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Modulatory effects of psychopathy on Wisconsin Card Sorting Test performance in male offenders with Antisocial Personality Disorder

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ABSTRACT

Neuropsychological deficits in executive functions (EF) have been linked to antisocial behavior and considered to be cardinal to the onset and persistence of severe antisocial and aggressive behavior. However, when psychopathy is present, prior evidence suggests that the dorsolateral prefrontal cortex is unaffected leading to intact EF. Ninety-one male offenders with Antisocial Personality Disorder (ASPD) and 24 controls completed the Wisconsin Card Sorting Test (WCST). ASPD individuals were grouped in three categories according to Psychopathy Checklist-Revised (PCL-R) scores (low, medium and high). We hypothesized that ASPD offenders with high PCL-R scores will not differ from healthy controls in EF and will show better EF performance in comparison with subjects with low PCL-R scores. Results showed that ASPD offenders with low PCL-R scores committed more perseverative errors and responses than controls and offenders with high PCL-R scores, which did not differ from healthy controls. Moreover, scores on Factor 1 and the interpersonal facet of the PCL-R were predictors of better WCST performance. Our results suggest a modulatory role of psychopathy in the cognitive performance of ASPD offenders, and provide further evidence supporting that offenders with ASPD and psychopathy are characterized by a cognitive profile different from those with ASPD without psychopathy.

1. Introduction

The majority of habitually violent criminals exhibit a distinctive behavior phenotype, which is clearly defined in the diagnostic criteria for Antisocial Personality Disorder (ASPD). ASPD is a "pervasive pattern of disregard and violation of the rights of others" that involves a set of behaviors and traits including irresponsibility, impulsivity, recklessness and irritability that emerges before the age of 15 and persist in adulthood (American Psychiatric Association, 2013). Moreover, almost one-third of individuals with ASPD are additionally diagnosed with psychopathy (Blair, 2003). In subjects with psychopathy, the antisocial traits of ASPD coexist with an emotional impairment, evidenced by a lack of empathy, callousness, shallow affect, and a manipulative affective-interpersonal style (Hare, 2003). It is widely considered that

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psychopathy is a more severe form of anti-sociality, but the idea that both constructs may reflect two separate disorders cannot be ruled out (Riser and Kosson, 2013). ASPD and psychopathy certainly share pathophysiological mechanisms, and both are highly comorbid within criminal populations, which display a global pattern of antisocial behavior, including an increased incidence of substance abuse and criminality, but also a high degree of treatment resistance and recidivism. Nevertheless, evidence suggests that there are some important differences between subjects with ASPD with and without psychopathy in the cognitive and emotional domain.

For example, psychopathy, but not ASPD, is associated with a reduced facilitation of lexical decisions by affective stimuli, deficits in startle potentiation using aversive cues, or a reduced reactivity to emotional facial expressions (Riser and Kosson, 2013; Baskin-Sommers and Newman, 2014). Such impaired processing of emotional information in individuals with psychopathy may be explained by alterations in selective attention, with a diminished aptitude to process contextual (including emotional) information when involved in goal-directed behaviors (Sadeh and Verona, 2008; Newman et al., 2010; Baskin-Sommers et al., 2011).

Executive functions (EF) encompass cognitive processes such as working memory, attention, cognitive flexibility and impulse control are assumed to be critical for planning and organizing behavior and have traditionally been linked to frontal lobe function (Eling et al., 2008). Dysfunction in different regions of the prefrontal cortex could account for the variety of interpersonal and behavioral problems seen in ASPD and, by extension, in psychopathy. In this sense, impaired EF has been hypothesized to be cardinal to the onset and persistence of severe antisocial and aggressive behavior, although such behavior may respond to either alterations in top–down or bottom–up regulation strategies, depending on the population being assessed. Thus, impaired EF may be underpinned by dorsolateral prefrontal dysfunction, leading to impaired top–down regulation of limbic areas and resulting in increased emotional reactivity and impulsive aggressive behavior. Conversely, when there exists a primary alteration of emotional information processing, as in psychopathic samples, activity within the limbic system is typically downregulated, thus leading to a lack of bottom–up regulation from emotion-processing regions to prefrontal areas involved in planning and decision making (De Brito and Hodgins, 2009; Contreras-Rodríguez et al., 2014).

