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Neurocognitive function in antisocial personality disorder

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Abstract

Recent neuroimaging studies and neuropsychological test findings support the contention that prefrontal dysfunction is associated with psychopathic personality traits and antisocial behavior. However, conflicting results have arisen regarding performance on measures of frontal executive function. We administered a neuropsychological test battery consisting of measures sensitive to frontal lobe dysfunction and a battery of personality questionnaires and clinical scales sensitive to antisocial personality disorder (APD) subjects presenting with prominent psychopathic personality features and matched control subjects. We also monitored the subjects' electrodermal activity during the presentation of emotionally charged stimuli. APD subjects showed greater neuropsychological deficits on measures sensitive to orbitofrontal dysfunction in comparison to control participants. Moreover, APD subjects were electrodermally hyporesponsive to aversive stimuli relative to control group members. APD subjects did not demonstrate performance deficits on classical tests of frontal executive function. Participants also underwent clinical assessment. As expected, APD subjects were less conscientious, self-reproaching, guilt-prone, and socially anxious than matched control subjects. Moreover, the scores indicated that APD subjects were more venturesome and uninhibited relative to control subjects. Contrary to expectations, APD subjects and community control subjects did not differ on a self-report measure of sensitivity to specific phobic situations.

Keywords: Psychopathy; Frontal lobe; Orbitofrontal; Dorsolateral–prefrontal; Neuropsychological; Electrodermal

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1. Introduction

1.1. Prefrontal dysfunction and psychopathy

Recent neuroimaging studies and neuropsychological test findings support the contention that prefrontal dysfunction (particularly orbitofrontal) is associated with psychopathic personality traits and antisocial behavior (Davidson et al., 2000; Raine et al., 1998, 2000; Lapierre et al., 1995). However, conflicting results have arisen regarding the performance of psychopathic subjects on measures of frontal executive function.

Several studies suggest that a select deficit involving the orbitofrontal system may underlie psychopathy and antisocial behavior. Lapierre et al. (1995) found that incarcerated psychopathic subjects were significantly impaired on tasks considered sensitive to orbitofrontal/ventromedial–prefrontal dysfunction including a visual go/no–go discrimination task, Porteus Maze Q-scores (i.e., rule-breaking errors), and an odor identification task in comparison to matched control subjects (non-psychopathic inmates). Lapierre et al. (1995) also found that psychopathic subjects did not display performance deficits on measures sensitive to dorsolateral–prefrontal (DLPF) and posterorolandic function (i.e., the Wisconsin Card Sorting Test (WCST) and the Mental Rotation Task). Moreover, Deckel et al. (1996) reported that performance on tests assessing frontal executive functioning (e.g. the WCST, controlled oral word fluency test, and trail-making test) failed to predict antisocial personality disorder classifications. These tasks are considered sensitive indicators of DLPF dysfunction (i.e., tasks which require the employment of organizational strategies for efficient performance). These findings suggest that a select orbitofrontal deficit may be associated with psychopathy.

However, Gorenstein (1982) reported that psychopathic subjects demonstrated performance deficits on tests of frontal executive function including the WCST (i.e., perseverative errors), Necker cube task, and a sequential matching memory task. A recent meta-analytic review of 39 studies by Morgan and Lilienfeld (2000) lends strong support to the contention that executive function deficits are associated with antisocial personality (APD). Morgan and Lilienfeld (2000) found a significant relationship between executive function deficits and antisocial behavior.

In response to Gorenstein's study, Hare (1984) assigned inmates to low-, medium-, and high-psychopathy groups and administered the aforementioned frontal executive function tasks. No significant group differences were observed. Hare was unable to replicate Gorenstein's findings. Sutker and Allain (1987) also found that psychopathic subjects and control subjects performed similarly on measures of concept formation, abstraction, and planning. How can we account for these conflicting findings? One possibility is that the executive function deficits among psychopathic subjects are associated with the presence of comorbid psychiatric conditions, while the core interpersonal and affective characteristics associated with psychopathy (e.g., egocentricity, callousness, manipulativeness, guile, lack of empathy and remorse) may result from orbitofrontal dysfunction.

1.2. Executive function and APD

Several studies examining neurocognitive function in psychopathy and APD reveal broadly frontal deficits, but if the prefrontal cortex can be fractionated into separate frontal subsystems, these may be differentially engaged in APD subtypes. One possibility is that APD subjects demonstrating core psychopathic traits and a lack of foresight (e.g., difficulty anticipating negative consequences), planning, and goal-directed behavior (e.g., disorganized offending) will show greater neuropsychological deficits on tasks considered sensitive to orbitofrontal dysfunction and on measures of frontal executive function. Specifically, core psychopathic personality characteristics may result from orbitofrontal dysfunction. The additional involvement of DLPF dysfunction may lead to antisocial behavior that combines core psychopathic characteristics with poor planning and organization, and difficulty keeping in mind diverse future consequences. Motivation for this hypothesis is that the DLPF cortex mediates executive functions (Smith and Jonides, 1999), while the