



# Neuropsychological performance in obsessive-compulsive disorder: A comparison with bipolar disorder and healthy controls



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## ABSTRACT

This study examined whether patients with obsessive-compulsive disorder (OCD) have deficits in executive functioning and memory, as well as the specificity of any OCD-related neuropsychological dysfunction. Previous studies have indicated poorer performance among individuals with OCD compared to healthy controls across the majority of neuropsychological domains, however, findings are very inconsistent. We included 34 individuals with bipolar-I disorder (BP-I), 35 untreated patients with OCD, and 33 healthy controls matched for age, gender, and education. Participants completed the Rey Auditory Verbal Learning Test (RAVLT), the Wechsler Memory Scale-Revised (WMS-R) visual-reproduction subscale, and Stroop Color-Word Interference Test (SCWIT). Compared to both healthy controls and participants with OCD, patients with BP-I showed poorer performance in long-delay verbal recall. Although participants with OCD performed more poorly in visual recall than both BP-I patients and healthy controls, their scores were within the normative range. In pairwise comparisons, OCD did not differ from either BP-I or controls. No significant differences were found in verbal memory or Stroop performance between OCD and healthy controls. Overall, we found no significant differences in neuropsychological performance between patients with OCD and healthy controls that could potentially contribute to functional impairment.

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## 1. Introduction

Obsessive-compulsive disorder (OCD) is a debilitating psychiatric condition characterized by persistent unwanted and distressing thoughts (obsessions) and/or behavioral or mental rituals to neutralize such thoughts (compulsions). Imaging studies have shown that the presence of OCD symptoms is correlated with hyperactivity in the orbitofrontal cortex, anterior cingulate cortex, and caudate nucleus (Chamberlain et al., 2008; Melloni et al., 2012). OCD has also been associated with activation across major domains of the frontostriatal circuits during performance on neuropsychological tasks (Roth et al., 2007). However, some studies have reported increased activation, while others have reported decreased activation during task performance (van den Heuvel et al., 2005; Maltby, Tolin, Worhunsky, O'Keefe, & Kiehl, 2005). Despite these variable findings, results have all been interpreted as supporting a frontostriatal model of OCD.

Compared to the arguably more consistent results found

in imaging studies, investigations of OCD's effect on neuropsychological test performance have yielded inconsistent results (Abramovitch, Mittelman, Tankersley, Abramowitz, & Schweiger, 2015). Meta-analyses have demonstrated that OCD patients display a small to moderate (and not clinically noticeable) degree of impairment on a wide range of cognitive tests (Abramovitch, Abramowitz, & Mittelman, 2013; Shin, Lee, Kim, & Kwon, 2014). Deficits in nonverbal memory and executive functioning are among the most consistently replicated findings among patients with OCD, yet overall inconsistent findings (Kuelz, Hohagen, & Voderholzer, 2004) have prevented a consensus regarding an OCD-specific neuropsychological profile.

Importantly, most neuropsychological performance studies have only compared performance between OCD patients and healthy controls, without also including comparisons to another psychiatric population. This is critical because without a psychiatric control group, it cannot be concluded that any observed differences are specific to OCD, as opposed to being a general function of psychiatric problems. As exceptions, Purcell, Maruff, Kyrios, and Pantelis (1998) found selective deficits in executive functions, visual memory, and motor abilities among OCD patients compared to patients with unipolar depression or panic disorder. Moritz et al. (2002) found that while patients with depression and

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schizophrenia showed similar levels of dysfunction in all tasks, OCD patients performed normally on all tasks except on Trail-Making-B and verbal-fluency tests, and poor performance on these tests was found to be associated with depression symptoms (HAM-D scores) rather than OCD per se.

Studies investigating neuropsychological test performance in patients with bipolar disorder (BD) have yielded both convergent and divergent findings compared to the studies of OCD. Among patients with BD, the most consistently reported deficits are in verbal episodic memory (Arts, Jabben, Krabbendam, & van Os, 2008; Martinez-Aran et al., 2007) and executive functioning (Arts et al., 2008), consistent with the neurobiological model of BD involving the frontotemporal and frontolimbic circuits. There is evidence that verbal-memory differences persist even when patients are euthymic, and this has been linked to functional outcomes in many studies (Martinez-Aran et al., 2007; del Mar Bonín et al., 2014; Öcek-Baş, Aksoy-Poyraz, Baş, Poyraz, & Tosun, 2015). Cognitive impairments and psychosocial functioning present in rather heterogeneous patterns among euthymic patients with BD, and these patterns can potentially indicate subgroups of patients with more severe cognitive deficits or worse psychosocial functioning. By contrast, no study has examined the functional correlates of impaired performance on cognitive tests in patients with OCD.

In the present study, we aimed to assess the specificity of neuropsychological findings in a sample of patients with OCD without depression, and to examine whether differences from healthy individuals are equally pronounced in OCD compared to BD. Ultimately, we sought to determine whether the pattern of neuropsychological findings associated with OCD could be readily distinguished from healthy individuals and BD, such that neurocognitive profiles may indicate subgroups of patients with differing levels of functioning and prognoses and furthermore, that patterns of neuropsychological deficits may be targets for treatment interventions. Because comorbid conditions, particularly depressive symptoms, have been associated with cognitive impairments (Moritz et al., 2001; Moritz, Kloss, Jahn, Schick, & Hand, 2003), we examined patients without secondary diagnoses.