Early EF studies in antisocial samples found that habitually violent offenders likely to meet the criteria for conduct disorder or ASPD had broad EF deficits compared with healthy controls (for a review see De Brito and Hodgins (2009)). In line with this idea, two meta-analytic reviews concluded that antisocial individuals showed poorer EF performance than non-antisocial controls (Morgan and Lilienfeld, 2000; Ogilvie et al., 2011). However, in psychopathy samples the results are mixed. Although some EF studies have yielded evidence of significant impairment in this cognitive domain (Dolan, 2012; De Brito et al., 2013), others observed that psychopathic individuals show virtually intact performance on EF tasks, especially when these involve the dorsolateral prefrontal cortex (DLPFC) (Hare, 1984; Blair et al., 2006). There are a number of factors that may contribute to such inconsistent findings across studies assessing EF in psychopathy, including the variety of tasks used to measure EF or the complexity of the psychopathy construct (Ogilvie et al., 2011). Indeed, multiple neuropsychological tasks have been used to assess EF across studies (i.e., tasks primarily focused on the assessment of ventromedial vs. orbitofrontal vs. dorsolateral prefrontal cortex function), and psychopathy has been differently defined across studies (i.e., single broad syndrome vs. trait dimension). Likewise, different studies also differ in the scales used for psychopathy assessment (i.e., interview vs. self-report) and the selection of the comparison groups (i.e., recruited from the community, prisons, forensic psychiatric hospitals, outpatient psychiatric clinics or substance abuse treatment programs) (Dolan and Park, 2002; De Brito and Hodgins, 2009; Baskin-Sommers et al., 2015).

In this context, a number of studies have been conducted using tasks such as the Wisconsin Card Sorting Test (WCST) (Gorenstein, 1982; Hare, 1984; Lapierre et al., 1995; Pham et al., 2003) to elucidate whether psychopathic individuals have deficits in executive functioning (De Brito and Hodgins, 2009; Glenn and Raine, 2014). The WCST is considered to be the prototypical test of EF since accurate performance relies on several executive domains, such as attention, working memory and inhibition (De Brito and Hodgins, 2009), which are assessed by means of different outcome measures derived from the test (see Section 2, below). While there is some evidence suggesting that psychopathy is associated with deficits on WCST performance (Yang et al., 2011), other studies have found that WCST scores are not related or only marginally associated with total psychopathy scores or to scores on either Factor 1 or 2 from the Psychopathy Checklist-Revised (PCL-R) (Lapierre et al., 1995; Roussy and Toupin, 2000; Mol et al., 2009). PCL-R Factor 1 is generally believed to represent a constellation of interpersonal-affective features relatively unique to psychopathy, while Factor 2 is related to a more general antisocial behavior, not unique to psychopathy (Hare, 1991). Importantly, in contrast with the above notions, some researchers have suggested that interpersonal-affective features may actually be associated with enhanced executive functioning (Sellbom and Verona, 2007).

This study aimed to further investigate the complex relationship between ASPD, psychopathy and EF. Importantly, to better approach this issue, we assessed populations with different degrees of psychopathy. Specifically, we studied a large group of male offenders with ASPD and a group of healthy controls who were assessed with the Psychopathy Checklist-Revised (PCL-R). These groups were compared in their performance in the WCST and the relationship between WCST scores and PCL-R interpersonal-affective and antisocial factors and facets were also examined (Hare, 2003). We hypothesized that ASPD offenders with psychopathy will not differ from healthy controls in EF but will show better EF performance in comparison with ASPD offenders without psychopathy. Also, we hypothesized that scores on PCL-R Factor 1 will be associated with a better performance on the WCST.

2. Material and methods

2.1. Participants

Ninety-one male offenders with ASPD, assessed with the Structural Clinical Interview for DSM-IV (SCID-II; (First et al., 1997)), were recruited from the high security department of the *Ponent Penitentiary Center*, in Lleida (Spain). Exclusion criteria included the existence of a DSM-IV Axis I diagnosis (except for past substance use disorder), neurodegenerative disorders or an Intelligence Quotient (IQ) below 70, which, according to previous literature (Trull and Prinstein, 2013), was estimated with the vocabulary subscale of Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wechsler (1981)). Past and current substance use was confirmed through medical records and routine drug-urine testing, respectively.

Twenty-four healthy male controls from the community selected from among acquaintances of the research team and hospital staff were also tested. These participants had no criminal record, no history of mental disorder, and were screened for the absence of Axis II pathology (SCID-II interview). All participants were informed of the nature of the study and gave written informed consent. This investigation was approved by the local research and ethics committee (Hospital Universitari Arnau de Vilanova, Lleida) and the study was carried out in accordance with the Declaration of Helsinki.