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Impaired decision-making on the basis of both reward and punishment information in individuals with psychopathy

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Abstract

In this study, we examined decision-making to rewarding or punishing stimuli in individuals with psychopathy ($n = 21$) and comparison individuals ($n = 19$) using the Differential Reward/Punishment Learning Task. In this task, the participant chooses between two objects associated with different levels of reward or punishment. Thus, response choice indexes not only reward/punishment sensitivity but also sensitivity to reward/punishment level according to inter-stimulus reinforcement distance. Individuals with psychopathy showed significant impairment when choosing between objects associated with differential levels of reward but also significantly greater impairment when choosing between objects associated with differential levels of punishment. However, the two groups were comparably affected by inter-stimulus reinforcement distance. The results are discussed with reference to current models of psychopathy.

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1. Introduction

Psychopathy is characterized by a callous, shallow and manipulative affective-interpersonal style combined with antisocial and reckless behavior (Hare, 1991). Individuals with psychopathy show little concern about the effects of their actions on other individuals or even themselves. They often commit impulsive, poorly planned crimes where the likelihood of being caught is high and fail to avoid behaviors which have previously been punished (Hare, 1991).

In line with this, research has indicated that individuals with psychopathy are impaired at learning about and appropriately responding to stimuli associated with punishment. Thus, they show impairments in aversive conditioning (Flor, Birbaumer, Hermann, Ziegler, & Patrick, 2002) and passive avoidance learning (Blair, Mitchell, Leonard, et al., 2004; Newman & Kosson, 1986). In addition, they show impaired augmentation of the startle reflex following visual threat primes (Levenston, Patrick, Bradley, & Lang, 2000), impaired recognition of negative affect emotional facial expressions (Blair, Mitchell, Peschardt, et al., 2004), and impaired skin conductance responses (SCR) to negative vocal expressions (Verona, Patrick, Curtin, Bradley, & Lang, 2004).

It is less clear whether individuals with psychopathy are comparably impaired in learning about and appropriately responding to stimuli associated with reward. They do show appropriate suppression of the startle reflex following a positive visual prime (Levenston et al., 2000), suggesting that the processing of appetitive information is intact in individuals with psychopathy. However, relative to comparison individuals, individuals with psychopathy present with reduced SCRs to positive auditory cues (Verona et al., 2004) and reduced interference from positive distracters on goal-directed processing (Mitchell, Richell, Leonard, & Blair, *in press*). In addition, individuals with psychopathy show a generalized reduction of the affect-driven facilitation for both positive and negative words in lexical decision (Kiehl, Hare, McDonald, & Brink, 1999; Lorenz & Newman, 2002; Williamson, Harpur, & Hare, 1991) and reduced affective priming for both positive and negative words (Blair et al., *in press*). These studies suggest that individuals with psychopathy are impaired in processing aversive and appetitive information.

Many studies have examined aversive and appetitive stimuli in a ‘crystallized’ form where the emotional learning about, and formation of, appetitive and aversive conditioned stimuli (CS) occurred prior to the study. These studies therefore are not informative regarding the ability of individuals with psychopathy to learn about reward and punishment information. In this paper we examine decision-making on the basis of reward/punishment associations learnt within the content of the study.

Emotional learning accounts of psychopathy make clear predictions regarding the ability of individuals with psychopathy to learn stimuli-punishment associations. Thus, accounts emphasizing the reduced ability to process punishing cues in individuals with psychopathy due to reduced anxiety or fear (Fowles, 1988; Lykken, 1957; Patrick, 1994) clearly predict that they should be impaired at learning stimuli-punishment associations but not necessarily stimulus-reward associations. However, Fowles has suggested that individuals with psychopathy ‘show no deficit in reward learning’ (Fowles, 1988, p. 377). These accounts then would predict that individuals with

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