Organizational strategy use in obsessive–compulsive disorder

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Abstract

Patients with obsessive–compulsive disorder (OCD) have been demonstrated to be less likely to use spontaneously generated organizational strategies during verbal episodic memory and visuoconstruction tasks. However, whether this organizational deficit is generalizable to other areas of cognitive functioning has not been established. In the present study, we assessed whether adults with OCD are less likely to spontaneously generate organizational strategies during performance of an executive function test, the Self-Ordered Pointing Task (SOPT). Participants included 30 adults with OCD and 24 healthy controls. Groups did not differ with respect to the time to complete or number of errors made on the SOPT. Furthermore, group differences were not observed in the ability to generate organizational strategies or in the specific types of strategies employed to complete the SOPT. These findings indicate that a reduced use of organizational strategies in OCD is not present across all cognitive domains.

Keywords: OCD; Executive function; Cognition

1. Introduction

Obsessive–compulsive disorder (OCD) has been associated with executive dysfunction including difficulty with response inhibition, cognitive flexibility, and working memory (Alarcon et al., 1994; Greisberg and McKay, 2003; Purcell et al., 1998; Roth and Baribeau, 1996). Several recent studies have also reported deficits in organizational skills in OCD. Patients with OCD were found to be less likely than healthy controls to spontaneously use a semantic organization strategy during learning of a word list. This deficit in strategy use was associated with poorer free recall of the words following a delay (Deckersbach et al., 2000; Savage et al., 2000). Patients with OCD have also been shown to have difficulty organizing their copy of a complex geometric design, the Rey Complex Figure, which was also associated with poorer free recall of the design after a delay (Deckersbach et al., 2000; Savage et al., 1999). Overall,
these studies raise the possibility that deficient spontaneous use of organizational strategies may be a core cognitive deficit in OCD that affects performance in a number of cognitive domains.

The ability to spontaneously generate and apply organizational strategies during cognitive tasks has been associated with frontal lobe integrity. Patients with acquired lesions to the frontal lobes are less likely to generate organizational strategies (Gershberg and Shimamura, 1995). Functional neuroimaging studies have demonstrated that the use of organizational strategies is associated with activation of the frontal lobe in healthy adults (Fletcher et al., 1998; Grasby et al., 1993; Savage et al., 2001). Decreased spontaneous generation of organizational strategies in OCD is consistent with positron emission tomography (Rauch et al., 2001; Saxena and Rauch, 2000) and structural magnetic resonance (Szczesko et al., 1999) evidence for a frontal–striatal circuitry abnormality in the disorder.

The Self-Ordered Pointing Task (SOPT) presents participants with an array of stimuli in different randomly ordered arrays on as many pages as there are stimuli (Petrides and Milner, 1982). Participants are asked to point to one stimulus on each page without repeatedly selecting any stimulus. The SOPT requires the use of working memory and self-monitoring (Petrides and Milner, 1982). Human and primates with acquired frontal lobe lesions have been shown to perform poorly on the task (Petrides and Milner, 1982; Petrides, 1995). Prominent frontal lobe activation on positron emission tomography is noted in healthy adults performing the SOPT (Petrides et al., 1993a,b). Furthermore, healthy elderly participants perform worse on the SOPT than young adult participants, consistent with the hypothesis of declining executive functioning with age (Daigneault and Braun, 1993). Daigneault et al. (1992) observed that 80% of the healthy participants spontaneously generated organizational strategies to facilitate their performance of an abstract design version of the SOPT. The most common strategies used included categorizing designs based on visual features (e.g., designs that contained triangles) and verbally labeling each design (e.g., musical note).

Two studies have reported on SOPT performance in OCD (Martin et al., 1995; Roth et al., 2004). Patients with OCD did not differ from healthy controls with respect to error rates in either study, while patients were slower than controls to complete the SOPT in one (Martin et al., 2004) but not the other (Roth et al., 2004). However, strategy use was not reported in either article. In the present study, we sought to determine whether deficient spontaneous generation of organizational strategies in OCD would be generalizable to a test specifically designed to assess executive functions, the SOPT. It was predicted that patients with OCD would be less likely than healthy controls to spontaneously generate strategies to facilitate task performance.

