



# The relationship between reward and punishment sensitivity and antisocial behavior in male adolescents



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## ARTICLE INFO

### Article history:

Received 27 August 2013

Received in revised form 17 January 2014

Accepted 21 January 2014

Available online 24 February 2014

### Keywords:

Antisocial behavior

Adolescent

Young offender

Psychopathy

Behavioral activation system

Behavioral inhibition system

Reward

Punishment

## ABSTRACT

The study examined the relation between reward and punishment sensitivity and antisocial behavior (ASB) in male adolescents. We compared Behavioral Inhibition/Behavioral Activation System (BIS/BAS) Scale scores in adolescent male offenders ( $n = 85$ ) and non-offenders ( $n = 50$ ), and explored the relation between BIS/BAS and measures associated with ASB (psychopathy, conduct problems and alcohol use) within the whole group of adolescents, and offending frequency in the offenders. Between group analyses indicated heightened BAS (reward sensitivity; specifically the drive to seek rewards) and lowered BIS (punishment sensitivity) in the offenders compared to the non-offenders. Regression analyses indicated that traits associated with reward seeking (BAS Drive and/or Fun Seeking) positively predicted psychopathic traits, conduct problems and alcohol use. In contrast, response to reward (BAS Reward Responsiveness) was negatively associated with psychopathy and conduct problems. Reduced punishment sensitivity (BIS) was associated with psychopathy only. The findings suggest that BAS reward traits are useful in understanding ASB and emphasize the importance of examining dimensions of reward processing in relation to different aspects of ASB in adolescents.

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## 1. Introduction

Theories that emphasize the biological basis of personality, such as Reinforcement Sensitivity Theory (RST; Gray, 1970), have contributed to a better understanding of the etiology of antisocial behavior (ASB). The RST proposes that reward and punishment systems underlie behavior and affect. Although increasing research has focused on the examination of RST in relation to aspects of ASB, there is a dearth of studies employing direct measures of RST in antisocial adolescents. Adolescence is an interesting time for investigating ASB and reward processing in particular; offending peaks during this period and heightened reward seeking has been implicated in the increased risk taking observed (see Moffitt, 1993; Steinberg, 2008). In addition, it must be noted that ASB is a complex construct encompassing clinical (e.g., conduct disorder, psychopathic traits) and legal approaches (e.g., delinquency). The present research examines multiple approaches to ASB in order to appreciate the heterogeneity in the behavior and the risk factors involved during adolescence.

### 1.1. The reinforcement sensitivity theory

The RST comprises three hypothetical motivational systems that respond to different reinforcing events; the Behavioral Activation System (BAS), Behavioral Inhibition System (BIS) and the Fight–Flight–Freeze system (FFFS). The BAS is an appetitive system, it is considered to regulate responses to rewarding stimuli, and is associated with activation in dopaminergic pathways. High BAS sensitivity is thought to lead to increased approach behavior in the presence of reward. The BIS was considered to regulate response to aversive stimuli and associated with activation in the septo-hippocampal system. High BIS was thought to lead to inhibition of movement towards goals (Carver & White, 1994). Recent revisions to the RST suggest that the FFFS is now responsible for mediating reactions to aversive stimuli and the BIS is involved in resolution of goal conflict in general (Gray & McNaughton, 2000). In the absence of new measures to reflect this revision this paper refers to BIS/FFFS as BIS functioning (See Corr, 2004).

### 1.2. Reinforcement sensitivity theory and psychopathology

The RST has provided a useful framework for understanding the relationship between personality and psychopathology; with those at the extreme on the BIS/BAS dimensions most at risk (Bijttebier,

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Beck, Claes, & Vandereycken, 2009). In general, elevated BAS has been associated with increased risk for externalising difficulties and elevated BIS with internalising problems (Bijttebier et al., 2009). In addition, it has been proposed that low BIS may underlie some externalising related disorders (e.g., Quay, 1997).

Research specifically examining the relationship between RST and delinquency in adolescents is rare. In a notable exception, Hasking (2007) demonstrated that self-reported delinquency was positively correlated with the drive to seek out rewards but contrary to predictions there was a negative correlation between the response to reward and delinquency. BIS was not associated with delinquency in the sample. The authors explained the unexpected negative association in terms of mediation by coping variables. Nevertheless, the study was susceptible to floor effects as the young people were recruited from private schools and displayed a limited range of ASB. Further research is required to examine BIS/BAS in youths with increased levels of ASB.

There has been relatively more research interest on the role of reward and punishment sensitivity in the personality disorder of psychopathy in adults. The BIS is thought to be low in psychopaths leading to deficits in the experience of anxiety and to impulsivity as cues for punishment fail to inhibit reward seeking behavior (e.g., Fowles, 1980; Hart & Dempster, 1997). In addition, it has been suggested that psychopathy may result from an overactive BAS with hypersensitivity to reward leading to disinhibited behavior (Gorenstein & Newman, 1980; Uzieblo, Verschuere, & Crombez, 2007). However, psychopathy is considered to encompass discrete subtypes that may differentially relate to reward and punishment (e.g., Lykken, 1995). The evidence in relation to this is mixed, but the results can tentatively be summarized by suggesting that BAS hypersensitivity is a risk factor for both primary (interpersonal and affective) and secondary (antisocial) psychopathy, whereas BIS underactivity is related to primary psychopathy only (Bijttebier et al., 2009; Newman, MacCoun, Vaughn, & Sadeh, 2005; Ross, Benning, Patrick, Thompson, & Thurston, 2009; Uzieblo et al., 2007). There have been few studies on BIS/BAS in youngsters potentially high in psychopathic traits.

