Deficits of Organizational Strategy and Visual Memory in Obsessive–Compulsive Disorder

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This study was conducted to investigate the deficits of organizational strategy and visual memory in obsessive–compulsive disorder (OCD). Thirty OCD patients and 30 healthy controls aged 20–35 years participated. The Maudsley Obsessive–Compulsive Inventory, Beck Anxiety Inventory, Wechsler Adult Intelligence Scale, and Rey–Osterrieth Complex Figure (ROCF) test were administered to participants. The authors scored ROCF performances using the Boston Qualitative Scoring System. The OCD patients showed poorer planning ability and higher fragmentation than did healthy controls when copying the ROCF, and they showed even poorer performances in the immediate and delayed recall conditions. The authors found that the Organization score in the copy condition mediated the difference between the OCD group and the healthy group in immediate recall. The direct effect of diagnosis (OCD or healthy) on the immediate recall condition of the ROCF was also significant. This study indicates that people with OCD have poor memory function and organizational deficits.

According to the Diagnostic and Statistical Manual of Mental Disorders (4th ed., DSM–IV; American Psychiatric Association, 1994), obsessive–compulsive disorder (OCD) is classified as an anxiety disorder and is characterized by repetitive, intrusive thoughts and/or compulsive stereotyped behaviors, which lead to severe distress and interfere with daily functioning and social activity. Recently, however, much evidence indicates that OCD is associated with a distinct pattern of brain dysfunction and cognitive impairment (Savage et al., 2000).

Many researchers have examined the association between OCD and cognitive impairment using neuropsychological tests to assess various aspects of executive and memory function. Their main findings were that people with OCD have problems with memory (Boone, Ananth, Philpott, Kaur, & Djenderedjian, 1991; Christensen, Kim, Dysken, & Hoover, 1992; Dirson, Bouvard, Cottraux, & Martin, 1995; Savage et al., 1996; Zielinski, Taylor, & Južwin, 1991); visuospatial organization (Aronowitz et al., 1994; Behar, Rapoport, & Berg, 1984; Boone et al., 1991; Cohen et al., 1996; Head, Bolton, & Hymas, 1989; Hollander et al., 1993); and executive functioning (Abbruzzese, Bellodi, Ferri, &Scarone, 1995, 1997; Abbruzzese, Ferri, & Scarone, 1995; Aronowitz et al., 1994; Head et al., 1989; Malloy, 1987; Nelson, Early, & Haller, 1993; Purcell, Maruff, Kyrios, & Pantelis, 1998a, 1998b; Veale, Sahakian, Owen, & Marks, 1996; Zielinski et al., 1991).

In particular, many studies have been conducted on the memory function of people with OCD. However, such studies have shown inconsistent results depending on the various OCD subtypes and memory tasks used. Nonetheless, most of these previous studies have suggested the presence of deficits in visual memory or visuospatial memory. Although some studies have suggested deficits in verbal memory, others have demonstrated that people with OCD do not have such a problem. Furthermore, memory deficits in people with OCD have been found to be related more to compulsive checking than to compulsive washing (Bouvard, Dirson, & Cottraux, 1997; MacDonald, Antony, MacLeod, & Richter, 1997; Rubenstein, Peynircioglu, Chambless, & Pigott, 1993; Sher, Frost, Kushner, Crews, & Alexander, 1989; Sher, Mann, & Frost, 1984).

The Rey–Osterrieth Complex Figure (ROCF; Osterrieth, 1944; Rey, 1941) is one of the most widely used neuropsychological tests for measuring visuospatial construction and nonverbal memory in both clinical and research settings (Somerville, Tremont, & Stern, 2000). The ROCF task involves copying a complex geometric figure and then reproducing it from memory, either immediately or after a brief delay. The ROCF, however, is complex, as it involves the integration of multiple cognitive operations, and organizing the ROCF into a meaningful perceptual unit during the copy condition enhances its subsequent recall from memory (Savage et al., 1999, 2000; Shorr, Delis, & Massman, 1992; Waber & Holmes, 1986).
Therefore, the ROCF can be used to assess the executive function, which is associated with the prefrontal cortex. Executive function on the ROCF is manifested in strategic planning and organizing abilities.

