Metacognition and episodic memory in obsessive-compulsive disorder

Cornelia Exner, Annika Kohl, Michael Zaudig, Gernot Langs, Tania M. Lincoln, Winfried Rief

Department of Clinical Psychology and Psychotherapy, University of Marburg, Gutenbergstrasse 18, D-35032 Marburg, Germany

Psychosomatic Clinic, Schützenstraße 100, 86949 Windach, Germany

Psychosomatic Clinic, Große Allee 1-3, 34454 Bad Aroizen, Germany

1. Introduction

Deficits in the area of learning and memory are among the most frequently reported neuropsychological findings in people with obsessive-compulsive disorder (OCD) (see Kuelz, Hohagen, & Voderholzer, 2004; Muller & Roberts, 2005, for review). What remains unclear from previous investigations is how deficits in learning and memory relate to the psychopathological symptoms of OCD. Do memory problems contribute to or even cause obsessive-compulsive psychopathology or are they a consequence of OCD symptoms instead? Neurobiological models of OCD have attributed learning and memory deficits in OCD to deficient organizational strategies thought to arise from dysfunctions in frontostriatal pathways (Deckersbach, Otto, Savage, Baer, & Jenike, 2000; Savage et al., 1999; Savage et al., 2000).

Cognitive models of OCD emphasize the negative appraisal of intrusive thoughts, which subsequently leads to neutralizing behavior (Rachman, 1997, 1998; Salkovskis, 1985, 1989). These cognitive theories of OCD focus on dysfunctional thought contents. They only rarely attempt to incorporate information processing deficits. An early memory deficit theory of OCD sought to explain pathological doubt and checking rituals by low memory accuracy (Sher, Frost, Kushner, Crews, & Alexander, 1989; Sher, Frost, & Otto, 1983). This model conceptualized obsessive-compulsive pathology as a consequence of preexisting memory problems but the theory has failed to find consistent empirical support (Moritz, Jacobsen, Willenborg, Jelinek, & Fricke, 2006; Tallis, Pratt, & Jamani, 1999).

During the last decade original appraisal-belief-models have been extended to incorporate abnormal meta-cognitive processing in OCD (Purdon & Clark, 1999; Wells, 2000; Wells & Matthews, 1996). The Obsessive Compulsive Cognition Working Group (OCCWG) has emphasized the overimportance of thoughts and control of thoughts as dimensions of dysfunctional meta-cognition in people with OCD (Compulsive Cognitions Working Group, 2001, 2003). Meta-cognition refers to cognitive processes and structures that monitor and control a person’s own cognition. Two specific constructs of meta-cognitive processing have been linked in particular to memory performance in OCD. Both meta-cognitive models conceptualize memory problems as arising from OCD pathology rather than conditioning it: First, people with OCD, especially of the checking subtype, have been repeatedly shown to have low confidence in their own memory performance (Hermons, Martens, De Cort, Pieters, & Eelen, 2003; Macdonald, Antony, Macleod, & Richter, 1997; Rachman, 2002; Tolin et al., 2001) which is further reduced by constant checking (van den Hout & Kindt, 2003, 2004). Second, people with OCD show a heightened tendency to focus attention on their own mental processes regardless of thought contents. This meta-cognitive characteristic, termed cognitive self-consciousness (CSC), has been shown to be especially linked to obsessive-compulsive pathology (Cartwright-Hatton & Wells, 1997; Cohen & Calamari, 2004; Janeck, Calamari, Rieman, & Heffelfinger, 2003). Cognitive
self-consciousness might be seen as a predisposition that renders participants more vulnerable to development of obsessions and compulsions because it makes intrusive negative thoughts more salient and increases the probability of dysfunctional thought appraisal, especially of assigning too much importance to passing thoughts. Increased cognitive self-consciousness, as it draws on the limited resources of controlled attention, might also disturb performance on effortful cognitive tasks (e.g. episodic memory or problem-solving).

Empirical support for the role of cognitive self-consciousness in deficient memory performance of OCD participants comes from recent research findings: Compared to normal controls (Marker, Calamari, Woodard, & Riemann, 2006) and to subjects with non-OCD anxiety disorders (Goldman et al., 2008) OCD participants were found to show impaired performance on an implicit serial reaction time test, but enhanced recognition of the embedded stimulus pattern. Thus, heightened levels of cognitive self-consciousness might be seen as conscious processing gating problems. This increases likelihood of normally unattended and undetected information (e.g. an embedded structure in the serial reaction time task or negative intrusive thoughts) to enter consciousness and interfere with ongoing cognitive tasks. In an own previous investigation we found Ruminations (a subscale of the Padua Inventory) to be the aspect of OC pathology with the strongest association to episodic memory deficits in participants with OCD (Exner, Martin, & Rief, in press). The psychopathological dimension of Ruminations appears to be closely related to the concepts of self-focused attention (situational) and self-consciousness (dispositional self-attention) as it represents a cognitive style that is characterized by an increased attentional focus on internal mental processes and a sense of reduced control over own mental activities. We suggested that increased attention to one’s own thoughts and monitoring of own mental processes might distract persons with OCD from memory tasks at hand and thus hamper them in the use of effortful encoding strategies.