2. Methods

2.1. Participants

Participants were 30 adult outpatients with OCD (60% women) and 24 healthy controls (41% women). Participants were between 18 and 65 years of age, were right-handed, and had no history of substance abuse, neurological illness, head injury resulting in a loss of consciousness, electroconvulsive therapy or psychosurgery, or other medical illness with potential effects on cognitive functioning. Patients were evaluated by either a psychiatrist or psychologist with extensive experience in diagnosing OCD. Diagnoses were established using the Anxiety Disorders Interview Schedule, a structured diagnostic interview for anxiety disorders and exclusionary conditions (Brown et al., 1994). Patients were excluded from the present investigation if they had a comorbid major depressive disorder or dysthymia, as defined by the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition (American Psychiatric Association, 1994). OCD symptom severity was assessed using the Yale–Brown Obsessive–Compulsive Scale (YBOCS), a structured clinical interview specifically designed to determine the nature, extent and severity of obsessions and compulsions (Goodman et al., 1989). Among the patients with OCD, nine had discontinued SSRI treatment at least 2 weeks before their participation and 21 were psychotropic medication naïve. Healthy controls were recruited from a subject pool at the Centre de Recherche Fernand Seguin (a dedicated research center affiliated with the University of Montreal and Louis H. Lafontaine...
Hospital and advertisements in a local newspaper. Controls were excluded if they reported any history of psychiatric illness. All participants provided written informed consent after complete description of the study. Data for SOPT speed and accuracy, but not strategy use, have been reported in a separate article for a subset of the present participants (Roth et al., 2004).

2.2. Procedures

We employed the 12-stimulus, abstract designs version of the SOPT (Petrides and Milner, 1982). Participants were presented with a booklet containing 12 pages. On each of the 12 pages were found 12 different abstract designs, with the placement of the designs randomized on each page. Participants were required to select a design on page 1 by pointing at it, turn to the next page and select a different design, and so forth until a design had been chosen on each of the 12 pages. Participants were informed that they should avoid selecting any of the designs more than once, and were not allowed to select designs in the same spatial location more than two pages in a row. Participants were not informed of any errors they committed, or that organizational strategies could be used to facilitate task performance. In addition, they were informed that task performance was timed, but that there was no time limit. This procedure was repeated for two more trials of the same 12 abstract designs, but using different random placements.

After completion of the three trials, participants were asked whether they had used a strategy to facilitate SOPT performance, and if so, to describe the strategy. Their response was recorded verbatim. Review of the performance data by a member of our research team, blind to group membership, was conducted to confirm the verbatim description of which, if any, strategy was used. Review of verbatim responses indicated that three different organizational strategy types were employed by participants. One strategy involved coming up with a verbal, representational label for the abstract designs (e.g., musical note, highway) in order to facilitate recall (verbal labeling strategy). Another strategy involved grouping designs based on the presence of specific visual features present in the abstract designs (e.g., squares, triangles) and then selecting all the designs with a specific visual feature, followed by all the designs with a different feature, and so on (visual feature strategy). Finally, some participants used an ordering strategy whereby they selected designs in a specific order, for example, always selecting from left to right or from top to bottom as they went through the test booklet (specific order strategy).

Participants also completed the Beck Depression Inventory (BDI) to assess mood. The BDI is a 21-item self-report scale designed to assess symptoms of depression (Beck, 1987). Scores range from 21 to 63, with higher scores indicating a greater level of depression.

2.3. Statistical analysis

Group differences in demographic, clinical characteristics, and SOPT errors and time to complete across the three trials were analyzed using independent samples t tests and nonparametric statistics as appropriate. Group difference in percent of participants using a strategy was analyzed using chi-square tests (no strategy versus any strategy). We also conducted 2 × 2 analysis of variance (ANOVA) with Group and Strategy as the factors and SOPT performance as the dependent variable, to evaluate an interaction effect on total errors or time to complete the three trials. In addition, we conducted chi-square analyses to determine whether there were group differences in the percent of participants using specific types of strategies (no strategy, visual feature, verbal labeling, or specific order), as well as 2 × 4 ANOVAs to assess any Group by Strategy Type interaction effect on total errors or time to complete the three trials. Correlation analyses between SOPT variables and BDI and YBOCS scores were also performed. All tests used two-tailed comparisons with significance level set at \( P < 0.05 \).

3. Results

3.1. Demographic and clinical characteristics

Demographic and clinical characteristics of the patient and control groups are presented in Table 1. The groups did not differ significantly with respect to age \( [t(52) = 0.49, \ P = 0.626] \) or sex composition
$\chi^2(1) = 0.18, P = 0.273$. A trend was observed for the patients to be less educated than the controls [$t(52) = 1.92, P = 0.06$]. Despite exclusion of patients with a diagnosable depressive disorder, the patient group reported a significantly higher level of depression than the controls [$t(52) = 6.68, P = 0.001$], with scores generally falling within the mild depression range (Beck, 1987).

### 3.2. SOPT performance

Table 2 presents the SOPT data. Groups did not differ significantly with respect to the total number of errors made [$t(52) = 0.31, P = 0.758$] or time to complete the SOPT [$t(52) = 0.18, P = 0.857$]. Furthermore, groups did not differ in the percent of participants using any organizational strategy (no strategy versus any strategy) to complete the task [$\chi^2(1) = 0.10, P = 0.781$]. ANOVA did not reveal a significant Group by Strategy interaction for either errors [$F(1,50) = 0.75, P = 0.391$] or time to completion [$F(1,50) = 0.46, P = 0.500$]. However, a main effect of Strategy was observed indicating fewer errors [$F(1,50) = 5.57, P = 0.022$] for participants using a strategy than those that did not use any strategy at all. Groups also did not differ in the percent of participants using each of the specific types of organizational strategies employed during the SOPT [$\chi^2(1) = 1.77, P = 0.623$]. The Group by Strategy Type interactions for errors [$F(1,46) = 1.34, P = 0.858$] and time to completion [$F(1,46) = 0.23, P = 0.875$] also did not differ significantly in the groups. In contrast, a main effect of Strategy Type was noted indicating significantly fewer errors for participants using the verbal labeling strategy than either of the other two strategy types or those not using a strategy at all [$F(1,50) = 7.23, P = 0.001$].