The RST and substance use has been extensively studied; alcohol and drugs have rewarding properties and given that individuals with elevated BAS are considered more reward sensitive it is hypothesized that increased BAS is associated with alcohol and drug use (Franken & Muris, 2006). Support for this comes from research using a range of clinical and non clinical samples (e.g., Franken, Muris, & Georgieva, 2006; Johnson, Turner, & Iwata, 2003; Willem, Bijttebier, Claes, & Uytterhaegen, 2012). In one exception a study failed to find an association between alcohol use and BAS sensitivity in younger adolescents; the authors argued that the low levels of alcohol use and lack of variance may be the most likely explanation (Hasking, 2006). The implication is that an examination of alcohol use in an adolescent sample known to display increased alcohol use is likely to yield more meaningful results. In addition, findings on alcohol use and BIS are equivocal, although the evidence is suggestive of a negative relationship, and further research is required to examine this association (see Bijttebier et al., 2009).

### 1.3. The present study

The present research examined the association between reward and punishment traits and ASB in adolescent males. Firstly, the Behavioural Inhibition System/Behavioural Activation System (BIS/BAS) scales (Carver & White, 1994; arguably the most well validated measure of BIS/BAS sensitivity) were assessed in young offenders (YOs) and non-offending normal controls (NCs). Reward seeking peaks in adolescence and this is thought to underlie the increased risk taking characteristic of this developmental period.

It was interesting to assess whether the YOs who exhibit more extreme levels of ASB, were also more extreme on the reward dimension compared to NCs. Secondly, the study explored BAS and BIS sensitivity in relation to various dimensions related to ASB (psychopathy, conduct problems, and alcohol use) in the group as a whole (given the dimensional nature of the ASB measures this was deemed appropriate) as well as offence frequency in the offenders. It was hypothesized broadly that BAS levels would demonstrate a positive relationship with multiple aspects of ASB. In addition given theories linking low BIS to externalising disorders it was hypothesized that reduced BIS would be associated with ASB.

## 2. Method

### 2.1. Participants and procedure

The young offender (YO) group consisted of 85 males, aged 12–18 years old; each of whom had been convicted of at least one offence. We focused on males as there were too few female offenders available for testing. They were recruited from the Youth Offending Service, a statutory body that manages YOs in the community. The normal control (NC) group ( $n = 50$ ) were males aged 13–17 years, recruited from comprehensive schools, who had no prior contact with the criminal justice system. Participants received £5 per hour in vouchers in compensation for their time. Participants were excluded if they had an IQ score <70.

### 2.2. Measures

The Behavioral Inhibition System/Behavioral Activation System (BIS/BAS scales; Carver & White, 1994). A 24 item self-report questionnaire for the assessment of reward and punishment sensitivity. It contains several subscales; BAS Drive (four items), the relentless pursuit of goals; BAS Fun Seeking (four items), the craving for and seeking out of novel potential rewards; and BAS Reward Responsiveness (five items), the positive response to reward and the anticipation of reward; and also BIS (seven items). Each item is answered on a 4-point Likert scale. In the present study the Cronbach alphas for the scales ranged from 0.63 to 0.74 in both the YOs and NCs; with the exception of BAS Fun Seeking in the YO sample which was 0.35.

The Youth Psychopathic traits Inventory (YPI; Andershed, Kerr, Stattin, & Levander, 2002). A 50 item self-report measure for the assessment of psychopathic traits in young people. The scale contains three core dimensions: (1) Grandiose-Manipulative (2) Callous-Unemotional and (3) Impulsive-Irresponsibility. Each item is answered on a 4-point Likert scale. In the present study, the Cronbach alphas for the three dimensions ranged from 0.74 to 0.91.

Youth Self-Report (YSR; Achenbach & Rescorla, 2001). The YSR is a self-report questionnaire that assesses behavioral and emotional problems including the DSM conduct problems scale. Each item is answered on a 3-point Likert scale. In the present study, the alpha was 0.81 in both YOs and NCs.

#### 2.2.1. Offence frequency

Official crime records were used to obtain details of any offences the young people had been found guilty of. A frequency score was calculated by summing the total number of offences committed by each young person.

Fast Alcohol Screening Test (FAST; Hodgson, Alwyn, John, Thom, & Smith, 2002). The FAST assesses levels of hazardous drinking using four questions related to frequency of binge and negative effects resulting from alcohol use in the past year. The measure has good internal reliability ( $\alpha = 0.77$ ).

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