Savage et al. (1999) found that immediate nonverbal memory problems in people with OCD were mediated by impaired organizational strategies used during copying the ROCF, which suggested that the primary deficit of OCD might be impaired executive function. Using the ROCF and the California Verbal Learning Test, Savage et al. (2000) also showed that verbal and nonverbal episodic memory deficits in OCD were affected by impaired strategic processing: People with OCD focused on details without appreciating the larger perceptual and semantic context and had mental shifting difficulties as well as difficulties trying alternative and adaptive strategies that negatively affect encoding and retrieving of new episodic memory. These findings are consistent with the neurobiological model of frontal–striatal dysfunction in OCD.

Although previous studies (Savage et al., 1999, 2000) in which the ROCF was used have demonstrated that people with OCD have a primary problem in terms of organizing the ROCF and poor memory function that is due to poor organizational ability, these studies did not eliminate the effect of anxiety on ROCF performance. Researchers have found that negative emotions such as trait and state anxiety have an adverse effect on memory function (Rubenstein et al., 1993). Because most people with OCD are thought to have moderate to severe levels of anxiety, their organizing strategy and memory function when performing the ROCF could be affected.

Furthermore, previous researchers have evaluated organizational strategy on the ROCF by using a quantitative method developed by Savage et al. (1999) that calculates the Organization score quite easily. However, that ROCF scoring system does not have a score for executive function, which is a very important variable for the evaluation of cognitive impairment in people with OCD.

Several quantitative methods for scoring the ROCF have been proposed (Bennett-Levy, 1984; Bernstein & Waber, 1996; Binder, 1982; Chiulli, Haaland, LaRue, & Garry, 1995; Hamby, Wilkin, & Barry, 1993; Loring, Lee, & Meador, 1988; Rapport, Farchione, Dutra, Webster, & Charter, 1996; Shorr, Delis, & Massman, 1992; Visser, 1973). However, although many of them have stressed the importance of executive functioning on ROCF performance, they have not provided a comprehensive system for the evaluation of executive function contributing to the ROCF (Somerville et al., 2000).

Bernstein and Waber (1996) suggested that the metacognitive function on the ROCF, which is associated with frontal lobe function, is manifested in strategic planning and organizing abilities. They developed the Developmental Scoring System of the ROCF for children, which includes the quantitative score of Organization. And although Savage et al. (1999, 2000) have also evaluated organizational strategy with a quantitative method, the only commercially available qualitative scoring system for assessing executive function of adults is the Boston Qualitative Scoring System (BQSS) developed by Stern et al. (1999). This system provides comprehensive sets of qualitative ratings as well as quantitative summary scores. In addition, the BQSS for the ROCF includes executive function variables, which are composed of five scores: Planning, Fragmentation, Neatness, Perseveration, and Organization. The BQSS executive function variables were found to be significantly correlated with the traditional executive measures, including Perseverative Errors responses on the Wisconsin Card Sorting Test and Total Words on the Controlled Oral Word Association Test (Somerville et al., 2000).

The primary aim of our study was to determine whether nonverbal memory impairment exists as an independent deficit or as a function of poor organizational strategies in people with OCD. Therefore, we undertook this study, using the BQSS for the ROCF, to examine (a) whether people with OCD show poorer organizational skills and planning ability than do healthy controls after eliminating the effects of anxiety and IQ on ROCF performance and (b) whether poor immediate recall in people with OCD is mediated by poor organizational strategy during the ROCF copy condition.