The aim of the present study was to look beyond group differences on standard memory measures between people with OCD and healthy controls in order to understand the mechanisms associated with reduced memory performance in OCD. Building on our previous observations the purpose of the present investigation was to study the proposed influence of a self-conscious meta-cognitive style on episodic memory processing directly and in a new OCD sample. We specifically hypothesized that increased levels of cognitive self-consciousness would have a mediating effect on episodic memory performance of participants with OCD.

### 2. Methods

#### 2.1. Participants

##### 2.1.1. Participants with obsessive-compulsive disorder (OCD)

The sample comprised 23 outpatients with the current diagnosis of obsessive-compulsive disorder (see Table 1). Participants were recruited for the study from our outpatient clinic (4 participants) and from 2 psychosomatic hospitals (19 participants). All participants fully met the criteria for current OCD of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 1994) on the basis of structured interviews (see Section 2.2). Subjects with a history of head injury, neurological diseases or substance dependence were excluded. Eleven OCD participants were on psychotropic medication: The majority (6 participants) was taking selective serotonin reuptake inhibitors (SSRIs), the others were taking other antidepressant agents (serotonin noradrenalin reuptake inhibitors, serotonin agonist and reuptake inhibitors, lithium carbonate).

##### 2.1.2. Healthy controls

OCD participants were compared with 22 healthy control subjects recruited for the study by an advertisement in a local newspaper and leaflets distributed in town. Only participants without a history of psychiatric or neurological disorder were studied. None was taking psychotropic drugs. Control participants matched OCD participants in terms of age, sex, years of education and intelligence (3 subtests of the Wechsler Adult Intelligence Scale, WAIS-III). The clinical and demographic characteristics of participants are summarized in Table 1. After complete description of the

### Table 1
Demographic and clinical characteristics of participants.

<table>
<thead>
<tr>
<th>Variable</th>
<th>OCD participants (n = 23)</th>
<th>Controls (n = 22)</th>
<th>Statistic</th>
<th>p*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, y</td>
<td>33.3 ± 4.5</td>
<td>33.2 ± 8.7</td>
<td>t(43) = 0.03</td>
<td>0.976</td>
</tr>
<tr>
<td>Education</td>
<td>17.1 ± 3.0</td>
<td>17.1 ± 3.0</td>
<td>t(43) = 0.07</td>
<td>0.944</td>
</tr>
<tr>
<td>Gender, no. (%) female</td>
<td>11 (47.8)</td>
<td>10 (45.5)</td>
<td>χ² = 0.05</td>
<td>0.824</td>
</tr>
<tr>
<td>WAIS-III, scaled scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information</td>
<td>12.0 ± 2.2</td>
<td>13.1 ± 2.7</td>
<td>t(43) = 1.557</td>
<td>0.127</td>
</tr>
<tr>
<td>Similarities</td>
<td>12.5 ± 1.8</td>
<td>12.4 ± 2.2</td>
<td>t(43) = 0.268</td>
<td>0.790</td>
</tr>
<tr>
<td>Block design</td>
<td>11.0 ± 2.8</td>
<td>12.1 ± 2.6</td>
<td>t(43) = 1.240</td>
<td>0.222</td>
</tr>
<tr>
<td>Y-BOCS, total raw score</td>
<td>22.2 ± 6.6</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Obsessions</td>
<td>11.6 ± 4.7</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Compulsions</td>
<td>11.1 ± 3.4</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>PI-R, total raw score</td>
<td>64.6 ± 23.5</td>
<td>16.3 ± 8.6</td>
<td>t(28.0) = 9.222</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Impulses</td>
<td>4.6 ± 6.3</td>
<td>1.0 ± 1.1</td>
<td>t(23.5) = 2.703</td>
<td>0.013</td>
</tr>
<tr>
<td>Washing</td>
<td>12.9 ± 10.7</td>
<td>2.3 ± 2.6</td>
<td>t(24.8) = 4.999</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Checking</td>
<td>15.2 ± 7.5</td>
<td>3.7 ± 3.0</td>
<td>t(25.1) = 6.821</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Ruminations</td>
<td>25.7 ± 7.0</td>
<td>8.0 ± 4.3</td>
<td>t(36.8) = 10.221</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Precision</td>
<td>6.2 ± 4.8</td>
<td>1.3 ± 1.6</td>
<td>t(27.3) = 4.577</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>CSC-E</td>
<td>37.0 ± 8.1</td>
<td>29.5 ± 5.8</td>
<td>t(43) = 3.559</td>
<td>0.001</td>
</tr>
<tr>
<td>BDI, total raw score</td>
<td>15.9 ± 9.5</td>
<td>3.2 ± 2.6</td>
<td>t(25.4) = 6.15</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**WAIS-III**: Wechsler Adult Intelligence Scale, German Version; **Y-BOCS**: Yale-Brown Obsessive Compulsive Scale; **PI-R**: Padua Inventory, revised; **CSC-E**: Cognitive Self-Consciousness Scale-Expanded; **BDI**: Beck’s Depression Inventory

