples 1 and 2 confirmed the guided sample recruitment strategy. More behavioral problems were reported by sample 2 than sample 1 [ $t(282) = -5.29, p < .001$ ] measured by the Antisocial Behavior Scale of the Social and Health Assessment (Schwab-Stone et al., 1999) as well as lower scores on BIS-FFFS [ $t(282) = 3.52, p < .001$ ] and BIS-Anxiety [ $t(282) = 4.68, p < .001$ ].

**Table 1**  
Intercorrelations between the psychopathy factors of the APSD and the YPI.

|                         | Callous/Unemotional | Impulsive/Irresponsible |
|-------------------------|---------------------|-------------------------|
| <i>YPI</i>              |                     |                         |
| Manipulative/Narcissism | .49**               | .56**                   |
| Callous/Unemotional     |                     | .43**                   |
| <i>APSD</i>             |                     |                         |
| Manipulative/Narcissism | .38**               | .52**                   |
| Callous/Unemotional     |                     | .38**                   |

APSD, Antisocial Process Screening Device; YPI, The Youth Psychopathic Traits Inventory.

\*\*  $p < .01$ .

assistants, completed the questionnaires in their classroom during regular school time.

#### 2.4. Overview of statistical analyses

The data were analyzed using SPSS version 17.0. Protocols with more than 10% missing data were excluded ( $n = 61$ ). For the remaining protocols, missing values were substituted by the mean score of the remaining items in the subscale. The three subscales of psychopathy correlated moderately to highly ( $r$ 's ranged from .38 to .56, Table 1), but also possessed sizeable unique variance. For this reason, we computed zero-order correlations as well as partial correlations controlling for the scores on the other two psychopathy subscales. The partial correlations allowed us to examine the unique relations of each psychopathy subscale with the BIS/BAS subscales. Because the samples differed in age [ $t(827) = 13.26$ ,  $p < .001$ ] and gender [ $t(827) = -4.00$ ;  $p < .001$ ] the partial correlations were also controlled for age and gender.

To address the problem of the rather low internal consistencies of some of the subscales (see Table 2), the correlations were corrected for attenuation for measurement error. Given the large number of correlations computed, we also used Bonferroni correction (by dividing  $p = .05$  by the total number of correlations examined) to minimize the chances of type I error. The correlations corrected for attenuation are shown in parentheses in Table 3 and will be interpreted in Section 3.

For examining mediation effects, we used the nonparametric, resampling method (bias-corrected bootstrap) with 5000 resamples to derive 95% confidence intervals for the indirect effect of FFFS via

**Table 2**  
Means ( $M$ ), standard deviations ( $SD$ ) and internal consistency coefficients ( $\alpha$ ) of all scales.

|                       | $M$   | $SD$ | $\alpha$ (MIC) |
|-----------------------|-------|------|----------------|
| <i>APSD</i>           |       |      |                |
| NARC                  | 4.29  | 2.58 | .67 (.23)      |
| CU                    | 3.55  | 2.08 | .55 (.17)      |
| IMP                   | 4.34  | 2.15 | .62 (.24)      |
| Total                 | 13.52 | 6.14 | .82 (.18)      |
| <i>YPI</i>            |       |      |                |
| GM                    | 0.70  | 0.49 | .90 (.31)      |
| CU                    | 0.86  | 0.37 | .80 (.21)      |
| II                    | 1.19  | 0.53 | .84 (.26)      |
| Total                 | 0.97  | .40  | .92 (.19)      |
| <i>BIS/BAS</i>        |       |      |                |
| Drive                 | 7.48  | 2.37 | .67 (.34)      |
| Fun-Seeking           | 8.43  | 1.98 | .49 (.18)      |
| Reward-Responsiveness | 12.47 | 1.79 | .51 (.17)      |
| FFFS                  | 5.26  | 1.94 | .57 (.30)      |
| BIS-Anxiety           | 7.85  | 2.42 | .66 (.33)      |

APSD, Antisocial Process Screening Device; YPI, The Youth Psychopathic Traits Inventory; BIS/BAS, Behavioral Inhibition System and Behavioral Activation System scales; IMP, Impulsivity; NARC, Narcissism; CU, Callous Unemotional; GM, Grandiose Manipulative; II, Impulsive/Irresponsible; FFFS, Fight Flight Freeze System; MIC, Mean inter-item correlation.

the hypothesized mediator (BIS-Anxiety) on the Callous/Unemotional factor (Preacher & Hayes, 2004). As control variables gender, age and the two other factors of psychopathy were included.