Method

Participants

Study participants were 30 OCD patients (24 men, 6 women) and 30 age- and sex-matched healthy controls whose ages ranged from 20 to 35 years. All gave informed consent prior to participating in this study. The OCD group consisted of patients who visited the OCD clinic at Seoul National University Hospital, Seoul, South Korea. All met DSM–IV (American Psychiatric Association, 1994) criteria for OCD and the Structured Clinical Interview for DSM–IV (SCID–IV; First, Spitzer, Gibbon, & Williams, 1997). The SCID–IV, a widely used structured interview that provides accurate and broad-spectrum DSM diagnoses for adults, was used to diagnose psychiatric disorders in both OCD and healthy participants. Among the 30 patients with OCD, 3 had a comorbid disorder of major depression, obsessive–compulsive personality disorder, and schizotypal personality disorder, respectively. At the time of testing, 16 were not on any medication and 14 were on medication. The mean daily dose was 70 mg of sertraline, 34 mg of fluoxetine, and 40 mg of paroxetine, either individually or in combination. In addition, 5 patients were on a mean daily dose of 1.1 mg of reserpine, 2 were on 7.5 mg of olanzapine, 3 were on 0.6 mg of clonazepam, and 2 were on 25 mg of trazodone. The healthy control participants were recruited from nonprofessional hospital staff. They consisted of administration staff, nurses, technicians, and secretaries who volunteered after seeing the recruitment notice posted at the Seoul National University bulletin. After administering the SCID–IV, we determined that none of the 30 healthy control participants had a psychiatric disorder or were taking any medication. To rule out depressive disorder, we administered the Beck Depression Inventory (BDI) to all participants and, as a result, discovered that the BDI scores of the OCD group were slightly higher than those of the healthy group. However, the scores were not statistically significant.

Exclusion criteria for OCD participants were other Axis I DSM–IV diagnoses and major medical or neurological illnesses, and those for the healthy control participants were any current or past psychiatric disorders or other medical illness. All except 2 participants were right-handed (see Table 1 for the demographic and clinical characteristics of each group).

Instruments

Maudsley Obsessive–Compulsive Inventory (MOCl; Rachman & Hodgson, 1980). The MOCl, a self-report instrument composed of 30 items, was designed to assess obsessive–compulsive symptoms. The Korean version of the MOCl was administered individually to the participants in the OCD and control groups. All participants answered “yes” (1) or “no” (0) to the description of the symptoms, so the possible range of total scores was from 0 to 30.
Beck Anxiety Inventory (BAI; Beck, Epstein, Brown, & Steer, 1988). The BAI is a self-report questionnaire that measures anxiety symptoms. Its 21 items evaluate the degree of anxiety on a 4-point scale; the maximal total score range is from 0 to 63.

Wechsler Adult Intelligence Scale (WAIS). Silverstein (1982) proposed that the short form of the Wechsler Adult Intelligence Scale—Revised (WAIS–R), which includes Arithmetic, Vocabulary, Block Design, and Picture Arrangement subtests, is useful for assessing global intellectual function. All participants were individually administered four subtests of the WAIS–R to estimate their IQ levels.

ROCF test (Osterrieth, 1944; Rey, 1941). The ROCF was administered to all participants. The ROCF consists of three test conditions: copy, immediate recall, and 20-min delayed recall. This test assesses a variety of cognitive processes such as planning, organizational skills, problem-solving strategies, and memory functions (Meyers & Meyers, 1995a, 1995b; Waber & Holmes, 1986).

Statistical Analysis

Multivariate analysis of covariance was used to examine group differences in terms of ROCF performances with covariates of IQ and the Beck Anxiety score. Pearson product–moment correlation analysis was used to calculate the correlation coefficients between the ROCF variables and the scores on the BAI and the MOCI. Structural equation modeling was used to examine the mediating effect of organizational strategy on nonverbal memory for the ROCF in people with OCD.

Results

Means and standard deviations of the quantitative summary scores on the ROCF test for each group are presented in Table 2. The OCD participants showed poorer performances on Immediate Presence and Accuracy, Delayed Presence and Accuracy, Immediate Retention, and Organization scores than did the healthy control participants: 4(1, 56) = 14.02, p < .001; 4(1, 56) = 12.39, p < .001; 4(1, 56) = 13.57, p < .001; and 4(1, 56) = 10.07, p < .01, respectively.

