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Passive avoidance learning in individuals with psychopathy: modulation by reward but not by punishment

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Abstract

This study investigates the ability of individuals with psychopathy to perform passive avoidance learning and whether this ability is modulated by level of reinforcement/punishment. Nineteen psychopathic and 21 comparison individuals, as defined by the Hare Psychopathy Checklist Revised (Hare, 1991), were given a passive avoidance task with a graded reinforcement schedule. Response to each rewarding number gained a point reward specific to that number (i.e., 1, 700, 1400 or 2000 points). Response to each punishing number lost a point punishment specific to that number (i.e., the loss of 1, 700, 1400 or 2000 points). In line with predictions, individuals with psychopathy made more passive avoidance errors than the comparison individuals. In addition, while the performance of both groups was modulated by level of reward, only the performance of the comparison population was modulated by level of punishment. The results are interpreted with reference to a computational account of the emotional learning impairment in individuals with psychopathy.

Keywords: Passive avoidance; Psychopathy; Amygdala; Reward; Punishment

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1. Introduction

Psychopathic offenders are characterized as callous and unemotional individuals, who show little concern for the effects of their crimes on others (Cleckley, 1976; Hare, 1991). They often present as cynical and calculating and lie, cheat and manipulate others for personal gain. Somewhat surprisingly, given the apparent calculation in their behaviour, they also appear to show little regard for the impact of their antisocial behavior on themselves. They often commit impulsive, poorly planned crimes where the likelihood of being caught is high and do not avoid behaviors which have previously been punished (Hare, 1991).

Various measures have been developed to assess the impairment shown by individuals with psychopathy in learning from aversive experiences. One of the most common of these is the passive avoidance paradigm in which the individual must learn to avoid responding to specific stimuli that give rise to punishment (Newman & Kosson, 1986; Newman & Schmitt, 1998; Thornquist & Zuckerman, 1995). In passive avoidance paradigms, performance is assessed by measuring rates of passive avoidance errors (i.e., responses to stimuli paired with negative reinforcement) and omission errors (i.e., failures to respond to stimuli paired with positive reinforcement). Since the original investigation showing poor passive avoidance learning in individuals with psychopathy (Lykken, 1957), there have been a series of replications of their impairment. Early work suggested that the nature of the negative reinforcer might affect the degree of impairment shown by individuals with psychopathy; the impairment might not be shown if the negative reinforcer was financial loss rather than electric shock (Schmauk, 1970). However, more recent studies have shown that, relative to comparison individuals, individuals with psychopathy commit more passive avoidance errors regardless of whether reinforcement is in the form of gain/loss of money, cigarettes or confectionery (Newman & Kosson, 1986; Newman & Schmitt, 1998; Newman, Widom, & Nathan, 1985; Thornquist & Zuckerman, 1995).

While it is known that individuals with psychopathy show impairment on passive avoidance tasks, there have been relatively few manipulations of individual parameters within these tasks. Yet data on the manner in which task manipulations can affect performance can allow considerable constraint, and aid the specification of neuro-cognitive models of these disorders (Bishop, 1997).

We developed a simple connectionist model of passive avoidance learning (see Fig. 1) that could be used to evaluate the impact of the task manipulations to be used in the current study; i.e., having different levels of reward/punishment associated with different stimuli. We suggested that performance on the passive avoidance task requires the participant to form appropriate stimulus–

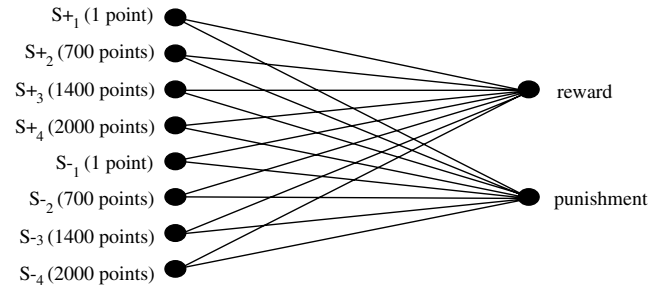

Fig. 1. Connectionist model of passive avoidance learning.