### 3. Results

#### 3.1. Descriptive statistics

Internal consistencies, means, and standard deviations of all measures in the correlational analyses are shown in Table 2.<sup>2</sup> All psychopathic trait measures—except the APSD CU subscale—showed (marginally) sufficient internal consistency. The low internal consistencies of the APSD CU subscale and the BAS subscales are consistent with previous findings (e.g., Falkenbach, Poythress, & Heide, 2003, for APSD; Franken et al., 2005, for BIS/BAS subscales). As expected, positive associations were found among the three BAS scales ( $r$ 's ranged from .26 to .37) as well as between both FFFS and BIS-Anxiety scales ( $r = .42$ ). The correlation between FFFS and BAS Reward-Responsiveness was non-significant ( $r = .03$ ). All other BIS-BAS correlations were significantly negative ( $r$ 's ranged from  $-.08$  to  $-.19$ ).

#### 3.2. Associations between the psychopathic trait measures and the BIS/BAS scales

The total scores of the YPI and the APSD showed positive associations with BAS Fun-Seeking and BAS Drive and negative associations with FFFS and BIS-Anxiety. No significant associations emerged for BAS Reward-Responsiveness. Bivariate correlations revealed a similar pattern of associations at the subscale level of the psychopathy measures. After partialling out the other psychopathy subscales, gender and age more distinct patterns of associations emerged, suggesting the operation of suppressor effects.

For both the APSD and YPI, the Callous/Unemotional factor was negatively associated with FFFS, BIS-Anxiety, and BAS Reward-Responsiveness. For both the YPI [ $t(372) = -5.91$ ,  $p < .0001$ ], and the APSD [ $t(452) = -7.50$ ,  $p < .0001$ ] the association with BIS-Anxiety was significantly stronger than with FFFS. The results of the bootstrapping method showed that the conditions were met to test for mediation and that for the APSD and the YPI, the indirect effects were estimated to lie between  $-.20$  and  $-.09$  and between  $-.04$  and  $-.02$ , respectively, with 95% confidence. Because zero is not in the 95% confidence interval, in both cases the indirect effect is significantly different from zero at  $p < .05$ , indicating that BIS-Anxiety mediates the relationship between CU and FFFS.

The Impulsivity/Irresponsible factor of both the YPI and the APSD showed mainly positive associations with BAS Drive and Fun-Seeking. For both the YPI [ $t(372) = -16.98$ ,  $p < .0001$ ], as for the APSD [ $t(452) = -7.40$ ,  $p < .0001$ ], the association with Fun-Seeking was significantly stronger than with Drive. For the APSD an additional negative association with FFFS emerged.

For both the YPI and the APSD, the Manipulative/Narcissism factor was positively associated with BAS Drive and Reward-Responsiveness. For the APSD, a positive association with Fun-Seeking emerged, whereas for the YPI a positive association with BIS-Anxiety emerged.

### 4. Discussion

We examined the associations of the three psychopathy factors with measures of the revised RST systems in adolescents. Zero-order correlations revealed positive associations of BAS sensitivity subscales (especially Drive and Fun-Seeking) with all three

<sup>2</sup> The internal consistencies of the BIS/BAS scales for each subsample were in the same range as that of the total sample.