Means and standard deviations of the qualitative scores on the ROCF Copy condition for each group are presented in Table 3. For Copy condition, significant differences between the OCD and the healthy group were found only in the Fragmentation and Planning scores. The OCD patients showed poorer planning ability, 4(1, 56) = 10.40, p < .01, and higher fragmentation, 4(1, 56) = 7.78, p < .02, than did the healthy controls when copying the ROCF.

Means and standard deviations of the qualitative scores on the ROCF in immediate and delayed recall conditions for each group are also presented in Table 3. The OCD patients showed even poorer performances in immediate and delayed recall conditions than they did in the Copy condition, suggesting nonverbal memory problems. For immediate recall, significant differences between the OCD and the healthy group were found for the qualitative variables of configural presence, cluster presence, cluster accuracy, detail presence, fragmentation, planning, perseveration, and conflation: 4(1, 56) = 4.19, p < .05; 4(1, 56) = 13.08, p < .001; 4(1, 56) = 8.63, p < .01; 4(1, 56) = 6.66, p < .05; 4(1, 56) = 5.45, p < .05; 4(1, 56) = 11.14, p < .001; 4(1, 56) = 18.44,
Table 2
Means and Standard Deviations of ROCF Summary Scores for Each Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control (n = 30)</th>
<th>OCD (n = 30)</th>
<th>F(1, 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Copy presence and accuracy</td>
<td>18.60</td>
<td>1.22</td>
<td>17.97</td>
</tr>
<tr>
<td>Immediate presence and accuracy</td>
<td>14.37</td>
<td>2.24</td>
<td>10.77</td>
</tr>
<tr>
<td>Delayed presence and accuracy</td>
<td>14.53</td>
<td>2.05</td>
<td>10.97</td>
</tr>
<tr>
<td>Immediate retention</td>
<td>-22.88</td>
<td>10.80</td>
<td>-40.15</td>
</tr>
<tr>
<td>Delayed retention</td>
<td>1.94</td>
<td>10.20</td>
<td>3.08</td>
</tr>
<tr>
<td>Organization</td>
<td>7.53</td>
<td>0.68</td>
<td>5.94</td>
</tr>
</tbody>
</table>

Note. ROCF = Rey–Osterrieth Complex Figure; OCD = obsessive–compulsive disorder.

Table 3
Means and Standard Deviations of Qualitative Scores in ROCF Copy, Immediate Recall, and Delayed Recall Conditions for Each Group

<table>
<thead>
<tr>
<th>Variable</th>
<th>Copy condition (n = 30)</th>
<th>Immediate recall condition (n = 30)</th>
<th>Delayed recall condition (n = 30)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Configural presence</td>
<td>3.92</td>
<td>0.23</td>
<td>3.55</td>
</tr>
<tr>
<td>Cluster presence</td>
<td>9.03</td>
<td>1.75</td>
<td>8.20</td>
</tr>
<tr>
<td>Cluster absence</td>
<td>4.00</td>
<td>0.00</td>
<td>3.97</td>
</tr>
<tr>
<td>Cluster absence</td>
<td>3.33</td>
<td>0.61</td>
<td>2.93</td>
</tr>
<tr>
<td>Cluster placement</td>
<td>3.43</td>
<td>0.50</td>
<td>3.43</td>
</tr>
<tr>
<td>Fragmentation</td>
<td>3.87</td>
<td>0.35</td>
<td>3.20</td>
</tr>
<tr>
<td>Planning</td>
<td>3.67</td>
<td>0.61</td>
<td>2.70</td>
</tr>
<tr>
<td>Neatness</td>
<td>3.80</td>
<td>0.48</td>
<td>3.57</td>
</tr>
<tr>
<td>Vertical expansion</td>
<td>4.00</td>
<td>0.00</td>
<td>3.97</td>
</tr>
<tr>
<td>Horizontal expansion</td>
<td>3.80</td>
<td>0.41</td>
<td>3.77</td>
</tr>
<tr>
<td>Rotation</td>
<td>4.00</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Perseveration</td>
<td>4.00</td>
<td>0.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Confabulation</td>
<td>3.97</td>
<td>0.18</td>
<td>3.97</td>
</tr>
<tr>
<td>IQ (covariate)</td>
<td>119.10</td>
<td>10.13</td>
<td>107.77</td>
</tr>
<tr>
<td>BAI (covariate)</td>
<td>4.47</td>
<td>4.11</td>
<td>17.10</td>
</tr>
</tbody>
</table>

