Speed and accuracy on tests of executive function in obsessive–compulsive disorder

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Abstract

Slowness in obsessive–compulsive disorder (OCD) has been attributed to intrusive thoughts or meticulousness. Recent research suggests that slowness in OCD may be particularly evident on tests of executive function subserved by frontostriatal circuitry. In the present study, the speed and accuracy of responding on neuropsychological tests of executive functions and psychomotor speed were investigated in 27 non-depressed, unmedicated adults with OCD and 27 healthy controls. The only group difference was that patients took significantly longer to copy a complex geometric design than controls. This finding was unrelated to residual depression or overall OCD symptom severity. Results suggest that slowness in OCD may be most apparent on executive tests requiring self-initiated organizational strategies, consistent with frontostriatal abnormality.

1. Introduction

Patients with Obsessive–compulsive disorder (OCD) can show significant slowness in completing activities of daily living such as eating, dressing, and bathing. Neuropsychological studies have also indicated that patients with OCD may perform more poorly on timed than untimed tests (Alarcon, Libb, & Boll, 1994). Slowness in OCD has most commonly been attributed to either the presence of distracting intrusive thoughts and/or meticulousness during test or task performance. Slowness cannot be readily attributed to comorbid depression.

In contrast to symptom-based explanations for slowness in OCD, patients with prominent obsessional slowness have been reported to show increased rates of neurological soft signs (Hymas, Lees, Bolton, Epps, & Head, 1991). In addition, Galderisi and colleagues reported that patients with OCD were significantly slower than healthy controls in completing tests sensitive to frontostriatal circuitry integrity, but not tests of temporal lobe integrity; groups did not differ with respect to accuracy of performance, and depression was unrelated to slowness in the patient group (Galderisi, Mucci, Catapano, D’Amato, & Maj, 1995). These findings were interpreted as being consistent with evidence of frontostriatal circuitry involvement in OCD (Rauch & Savage, 2000), and the association of slowed behavioral responding with frontostriatal circuitry abnormality in neurological populations such as Parkinson’s disease (Cummings, 1995). In addition, the findings suggest that patients with OCD may be most likely to exhibit slowness on tests of executive functions subserved by frontostriatal circuitry, rather than slowness resulting in a generalized deficit on timed tests.

In the present study, we further evaluated whether OCD is associated with significant slowness on measures of executive function sensitive to frontostriatal circuitry abnormality. Both measures of speed and accuracy were employed to determine whether any observed slowness is associated with a cost in accuracy. In addition, tests of psychomotor speed were also administered to ensure that any evidence of slowness in OCD on executive tests is not due to comorbid depression.

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measures was not the result of generalized slowness when completing neuropsychological tests.

2. Methods

2.1. Participants

Participants included 27 unmedicated, non-clinically depressed adults with OCD recruited through the Centre de Recherche Fernand Seguin in Montréal, Québec. Patients were diagnosed using the Anxiety Disorders Interview Schedule for DSM-IV. Patients with comorbid major depressive disorder or dysthymia were excluded. OCD symptom severity was assessed with the Yale–Brown Obsessive–Compulsive Scale (Mean = 26.8, SD = 7.0). All patients were either unmedicated for at least two weeks prior to the neuropsychological evaluation (n = 11) or treatment-naïve (n = 16). A sample of 27 healthy controls was recruited through advertisements in local newspapers. All participants were between 18 and 65 years of age and had no history of neurological illness, head injury resulting in a loss of consciousness, substance abuse, or systemic illness with potential effects on cognitive functioning. Written informed consent was obtained from each subject after a complete description of the study.

2.2. Measures

Residual depression was measured using the Beck Depression Inventory (BDI). Current anxiety was assessed with the State-Trait Anxiety Inventory—State subscale (STAI-State). Neuropsychological variables included measures of executive function (total copy score and time to complete the Rey Complex Figure copy trial; time to complete and percentage of perseverative errors on the Wisconsin Card Sorting Test; time to complete and total number of errors on the Trail Making Test-Part B); and psychomotor speed (time to complete and total number of errors on the Trail Making Test-Part A; age-scaled score on the Digit Symbol Subtest from the Wechsler Adult Intelligence Scale—Revised; mean for both left and right-hand simple motor speed trials of the Purdue Pegboard Test).

2.3. Statistical analysis

Variables with kurtotic or skewed distributions were transformed to ensure compliance with parametric assumptions. Group differences in demographic characteristics, mood, and neuropsychological functioning were analyzed using independent samples t tests and non-parametric statistics as appropriate. Minimal errors were made on the Trail Making Test in both groups resulting in non-normal distributions that could not be adjusted using statistical transformation. We therefore used non-parametric analysis to evaluate the percentage of subjects within each group making at least one error on Part A or Part B. All comparisons were two-tailed with the significance level set at P < .05.

2.4. Results

Table 1 presents the descriptive statistics and results of statistical analyses. The groups were well matched for age, years of education, and sex composition. Despite exclusion of patients who met DSM-IV criteria for a depressive disorder, the OCD group reported significantly more depression (BDI), as well as more anxiety (STAI-S), than the healthy controls. On neuropsychological measures, group differences were not observed for accuracy on any of the tests. In addition, patients did not differ from controls on measures of psychomotor speed, or time to complete the Wisconsin Card Sorting Test or Trail Making Tests. In contrast, the OCD group took significantly longer than controls to complete the copy of the Rey Complex Figure. This finding remained significant when analysis of covariance was conducted using BDI and STAI-State scores as covariates. Further analysis indicated that time to complete the Rey Complex Figure copy was not correlated with overall OCD symptom severity (r = .19, P = .34). However, the obsessional slowness item on the YBOCS, available for a subset of nineteen patients, was significantly correlated with time to complete the copy of the Rey Complex Figure (r = .49, P = .03).

3. Discussion

The present findings revealed that non-depressed, unmedicated patients with OCD were significantly slower than controls only when copying the Rey Complex Figure. In a subset of patients for whom data was available, a clinician rating of obsessive slowness was significantly correlated with time to complete the figure. Group differences were not observed for speed on any measure of psychomotor speed or other measures of executive function. Furthermore, groups did not differ with respect to accuracy on any of the measures employed.

The results of this investigation indicate that OCD is not associated with generalized impairment on timed neuropsychological tests, nor on all measures of executive function. That slowness was only observed on the copy trial of the Rey Complex Figure is in keeping with the evidence that patients with OCD show poor use of organizational strategies when copying the figure (Savage et al., 1999). It is possible that slowness in OCD may be most apparent on executive tests requiring
self-initiated use of organizational strategies. Studies of the ability of patients with OCD to generate and apply organizational strategies on tests of executive functions in a timely manner would be informative. Given that impaired self-initiation is commonly observed in neurological disorders with frontostriatal abnormality (Cummings, 1995), functional neuroimaging would be helpful for determining the relationship between slowness, poor use of organizational strategies, and frontostriatal abnormality in OCD.

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