**Table 3**  
Correlations between the BIS/BAS subscales and the subscales of the APSD and YPI.

|                         | Drive         |               | Fun-Seeking   |               | Reward-Responsiveness |                 | FFFS            |                 | BIS-anxiety     |                 |
|-------------------------|---------------|---------------|---------------|---------------|-----------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                         | Bivariate     | Partial       | Bivariate     | Partial       | Bivariate             | Partial         | Bivariate       | Partial         | Bivariate       | Partial         |
| <b>APSD<sup>a</sup></b> |               |               |               |               |                       |                 |                 |                 |                 |                 |
| NARC                    | .36** (.55**) | .23** (.35**) | .36** (.62**) | .14 (.24**)   | .07 (.13)             | .13 (.23**)     | -.13 (-.21**)   | .04 (.06)       | -.13 (-.19**)   | .08 (.12)       |
| CU                      | .21** (.35**) | .05 (.08)     | .25** (.48**) | .07 (.13)     | -.11 (-.22**)         | -.13 (-.26**)   | -.27** (-.47**) | -.17** (-.30**) | -.43** (-.71**) | -.37** (-.61**) |
| IMP                     | .33** (.52**) | .17** (.27**) | .46** (.83**) | .33** (.59**) | .01 (.02)             | .00 (.00)       | -.21** (-.34**) | -.11 (-.18**)   | -.22** (-.34**) | -.08 (-.12)     |
| Total                   | .40** (.55**) |               | .47** (.73**) |               | -.01 (-.02)           |                 | -.25** (-.36**) |                 | -.32** (-.43**) |                 |
| <b>YPI<sup>b</sup></b>  |               |               |               |               |                       |                 |                 |                 |                 |                 |
| GM                      | .37** (.47**) | .16 (.20**)   | .31** (.47**) | -.02 (-.03)   | .09 (.13)             | .12 (.17*)      | -.08 (-.12)     | .05 (.07)       | -.08 (-.11)     | .24** (.32**)   |
| CU                      | .28** (.37**) | .05 (.07)     | .19** (.31**) | -.10 (-.16)   | -.13 (-.19**)         | -.22** (-.33**) | -.31** (-.48**) | -.28** (-.44**) | -.48** (-.67**) | -.49** (-.69**) |
| II                      | .40** (.52**) | .24** (.31**) | .60** (.94**) | .55** (.86**) | .09 (.13)             | .10 (.15)       | -.06 (-.09)     | .04 (.06)       | -.21** (-.29**) | -.11 (-.15)     |
| Total                   | .43** (.53**) |               | .46** (.69**) |               | .03 (.04)             |                 | -.18** (-.26**) |                 | -.31** (-.40**) |                 |

Between parentheses the correlations corrected for attenuation are shown.

APSD, Antisocial Process Screening Device; YPI, The Youth Psychopathic Traits Inventory; BIS/BAS, Behavioral Inhibition System and Behavioral Activation System scales; IMP, Impulsivity; NARC, Narcissism; CU, Callous Unemotional; GM, Grandiose Manipulative; II, Impulsive/Irresponsible; FFFS, Fight Flight Freeze System.

<sup>a</sup> Based on dataset of sample 1 ( $n = 455$ ).

<sup>b</sup> Based on the dataset of sample 2 ( $n = 375$ ).

\*\*  $p < .01$  (Bonferroni corrected).

\*  $p < .05$  (Bonferroni corrected).

psychopathy factors, which is consistent with previous research (Bijttebier et al., 2009) and supports the idea that heightened BAS activity cuts across all three factors of psychopathy (Ross et al., 2007). In addition, negative associations of both the FFFS and BIS-Anxiety subscales with all three psychopathy factors emerged, albeit with the largest magnitude for the Callous/Unemotional factor.

Partial correlations revealed a more distinct pattern of associations. The Callous/Unemotional factor was inversely related to FFFS, BIS-Anxiety, and BAS Reward-Responsiveness. The negative associations with FFFS are in line with the low-fear theory, which suggest that persons with Callous/Unemotional traits are characterized by attenuated fear (Lykken, 1995). However, BIS-Anxiety mediated the relation between FFFS and the Callous/Unemotional factor. This finding is consistent with the hypothesis that the lack of fear (FFFS) often observed in psychopaths is due to a deficit of the appraisal and risk assessment mechanism (BIS-Anxiety) (Corr, 2010). It also may fit with the response modulation hypothesis of Patterson and Newman (1993), which proposes that the core deficit of individuals with psychopathic traits is a regulatory failure to shift their attention from dominant response sets in the face of goal conflicts. From this theoretical account, a negative association between BIS-Anxiety – which incorporates more regulatory influences – and psychopathic traits could be expected (Corr, 2010). The Impulsive/Irresponsible factor of psychopathy showed, as expected, a positive association with BAS, more specifically with Fun-Seeking and Drive. These findings are consistent with reports that this factor is especially associated with disinhibited approach behavior (Wallace, Malterer, & Newman, 2009). For both the YPI and the APSD, the Manipulative/Narcissism factor was positively related to BAS Drive and Reward-Responsiveness, suggesting that this factor is mainly related to the tendency to pursue appetitive goals and experience positive emotions after rewarding activities.