None of the correlations between SOPT variables (total errors, time to complete) and either BDI or YBOCS scores were significant (all $P > 0.05$). The relationship between BDI and YBOCS scores and strategy use in the OCD group also was not significant. No differences were observed for the SOPT variables between healthy controls, treatment-naïve ($n = 21$) patients and medication-withdrawn ($n = 9$) patients (all $P > 0.05$). Finally, we did not observe any interaction between Group, Strategy use, or either age or education on any of the SOPT variables.

### 4. Discussion

Contrary to expectations, our patients with OCD and healthy controls differed neither in their use of self-generated organizational strategies nor in their accuracy or time to complete the SOPT. Furthermore, differences were not observed in the nature of the organizational strategies employed. These findings contrast with prior studies reporting that patients with OCD are significantly less likely to use organizational strategies during the performance of verbal episodic memory and visuoconstruction tasks (Savage et al., 1999, 2000; Deckersbach et al., 2000). However, across our entire sample of participants, the spontaneous use of an organizational strategy involving providing a verbal label for the abstract designs was associated with significantly fewer errors on the SOPT. This is consistent with prior studies showing better performance on the SOPT when an organizational strategy is used (Daigneault and Braun, 1993).
That group differences in strategy use were not observed in the present study is unlikely to be due to a lack of statistical power, as our sample size was similar or greater to that used in prior studies that did find an organizational strategy use deficit in OCD (Savage et al., 1999, 2000; Deckersbach et al., 2000). It may be argued that the present finding is not unexpected, since the patients and controls did not differ in their speed or accuracy during SOPT performance. However, a prior study observed that patients were less likely to use an organizational strategy to copy the Rey Complex Figure than healthy controls, but group differences did not emerge for the accuracy of the copies (Savage et al., 1999). In addition, it has been argued that deficient organizational strategy use is what accounts for poor recall of verbal and visual information in OCD, not vice versa (Deckersbach et al., 2000; Savage et al., 2000). Thus, if there is a generalized organizational strategy deficit in OCD relative to healthy controls, it should appear whenever performance on a task is significantly improved with the spontaneous use of organizational strategies. The present study clearly shows that this is not the case.

Overall OCD symptom severity was greater in the Savage et al. (2000) study than in the present investigation, and a trend for organizational strategy use during the copy component of the Rey Complex Figure and severity of obsessions on the YBOCS to be correlated has been noted (Savage et al., 1999). We did not observe any significant relationship between SOPT variables and severity of OCD symptoms within our sample. Thus, the lack of organizational strategy use deficit in the present study cannot be accounted for by differences between the studies with respect to OCD symptom severity.

Studies of patients with OCD using tests tapping a variety of executive functions have yielded inconsistent findings (Christensen et al., 1992; Purcell et al., 1998; Basso et al., 2001; Greisberg and McKay, 2003). The lack of organizational strategy in the present study fits into this broader literature on executive functions in the disorder. It has been suggested that the presence of comorbid depression accounts for executive dysfunction when observed in patients with OCD (Basso et al., 2001; Moritz et al., 2001). Two previous studies showing an organizational strategy deficit in OCD included patients who were significantly more depressed than healthy controls, based on their BDI scores (Savage et al., 1999, 2000). However, neither of these studies reported whether there was a relationship between strategy use and depression. Two findings from the present study argue against depression as a significant mediator of differences in organizational strategy use between the studies. First, our patient group also obtained significantly higher scores on the BDI than controls but did not show an organizational strategy use deficit. Second, depression was not correlated with any of the SOPT variables in our patient group. It is plausible that there are one or more distinct subtypes of OCD that can be differentiated based on intact or deficient executive functions such as organizational strategy use. Studies with larger sample sizes that would permit more extensive evaluation of potential subtypes would likely prove helpful in understanding discrepancies observed between studies.

In summary, the present study did not observe a deficit in spontaneous generation of organizational strategies during the performance of an executive function task in patients with OCD. This finding contrasts with prior studies and indicates that deficient organizational strategy use in OCD is not generalized across tests tapping various cognitive domains such as executive functions, memory and visuoconstruction. Further research using larger samples and multiple tests, from a variety of cognitive domains, on which performance can be improved with the generation of organization strategies will be necessary to resolve discrepancies in the current literature.

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