## 2. Methods

### 2.1. Participants

Study participants were 34 euthymic individuals with bipolar I disorder (BP-I), 35 untreated patients with OCD, and 33 healthy individuals (controls). Patients diagnosed with BP-I or OCD had attended the outpatient unit of Cerrahpaşa Medical Faculty Department of Psychiatry. Diagnoses of BP-I were established according to criteria from the Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM-IV-TR; American Psychiatric Association, 2000) after a detailed clinical examination by two consulting psychiatrists. Additional information was gathered from family members and patients' previous medical history. Exclusion criteria included a history of neurological illness, head trauma, mental retardation, electroconvulsive therapy in the previous 6 months, current and past drug or alcohol abuse, and diagnosable or self-reported visual impairment. BP-I patients were euthymic at the time of the study, and any with a Hamilton Rating Scale for Depression (HAM-D) score  $> 8$  and a Young Mania Rating Scale (YMRS)  $> 6$  were excluded from the study (Hamilton, 1960; Young, Biggs, Ziegler, & Meyer, 1978).

Patients with OCD were recruited during their first visit to the outpatient unit of Cerrahpaşa Medical Faculty Department of Psychiatry. Patients with a secondary diagnosis or a personality disorder were excluded from the study. To confirm diagnoses of

OCD and exclude other diagnoses, patients with OCD were evaluated by the SCID-I (First, 2005). OCD patients with a HAM-D score  $> 8$  were excluded from the study and none of the patients with OCD were on medication (26 patients were drug-naïve and the remaining 9 patients had not taken any medications for at least 3 months). No individuals in either the BP-I or OCD groups had comorbid psychiatric diagnoses at the time of assessment.

Healthy control participants were selected to match the participants with OCD and BP-I as closely as possible in age, sex, and years of education. Healthy controls had no current or prior psychiatric history. This study was approved by the Istanbul University Cerrahpaşa Medical Faculty Ethical Committee, and all participants provided written informed consent.

### 2.2. Materials

Memory functioning was evaluated with the Rey Auditory Verbal Learning Test (RAVLT; Rey, 1964) and the Wechsler Memory Scale-Revised (WMS-R; Wechsler, 1987) visual-reproduction subscale. The WMS-R has been standardized for Turkish populations (Karakaş, Kafadar, & Eski, 1996; Karakaş, Kafadar, & Erişen, 1998). Executive functioning (response inhibition) was assessed via the Stroop Color-Word Interference Test (SCWIT; Golden, 1978). The Stroop test has been validated in Turkish by Karakaş et al. (1999).

The Rey Auditory Verbal Learning Test (RAVLT) is a test of verbal memory. It has two lists of 15 words, A and B, that are presented at a speed of one word per second. List A is presented with five successive trials, and after each trial, the participant recalls as many words as possible that have been listed. List B is an interference trial given after the fifth trial of list A. The test measures learning score (number of words correctly recalled in each of the five trials) and both immediate (after List B) and 20-minute delayed recall. Öktem (1992) standardized this test for Turkish populations.

### 2.3. Statistical analyses

A univariate analysis of variance (ANOVA) with group (BP-I, OCD, or healthy control) included as a between-subject factor was conducted using  $p < 0.05$  as the significance threshold. For variables not meeting the assumption of a normal distribution, a non-parametric Kruskal-Wallis analysis of variance followed by Mann-Whitney U-tests was used instead of parametric tests. When the overall Kruskal-Wallis test indicated a significant difference ( $p < 0.05$ ), post-hoc pairwise comparisons were tested with a Bonferroni correction of the significance threshold ( $p < 0.017$ ). The association between age of onset, duration of illness, number of depressive and manic episodes (for BP-I participants only), and visual and long-delayed recall were explored using Spearman rank-order correlations.

## 3. Results

Table 1 summarizes the demographic and clinical characteristics of the participants. BP-I, OCD, and healthy-control participants did not differ with respect to age ( $F=1.4$ ,  $p=0.244$ ), sex ( $\chi^2=0.036$ ,  $p=0.982$ ), or years of education ( $\chi^2=1.237$ ,  $p=0.539$ ). BP-I and OCD participants did not differ in their age of onset ( $z=-1.72$ ,  $p=0.08$ ). Duration of illness was significantly longer in patients with BP-I ( $z=-3.964$ ,  $p < 0.001$ ).

Table 2 shows neuropsychological test scores. Kruskal-Wallis tests indicated significant group differences for learning score ( $X_2=32.606$ ,  $p < 0.001$ ), maximum learning score ( $X_2=15.045$ ,  $p=0.001$ ), long-delayed free recall ( $X_2=24.487$ ,  $p < 0.001$ ), and visual recall ( $X_2=6.292$ ,  $p=0.043$ ). On the other hand, the three

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