The results of the partial correlations for the two psychopathy questionnaires were similar, although some divergences occurred. Further research is needed to determine whether these differences reflect measurement differences, sample differences, or both.

Taken together, the results of the present study suggest several new directions concerning the conceptualization and measurement of the revised RST. Regarding BAS, the theoretical framework of the RST did not propose a multidimensional BAS concept. The three BAS subscales used in many studies derive from factor analyses of the BIS/BAS scales. Nevertheless, the pattern of differential

associations we observed supports a multidimensional conceptualization of BAS. In particular, Reward-Responsiveness yielded a different pattern of associations with the measures of psychopathic traits compared with Fun-Seeking and Drive subscales. Corr (2008) argued that the BAS function is heterogeneous and contains distinct incentive motivational and consummatory components. The former process mediates the pursuit of rewarding goals, whereas the latter mediates the enjoyment of such goals. There is evidence for the existence of distinct brain processes underlying these rewarding phenomena (Carver, 2005). The present study offers tentative evidence that the Impulsive/Irresponsible factor and the Manipulative/Narcissism factor are especially associated with the heightened incentive motivational component. The Manipulative/Narcissism factor seems also to be associated with heightened consummatory processes, whereas the Callous/Unemotional factor is associated with lowered consummatory processes.

Regarding the BIS, the conceptual basis for the distinction of facets has been established in the revised RST, but the empirical evidence for such a model is weak. Nevertheless, our results raise questions concerning the differentiation between FFFS and BIS-Anxiety. The pattern of associations of both subscales with psychopathy factors was less distinct than expected. Moreover, both subscales were moderately correlated ( $r = .42$ ), which is consistent with previous evidence (Heym et al., 2008). This finding may reflect the fact that the BIS/BAS scales (Carver & White, 1994) were developed for the original RST, which made no explicit differentiation between FFFS and BIS-Anxiety. Furthermore, the internal consistency was inadequate for several BIS/BAS subscales, which can be partly attributed to the low number of items in these subscales (five or less). Accordingly, Heym et al.'s (2008, p. 714) suggestion of “a general revision of these scales with inclusion of additional items” requires serious consideration. The BIS scale may not provide sufficient breadth of coverage to adequately distinguish BIS-Anxiety from FFFS. To more clearly distinguish FFFS and BIS-Anxiety, we recommend either a revision of the BIS scale or the development of alternatives measures to assess the constructs of the revised RST. We agree with Corr (2010) that differentiating FFFS from BIS-anxiety processes ‘is currently not possible with existing questionnaire scales’ (p. 701) and that future research should focus on developing psychometric and laboratory measures to separate these processes.

The current study is marked by a few limitations, each of which provides fruitful directions for future research. First, because our

results derived solely from self-report measures, our correlations may have been inflated by mono-method bias. Also, we cannot exclude the possibility of inaccurate self-report. Future studies would benefit from the inclusion of measures of behavioral and physiological markers of the BIS and BAS systems (Brenner, Beauchaine, & Sylvers, 2005). As Corr (2010) observed, “separating FFFS-fear and BIS anxiety would be especially important” in future neurobiological work designed to examine the differential brain correlates of these systems (p. 701). Second, data were gathered in two somewhat different samples, a community sample and a predominantly male sample from a technical education school. Although the combination of these two samples increased the diversity in our participant pool, future studies should examine the generalizability of the findings to other samples (e.g. samples with more girls, clinical samples) and different psychopathy measures. Third, as discussed by Wang (2010), although correlations corrected for attenuation can be used to correct for measurement error, caution is recommended by interpreting these correlations, as such they sometimes represent overestimates of the true population correlation. As recommended by Wang (2010), we reported both unadjusted and adjusted correlations in the present study.