Note. ROCF = Rey–Osterrieth Complex Figure; OCD = obsessive–compulsive disorder.

p < .001; and F(1, 56) = 7.15, p < .01; respectively. For the delayed recall condition, significant differences between the OCD and the healthy group were found for the qualitative variables of cluster presence, detail presence, neatness, perseveration, and confabulation: F(1, 56) = 19.32, p < .001; F(1, 56) = 8.65, p < .01; F(1, 56) = 8.84, p < .01; F(1, 56) = 25.25, p < .001; and F(1, 56) = 7.88, p < .01, respectively.

To examine the effects of the anxiety and severity of OCD symptoms on ROCF performance, we calculated correlation coefficients between the ROCF variables and the BAI and MOCI scores (see Table 4). The BAI Anxiety score was significantly correlated with the obsessional symptom of the MOCI (r = .65, p < .001) and was negatively correlated with Immediate Presence and Accuracy, Delayed Presence and Accuracy, and Immediate Retention scores on the ROCF (r = -.42, p < .001; r = -.40, p < .001; and r = -.41, p < .001; respectively). The MOCI score was also found to be negatively correlated with Immediate Presence and Accuracy, Delayed Presence and Accuracy, Immediate Retention, and Organization scores on the ROCF (r = -.50, p < .001; r = -.45, p < .001; r = -.46, p < .001; and r = -.32, p < .01; respectively).

To investigate whether memory problems in OCD could be mediated by poor organizational strategies during copying, we tested direct and indirect models of the group effect (OCD = 1, healthy = 0) on the ROCF Visual Memory condition (see Figure 1). These models were based on those described in Savage et al.’s (2000) study. At first, we used the composite score of Immediate Presence and Accuracy and Immediate Retention of summary

\[ \text{Wilks's lambda} = .689, F(13, 44) = 1.52, \text{ ns} \]

\[ .463, F(13, 44) = 1.80, p < .005 \]

\[ .318, F(13, 44) = 5.05, p < .001 \]
scores as dependent variables and the copy Organization score as the mediating variable. Figure 1 illustrates the path models representing the direct and indirect models, with path coefficient B and significance levels. In the direct model, group difference in the ROCF immediate recall was expressed directly as the significant regression coefficient between group and immediate recall (B = −20.87, p < .001). In the mediate model, the group effect on immediate recall was expressed indirectly through the effect of group on organization and organization on immediate recall. That is, the Organization score mediates the difference between two groups in ROCF immediate recall. However, the direct effect of group on ROCF immediate recall was also significant (B = −17.82, p < .001).

**Discussion**

Many researchers have examined the association between OCD and cognitive impairment using neuropsychological tests that assess various aspects of executive and memory function. With regard to the memory problems of OCD, many inconsistent findings have been published. Using the ROCF, Savage et al. (1999, 2000) demonstrated that OCD patients were primarily impaired in strategic processing, which then had secondary effects on immediate and delayed free recall, suggesting the hypothesis of frontal–striatal dysfunction in OCD. However, this study did not eliminate the effect of anxiety on ROCF performance. Furthermore, in that study, researchers evaluated organizational strategy on the ROCF by using a quantitative method. The BQSS developed by Stern et al. (1999) is the only commercially available qualitative scoring system for assessing executive function of adults. In addition, the BQSS for the ROCF includes executive function variables. Thus, in this study we examined whether OCD patients indeed showed poorer organization and planning ability than did healthy controls using the BQSS for the ROCF and whether their poor nonverbal memory on the ROCF was due to poor organizational strategy for copying the ROCF rather than to a true memory dysfunction.

