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Borderline personality disorder: impaired visual perception and working memory

Andreas Stevens^{a,*}, Michaela Burkhardt^a, Martin Hautzinger^b, Jürgen Schwarz^a,
Christine Unckel^c

^a*Department of Psychiatry, University of Tübingen, Osianderstr. 22, D-72076 Tübingen, Germany*

^b*Department of Psychology, University of Tübingen, Tübingen, Germany*

^c*Department of Psychiatry, University of Freiburg, Freiburg, Germany*

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Abstract

The neurobiology of borderline personality disorder (BPD) is still elusive. There are a few studies on neuropsychological performance in BPD, which report a broad spectrum of abnormalities. The present study evaluates perception and working memory as instances of basic cognitive functions. Female subjects diagnosed with DSM-IV borderline personality disorder ($n=22$) were compared with age- and education-matched controls ($n=25$). Perception speed was assessed by a backward masking paradigm. Working memory was tested by a series of delayed matching-to-sample paradigms involving varying subsidiary functions like mental rotation, retrieval from memory, ignoring distracters, and cross-modal performance. In backward masking, BPD subjects required significantly longer stimulus onset asynchrony (SOA) than controls to identify the visual target, and there was an additional slowing of the motor response. Working memory accuracy was impaired in BPD subjects, but did not worsen when the cognitive load was increased. With increasing task difficulty, they traded off speed for accuracy similarly as the controls. Impulsivity and dissociation ratings were not correlated with performance. It is concluded that perceptual speed and working memory are impaired in BPD, but that the deficits are not augmented by increasing cognitive load.

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1. Introduction

Borderline personality disorder (BPD) is characterized by an enduring pattern of abnormal behavior, cognition, and affect, with onset in early adolescence. The etiology of BPD is unknown.

Andrulonis et al. (1980, 1982) and Van Reekum et al. (1996) reported that more BPD subjects than controls had suffered traumatic brain injury, and that the neuropsychologic profile of BPD subjects resembled that of persons with brain trauma. EEGs of BPD were reported to contain abnormal slow wave activity (Ogiso et al., 1993; De La Fuente et al., 1998). Neurological soft signs (subtle abnormalities on neurological examination) were significantly more frequent in BPD patients than in

*Corresponding author. Tel.: +49-7071-2982322; fax: +49-7071-2941-41.

E-mail address: andreas.stevens@med.uni-tuebingen.de (A. Stevens).

controls (Quitkin et al., 1976; Gardner et al., 1987; Stein et al., 1993). Only a few studies pertain to the neuropsychological performance of BPD patients. Burgess (1991a,b), in persons with dramatic personality disorder, found impairments of memory, of sequence planning and performance. Van Reekum et al. (1993, 1996) suggested a dysfunction of prefrontal circuits because of deficits on impulse control and on the Wisconsin Card Sorting Test (WCST Heaton et al., 1993). O'Leary et al. (1991) reported impairments of visual perception, of memory for complex material, of visual discrimination, and of flexibility in the digit symbol test. In a broader sense, inappropriate behavior in BPD might be based on improper decisions about what to do. Decision-making has been found to correlate with working memory performance (Hinson et al., 2002, 2003), but decision-making certainly involves other processes as well.

Baddeley (2001) recently proposed a four-component model of working memory, adding as a new component the episodic buffer to the 'classic' elements, which comprise the phonological loop, the visuospatial sketchpad and the central executive. The episodic buffer is thought to act as a limited storage system capable of integrating information from a variety of sources.

Nuechterlein et al. (1994) and, more recently, Lencz et al. (2003) pointed out that many cognitive tasks, and visual working memory in particular, require a representation of the stimulus to be formed as a first step of information processing. They also demonstrate that backward masking paradigms can differentiate perceptual impairments from deficits in maintaining and manipulating the stimuli. For these reasons, a visual backward masking paradigm was included in the present experiment. Schubert et al. (1985) investigated backward masking in depressed patients with BPD, but they found no differences compared with controls.

The present study attempts to evaluate perception speed (by means of a backward masking paradigm) and working memory (through a series of delayed matching-to-sample tasks in BPD subjects). To explore the impact of the stimulus modality, auditory and visual delayed matching-to-sample (DMS) tasks are employed. In order to differentiate the effects of load from

interference, the tasks were performed with and without interfering stimuli, an additional (within-modality) task-mental rotation was added, and finally a cross-modal version (auditory and visual stimuli) was administered.

The following hypotheses were formulated: Compared with controls, (1) BPD patients are impaired in stimulus perception (measured as speed deficit, while accuracy is controlled); (2) BPD patients show impaired working memory (measured as accuracy or speed deficit); (3) more specifically, BPD patients perform worse when the load on the working memory is increased by growing task complexity. Hypothesis (4) assumes that within BPD subjects, dissociation scores correlate with working memory performance.

2. Methods

2.1. Subjects

The BPD subjects ($n=22$) were recruited from in- and out-patients of the Department of Psychiatry, University of Tübingen. Controls ($n=25$) were recruited by a newspaper advertisement and were matched by age and years of education. Inclusion criteria were female gender, absence of current medication (except antidepressants in the BPD group), age 18–40 years, and right-handedness (Oldfield, 1971). Exclusion criteria were any other current psychiatric or neurologic diagnosis and present suicidal state. Three BPD subjects took tricyclic antidepressants. A diagnosis of BPD was established (a) by the Diagnostic Interview for Borderline Personality Disorder (Zanarini et al., 1987) requiring a score >7 , and (b) by assessing DSM-IV criteria for borderline personality disorder (American Psychiatric Association, 1994). A DIB score >7 in a control disqualified the subject. All participants were evaluated with a structured interview for DSM-IV diagnoses (Margraf, 1994), a standardized affective checklist measuring negative feelings (BfS, Zerssen von and Koeller, 1976, measuring present negative feelings, e.g. feeling tired, ineffective, listless, lack of self-esteem), a structured interview for lifetime experience with dissociative phenomena (FDS, Freyberger et al., 1999), and subtests of the

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