These limitations notwithstanding, the current study replicated and extended in important ways findings on the temperamental associations of psychopathic traits in youth taking into consideration the three factor structure of psychopathic traits and the revised RST. Our results suggest the need for improved measures to better differentiate FFFS and BIS-Anxiety in adolescents. Finally, these results clarify the relation between psychopathic trait dimensions and dimensions derived from the revised RST in youth, which could be relevant for understanding the development of psychopathic traits. Because high scores on measures of psychopathic traits may reflect the operation of different underlying processes, treatment and preventative strategies for children may need to target different dimensions of psychopathy.

## References

- Andershed, H., Kerr, M., Stattin, H., & Levander, S. (2002). Psychopathic traits in non-referred youths: A new assessment tool. In E. Blaauw & L. Sheridan (Eds.), *Psychopaths: Current international perspectives* (pp. 131–158). The Hague: Elsevier.
- Bijttebier, P., & Decoene, S. (2009). Assessment of psychopathic traits in children and adolescents: Further validation of the antisocial process screening device and the childhood psychopathy scale. *European Journal of Psychological Assessment, 25*, 157–163.
- Bijttebier, P., Beck, I., Claes, L., & Vandereycken, W. (2009). Gray's reinforcement sensitivity theory as a framework for research on personality–psychopathology associations. *Clinical Psychology Review, 29*, 421–430.
- Brenner, S. L., Beauchaine, T. P., & Sylvers, P. D. (2005). A comparison of psychophysiological and self-report measures of BAS and BIS activation. *Psychophysiology, 42*, 108–115.
- Campbell, M. A., Doucette, N. L., & French, S. (2009). Validity and stability of the youth psychopathic traits inventory in a nonforensic sample of young adults. *Journal of Personality Assessment, 91*(6), 584–592.
- Carver, C. S. (2005). Impulse and constraint: perspectives from personality psychology, convergence with theory in other areas, and potential for integration. *Personality and Social Psychology Review, 9*, 312–333.
- 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*, 319–333.
- Corr, P. J. (Ed.). (2008). *The reinforcement sensitivity theory of personality*. Cambridge: Cambridge University Press.
- Corr, P. J. (2010). The psychoticism–psychopathy continuum: A model of core neuropsychological deficits. *Personality and Individual Differences, 48*, 695–703.
- Corrado, R. R., Vincent, G. M., Hart, S. D., & Cohen, I. M. (2004). Predictive validity of the psychopathy checklist: Youth version for general and violent recidivism. *Behavioral Sciences and the Law, 22*, 5–22.
- Eysenck, S. B. G., Pearson, P. R., Easting, G., & Allsopp, J. F. (1985). Age norms for impulsiveness, venturesomeness and empathy in adults. *Personality and Individual Differences, 6*, 613–619.
- Falkenbach, D. M., Poythress, N. G., & Heide, K. M. (2003). Psychopathic features in a juvenile diversion population: Reliability and predictive validity of two self-report measures. *Behavioral Sciences and the Law, 21*, 787–805.
- Forth, A. E., Kosson, D. S., & Hare, R. D. (2003). *The psychopathy checklist: Youth version*. Toronto: Multi-Health Systems.
- Franken, H. A., Muris, P., & Rassin, E. (2005). Psychometric properties of the Dutch BIS/BAS-scales. *Journal of Psychopathology and Behavioral Assessment, 27*, 25–30.
- Frick, P. J., Barry, C. T., & Bodin, S. D. (2000). Applying the concept of psychopathy to children: Implications for the assessment of antisocial youth. In C. B. Gacono (Ed.), *The clinical and forensic assessment of psychopathy* (pp. 3–24). Hillsdale, NJ: Erlbaum.
- Frick, P. J., Bodin, S. D., & Barry, C. (2001). Psychopathic traits and conduct problems in community and clinic-referred samples of children: Further development of the psychopathy screening device. *Psychological Assessment, 12*, 382–393.
- Frick, P. J., & Hare, R. D. (2001). *The antisocial process screening device*. Toronto: Multi-Health Systems.