For the ROCF copy condition, significant differences were found only in the Fragmentation and the Planning scores between the OCD and the healthy groups, after partialing out the effects of anxiety and IQ on ROCF performance. The OCD patients did not have any problems attending to or processing specific elements or in visuoperceptual and visuoconstructional ability during copying; planning and organization were only impaired. These results demonstrate OCD patients to have impaired organization and planning abilities, which is consistent with Savage et al.’s (1999, 2000) findings. The merit of the Stern Scoring System for the BQSS of the ROCF is that it gives executive function scores that are very

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**Table 4**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Copy Presence and Accuracy</th>
<th>Immediate Presence and Accuracy</th>
<th>Delayed Presence and Accuracy</th>
<th>Immediate Retention</th>
<th>Delayed Retention</th>
<th>Organization</th>
<th>MOCI</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOCI</td>
<td>−.25</td>
<td>−.50**</td>
<td>−.45**</td>
<td>−.46**</td>
<td>.11</td>
<td>−.32*</td>
<td>—</td>
</tr>
<tr>
<td>BAI</td>
<td>−.23</td>
<td>−.43**</td>
<td>−.40**</td>
<td>−.41**</td>
<td>.09</td>
<td>−.21</td>
<td>.65**</td>
</tr>
</tbody>
</table>

*Note.* MOCI = Maudsley Obsessive–Compulsive Inventory; BAI = Beck Anxiety Inventory; ROCF = Rey–Osterrieth Complex Figure.

*p < .01. **p < .001.

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**Figure 1.** Two path models showing group differences in immediate recall on the Rey–Osterrieth Complex Figure test.
important in examining the neurobiological model of frontal–
striatal dysfunction in OCD. We were interested, therefore, in
whether OCD patients can be correctly discriminated from healthy
controls on the basis of five executive function variables as scored
by the BQSS of the ROCF. Even though the canonical discrimi-
nant function was statistically significant (canonical correlation =
.52, p < .001; Wilks’ s Λ = .73), χ²(4, N = 60) = 17.84, p < .001,
the percentage (73.3%) of overall accuracy of classification is
considered to be modest. Unless the ratio of total sample size to
number of variables is quite large, say 20:1, one should be cautious
in interpreting the results (Stevens, 1996, p. 264). But the results of
discriminant analysis demonstrated that the executive variables of
the ROCF copy condition might be useful for distinguishing be-
tween OCD and healthy groups.

We found it interesting that the OCD patients showed even
poorer performances in immediate and delayed conditions than
in the copy condition, which suggests a nonverbal memory
problem. Using a quantitative scoring method for the ROCF,
Savage et al. (1999, 2000) showed that free-recall problems in
OCD were mediated by impaired organizational strategies used
during encoding trials. Because people with OCD have diffi-
culties in using semantic and perceptual organizational at-
tributes of stimuli, they seem unable to encode and retrieve
new episodic memories effectively, which results in poor
memory function. However, in the present study we found that
even though the poor immediate recall of OCD patients was
statistically mediated by their poor organization skill, they also
had nonverbal memory problems. Such results were not con-
sistent with Savage et al.’s assertion that verbal and nonverbal
episodic memory deficits in OCD are affected by impaired
strategic processing. One of the reasons for this difference is
that we used the Qualitative Scoring System of the ROCF,
whereas Savage et al. used the Quantitative Scoring System.
Therefore, it is possible that we were able to detect memory
deficits in OCD patients more sensitively. It is also possible that
OCD is not a homogeneous disorder; it indeed seems to be
heterogeneous, both clinically and pathophysiological.
With regard to the memory problems of OCD, many inconsistent
findings have been published. Some studies have demonstrated
memory deficits in OCD, and others have not. In the latter
studies, symptom types and severity of OCD and of comorbidi-
ties have varied.

