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Review article

Disadvantageous decision-making in borderline personality disorder: Partial support from a meta-analytic review

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ABSTRACT

To achieve long-term goals, organisms evaluate outcomes and expected consequences of their behaviors. Unfavorable decisions maintain many symptoms of borderline personality disorder (BPD); therefore, a better understanding of the mechanisms underlying decision-making in BPD is needed. In this review, the current literature comparing decision-making in patients with BPD versus healthy controls is analyzed.

Twenty-eight empirical studies were identified through a structured literature search. The effect sizes from studies applying comparable experimental tasks were analyzed.

It was found that (1) BPD patients discounted delayed rewards more strongly; (2) reversal learning was not significantly altered in BPD; and (3) BPD patients achieved lower net gains in the Iowa Gambling Task (IGT). Current psychotropic medication, sex and differences in age between the patient and control group moderated the IGT outcome. Altered decision-making in a variety of other tasks was supported by a qualitative review.

In summary, current evidence supports the altered valuation of outcomes in BPD. A multifaceted influence on decision-making and adaptive learning is reflected in this literature.

Contents

Abbreviations: BPD, Borderline Personality Disorder; vmPFC, ventromedial prefrontal cortex; OFC, orbitofrontal cortex; TDD, Temporal Delay Discounting; REV, reversal learning; IGT, Iowa Gambling Task; ODT, other decision-making tasks; SES, socioeconomic status; cDEP, current depression diagnosis; lPsych, lifetime psychosis diagnosis; ED, eating disorder; CI, confidence interval.

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1. Introduction

For the clinician, it is clear that patients with Borderline Personality Disorder (BPD) are prone to disadvantageous decision-making. They tend to engage in impulsive behavior without regarding adverse long-term consequences. For example, patients injure themselves to alleviate stress, show suicidal tendencies, and engage in abusive relationships to avoid abandonment. Consequences are often devastating and contribute to frequent crises, and this entails further medical and psychosocial treatments. A detailed analysis of decision-making in BPD could improve understanding the causes for disregard of adverse consequences and help to improve psychiatric treatment.

Decisions are ubiquitous in daily life and "commit the organism to one out of several possible behaviors" (Pearson et al., 2014, p. 950). Behavior is guided by the subjective value of outcomes and expectations about future reinforcement (i.e., reward and punishment). They let us flexibly choose between multiple options.

In a recent meta-analysis, Unoka and Richman (2016) report impaired decision-making in BPD. Though several measures of executive functioning were analyzed, only two studies were classified to assess decision-making. In this paper, we offer a more comprehensive and in-depth literature analysis based on the neuropsychological foundations of decision-making. Individuals take into account the motivational value and probability of expected gains and losses in their decisions (Kahneman and Tversky, 1979). In order to maximize outcomes, they weigh the options in hand according to the subjective value they attribute to each of these options. This conceptualization applies to situations that require subjects to select between options associated with different values and different probabilities of receiving rewards or punishments. Thus, processes such as delay discounting and reinforcement learning, as well as decisions under risk and ambiguity are fundamental for the study of decision-making (Pearson et al., 2014). In contrast to other reviews on executive functions (e.g. (Ruocco, 2005; Unoka and Richman, 2016)), we focus on neuropsychological studies using tasks that are consistent with the aforementioned conceptualization of decision-making. Other processes relevant for daily life decision-making but not fitting to the framework (e.g. response inhibition or planning assessed with the Tower-of-London task) are not addressed here. For conciseness, social and moral decision-making are not addressed either.

Neuroimaging work provides profound evidence for involvement of the ventromedial prefrontal cortex (vmPFC) and orbitofrontal cortex (OFC) in risky choices (Christakou et al., 2009; Hartstra et al., 2010; Lawrence et al., 2009; Li et al., 2010), reversal learning (Budhani et al., 2007; Gläscher et al., 2009; Greening et al., 2011; Hampshire et al., 2012; Hampton et al., 2006; O'Doherty et al., 2003; Remijnse et al., 2005) and temporal delay discounting (Scheres et al., 2013). Neurological patients with vmPFC/OFC lesions show marked deficits in these tasks (Bechara et al., 1994; Rolls et al., 1994; Sellitto et al., 2010; Tsuchida et al., 2010; for a review see Zald and Andreotti, 2010). To summarize, vmPFC and OFC activations represent the learning history of rewards and punishments, task rules and the immediacy of expected reward delivery. Futher, they are involved in the computation of the subjective value of outcomes; comprising both actually received and expected rewards and punishments (Bartra et al., 2013).

Patients with vmPFC/OFC lesions are impaired in emotion regulation and frequently show social disturbances (Damasio et al., 1994) or display increased emotional reactivity and deficits in several real-life competencies, such as social appropriateness (Anderson et al., 2006). Hence, we hypothesize that vmPFC/OFC malfunction is implicated in BPD. This is supported by several studies applying brain volumetry analyses and reported differences in grey matter volume in BPD patients versus healthy controls (Bertsch et al., 2013; Brunner et al., 2010; Chanen et al., 2008; de Araujo Filho et al., 2014; Rossi et al., 2013; Sato et al., 2012; Tebartz van Elst et al., 2003) and in BPD patients versus other clinical populations (Bertsch et al., 2013; Richter et al., 2014). In a recent meta-analysis, Schulze et al. (2016) found reduced grey matter volume in the vmPFC and OFC (Brodman areas 10 and 11) of patients with BPD. Therefore, studies using tasks that are sensible for vmPFC/OFC impairment could contribute to the understanding of some of the psychopathological mechanisms involved in BPD.

Here, we aim to provide a meta-analysis of studies that compared patients with BPD to non-patient control participants (further referred to as 'controls') in decision-making tasks. Patients with BPD were expected to have worse outcomes (e.g. less reward, more punishment or less net gains) than controls. The literature search was guided by an a priori scheme of relevant neuropsychological functions involving subjective value processing, i.e. delay discounting (reflecting a form of impulsive decision-making), reinforcement reversal learning/model-based learning and risky-choice behavior. The latter is usually assessed with experimental gambling tasks.

After the literature search, eligible studies were assigned to four categories useful for further analyses: (A) temporal delay discounting (TDD), (B) reversal learning tasks (REV), (C) Iowa Gambling Task (IGT) and (D) other decision-making tasks (ODT). These are described in Table 1. Categorization reduces complexity and makes the results tangible for statistical meta-analysis. However, cognitive processes associated with the task categories partly overlap. Most importantly with regard to this review, all tasks involve the subjective valuation of (expected) outcomes to maximize gains and minimize losses. Moreover, basic processes like working memory and sustained attention are involved that may contribute to differences in performance for patients with BPD (Hagenhoff et al., 2013; Ruocco, 2005; Unoka and Richman, 2016). Furthermore it should be emphasized, that the IGT is a complex cognitive task involving reversal learning of stimulus-outcome relations (Fellows and Farah, 2005).

In addition to summarizing findings on general group differences, we performed a moderator analysis to explore the impact of study characteristics on group effects. Moderators of interest were the matching of samples for sociodemographic data, psychotropic medication at time of testing, sex and psychiatric comorbidity.