- Frick, P. J., O'Brien, B. S., Wootton, J. M., & McBurnett, K. (1994). Psychopathy and conduct problems in children. *Journal of Abnormal Psychology, 103*, 700–707.
- Frick, P. J., & White, S. F. (2008). Research review: The importance of callous-unemotional traits for developmental models of aggressive and antisocial behavior. *Journal of Child Psychology and Psychiatry, 49*, 359–375.
- Gray, J. A. (1970). The psychophysiological basis of introversion–extraversion. *Behaviour Research and Therapy, 8*, 249–266.
- Gray, J. A., & McNaughton, N. (2000). *The neuropsychology of anxiety: An inquiry into the functions of the septo-hippocampal system*. Oxford: Oxford University Press.
- Hare, D. R. (1991). *Manual for the hare psychopathy checklist-revised*. Toronto, Ontario: Multi-Health Systems.
- 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, 48*, 709–715.
- Heym, N., & Lawrence, C. (2010). The role of Gray's revised RST in the P-psychopathy continuum: The relationships of psychoticism with a lack of fear and anxiety, and increased impulsivity. *Personality and Individual Differences, 8*, 874–879.
- Hillege, S., Das, J., & de Ruiter, C. (2009). The youth psychopathic traits inventory: Psychometric properties and its relation to substance use and interpersonal style in a Dutch sample of non-referred adolescents. *Journal of Adolescence, 33*, 83–91.
- Karpman, B. (1941). On the need for separating psychopathy into two distinct clinical types: Symptomatic and idiopathic. *Journal of Clinical Psychopathology, 3*, 112–137.
- Kelsey, R. M., Ornduff, S. R., McCann, C. M., & Reiff, S. (2001). Psychophysiological characteristics of narcissism during active and passive coping. *Psychophysiology, 38*, 292–303.
- Leistico, A. R., Salekin, R. T., DeCoster, J., & Rogers, R. (2008). A large-scale meta-analysis relating the hare measures of psychopathy to antisocial conduct. *Law and Human Behavior, 32*, 28–45.
- Loney, B. R., Taylor, J., Butler, M. A., & Iacono, W. G. (2007). Adolescent psychopathy features: 6-Year temporal stability and the prediction of externalizing symptoms during the transition to adulthood. *Aggressive Behavior, 33*, 242–252.
- Lykken, D. T. (1995). *The antisocial personalities*. Hillsdale, NJ: Lawrence Erlbaum.
- Lynam, D. R. (1996). Early identification of chronic offenders: Who is the fledgling psychopath? *Psychological Bulletin, 120*, 209–234.
- Muñoz, L. C., & Frick, P. J. (2007). The reliability, stability, and predictive utility of the self-report version of the antisocial process screening device. *Scandinavian Journal of Psychology, 48*, 299–312.
- Patterson, C. M., & Newman, J. P. (1993). Reflectivity and learning from aversive events: Towards a psychological mechanism for the syndromes of disinhibition. *Psychological Review, 100*, 716–736.
- 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.
- Preacher, K. J., & Hayes, A. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, and Computers, 36*, 717–731.
- Roose, A., Bijttebier, P., Decoene, S., Claes, L., & Frick, P. J. (2010). Assessing the affective features of psychopathy in adolescents: Further validation of the inventory of callous and unemotional traits. *Assessment, 17*, 44–57.
- Ross, S. R., Moltó, J., Poy, R., Segarra, P., Pastor, M. C., & Montañés, S. (2007). Gray's model and psychopathy: BIS but not BAS differentiates primary from secondary psychopathy in noninstitutionalized young adults. *Personality and Individual Differences, 43*, 1644–1655.
- Rothbart, M. K. (2007). Temperament, development, and personality. *Current Directions in Psychological Science, 16*, 207–212.
- Schwab-Stone, M., Chen, C., Greenberger, E., Silver, D., Lichtman, J., & Voyce, C. (1999). No safe haven II: The effects of violence exposure on urban youth. *Journal of the American Academy of Child and Adolescent Psychiatry, 38*, 359–367.
- Wallace, J. F., Malterer, M. B., & Newman, J. P. (2009). Mapping Gray's BIS and BAS constructs onto factor 1 and factor 2 of Hare's psychopathy checklist – Revised. *Personality and Individual Differences, 47*, 812–816.
- Wang, L. L. (2010). Disattenuation of correlations due to fallible measurement. *Newborn and Infant Nursing Reviews, 10*, 60–65.