Researchers have studied possible differences in memory func-
tion between OCD patients who check or repeat actions (checker)
and those who do not (nonchecker). Several studies have found
that checking symptoms appear to be associated with memory
impairment (Rubenstein et al., 1993; Sher et al., 1984, 1989). On
the other hand, MacDonald et al. (1997), using the Wechsler
Memory Scale (WMS) and the Verbal Recall subtest (Battig &
Montague, 1969) composed of 48 words, found OCD checking to
be unrelated to memory impairment. Checking is a symptom of
decreased confidence in memory. Bouvard et al. (1997) compared
compulsive checkers and washers using the Wechsler Memory
Scale—Revised (WMS–R) and found that washers did not show
any memory or visual processing deficits, which were associated
more with checking. To resolve the controversy concerning mem-
ory problems in OCD, Roth and Baribeau (1996) examined the
frontal and temporal lobe memory function in compulsive check-
ers using the frontal lobe task (Self-Ordered Pointing) and the
Logical Memory and Visual Reproduction subtests of the
WMS–R. They found that the memory impairment of checkers
might be distinguished from that associated with medial temporal
dysfunction, wherein the ability to store new memories is primarily
affected. Checkers showed a significantly poorer ability to monitor
their responses on Self-Ordered Pointing but no deficits on the
memory tests. It seems that compulsive checking is associated with
a deficit in the monitoring of self-generated responses, a task
requiring adequate functioning of the frontal lobe (frontal memory
for action deficit). Using the WAIS, the WMS, the Wisconsin Card
Sorting Test, and auditory event-related potentials, Okasha et al.
(2000) showed that patients who were obsessive had a defective
visual memory, whereas patients who were compulsive had a
delayed perception of task-relevant stimuli. Given the findings of
previous studies, we believe it is possible that people with OCD
may have a characteristic pattern of cognitive dysfunction that
varies in severity, chronicity, symptom type, and comorbidity.
For the present study, we suggest that OCD patients do have a poor
memory function as well as an organizational deficit. However, the
direct effect of group (OCD vs. healthy; β = −1.78) was consid-
ervably larger than the mediating effect of organization strategy
(β = −1.60), which suggests that the OCD group had an apparent
nonverbal memory problem even when the indirect effect of or-
ganization strategy on memory function was excluded. Although
poor nonverbal memory shown by OCD patients on the ROCF can
be mediated somewhat by impaired organizational strategy, OCD
patients still had poor nonverbal memory compared with that of
healthy controls even after mediating effects of anxiety and IQ
were controlled. Considering the inconsistent results of the previ-
ous studies on the memory problems of checkers and noncheckers,
we performed an additional analysis on nonverbal memory func-
tion by separating our OCD patients into checkers and noncheck-
ers. No significant difference was found between the two groups.
Unfortunately, however, we could not examine the memory prob-
lems in terms of OCD subtypes because of the small sample size
of the OCD patients. Also, although we assessed nonverbal
memory with the ROCF, we did not assess the overall memory function
with other memory tests. Further research with various neuropsy-
chological tests is warranted to examine deficits in verbal and
nonverbal memory and organizational ability according to OCD
subtypes, severity, and comorbidity. Such studies are likely to shed
light on whether OCD memory problems are caused by frontal–
striatal dysfunction or both frontal and temporal dysfunctions and
on whether those deficits vary according to OCD subtypes.

The present study may be limited by several potential shortcom-
ings. Almost half of the OCD patients in this study were taking
medications such as sertraline, fluoxetine, and paroxetine at the
time of testing. Therefore, further study is needed to examine the
potential cognitive effects of various medications on ROCF per-
formance. Because we included OCD patients with multiple symp-
toms, such as checking, washing, slowness, indecisiveness, and
destructive ideation, we could not compare the performances in
terms of subtypes. Moreover, the tests of memory and executive
function used in this study are not comprehensive enough to
measure several domains of neuropsychological function. Further
research that uses more refined and comprehensive measures of
neuropsychological functions, including tests for frontal and tem-
poral lobe function in OCD subtypes, is needed to examine the
characteristic cognitive deficits of OCD.
References


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