* Table values are given as mean ± S.D. unless indicated otherwise.

b Number of years spent in full-time education.

c Homogeneity correction in case of heterogeneous variances.

d Bold values refer P < 0.05.
2.2. Clinical assessment

The Diagnostic Interview for Mental Disorders (Mini-DIPS) (Margraf, 1994) was conducted to establish a current diagnosis of OCD. The Mini-DIPS is used to record the most important mental disorders relevant for psychological interventions based on the criteria of DSM-IV and ICD-10. The interrater-reliability of the Mini-DIPS presents with a kappa coefficient between 0.84 and 1.0 (Margraf, 1994). The Mini-DIPS permits a sufficiently precise diagnosis of all mental disorders except organic mental disorders (F0) and personality disorders (F6).

OC symptoms were rated using the German authorized translation (Hand & Büttner-Westphal, 1991) of the Yale-Brown Obsessive Compulsive Scale (Y-BOCS) (Goodman et al., 1989). OCD participants and healthy controls also completed a self-report inventory of OCD symptoms, the German version of the Padua Inventory (PI-R) (Emmelkamp & van Oppen, 2000). A thought-focused meta-cognitive style was assessed with the Cognitive Self-Consciousness-Scale-Expanded (CSC-E). The CSC-E is a self-report measure comprised of the seven original items from the CSC subscale of the Meta-Cognitions Questionnaire (MCQ, Cartwright-Hatton & Wells, 1997) as well as seven additional items that were added by Janeck et al. (2003). The German version of the MCQ was administered (Hoyer & Möbius, 2003). The 7 additional items by Janeck et al. (2003) were translated into German and then back-translated by a bilingual speaker. Authors of the original version confirmed the close match of original and back-translated items (personal communication by John E. Calamari, 27 June 2007).

Self-reports of additional depressive symptoms were obtained from the German version of the Beck’s Depression Inventory (BDI) (Hautzinger, Bailar, Worrall, & Keller, 2000).

2.3. Episodic memory assessment

Our own previous investigation (Exner et al., in press) as well as numerous investigations by other researchers (Kuelz et al., 2004), had shown that episodic memory is the memory domain most affected in OCD. Episodic memory refers to the memory of events, times, places, associated emotions, and other information in relation to a specific experience. Standard neuropsychological test measures were chosen to assess verbal and visual episodic memory: Verbal episodic memory for stories was assessed with subtests Logical Memory I and II from the German Version of the Wechsler Memory Scale—Revised (WMS-R) (Härting et al., 2000), which require participants to recall two short prose passages immediately after oral presentation and after a 30-min delay. Verbal episodic memory for word list material was assessed with the German version of the California Verbal Memory Test (CVLT) (Delis, Kramer, Kaplan, & Ober, 1987; German version: Nienm, Sturm, Thöne-Otto, & Willmes, 2008). The CVLT consists of a list of 16 shopping items (“Monday list”) read to the participants in five study trials, with free recall after each learning trial. The list contains an embedded semantic structure, of which the participants are not informed. Each item belongs to one of four semantic categories (e.g. tools, articles of clothing). An interference list (“Tuesday list”) is administered and recalled after the fifth study trial followed by short and long (20 min) free and category- cued delayed recall of the original “Monday list” and a recognition test. The CVLT is a complex format that generates up to 19 different (though highly interrelated) scores of which we chose the two most common: Free recall across learning trial 1–5 was taken as a measure of immediate memory. Free delayed recall after 20 min was taken as a measure of delayed recall performance. The CVLT also allows for analysis of organizational strategies in list learning: The semantic clustering score measures the degree to which participants group words into semantic categories during learning. Participants receive points for recalling words that belong to the same semantic category in succession. An alternative strategic process is reflected in the serial clustering score. Participants receive points for recalling words in the order of presentation.

Visual episodic memory performance for designs was assessed with Visual Reproduction I and II (WMS-R), which requires participants to copy from memory four consecutively presented visual designs immediately after presentation and after a 30-min delay. As a further test of visual episodic memory the Rey-Osterrieth Complex figure Test (RCFT) was administered. Participants were instructed to copy the complex figure and subsequently draw it from memory immediately (without intervening distractions) and after a 20-min delay. Accuracy of recall was based on the scoring system described by Lezak (1995) resulting in a maximum score of 36 points. Organizational strategy was evaluated with a quantitative method described in detail by Savage et al. (1999). Participants receive up to 6 organization scores for constructing the 5 configural elements of the complex figure (2 points for the base rectangle, 1 point each for the two diagonals, a vertical midline, a horizontal midline and the vertex of the triangle on the right).

Effect sizes (d) are given for each memory measure to allow for comparisons with previously published data on the same standard memory tests.

2.4. Statistical analysis

Statistical computations were based on raw scores. T tests were applied where appropriate to compare differences between groups. Frequencies were compared using the exact test of Fisher. Separate multiple ANOVAs were run across tests of verbal memory, visual memory and organizational strategies, respectively, followed up by univariate models.

A mediation hypothesis was tested through multiple regression in two 3-variables path models separately for Logical Memory I and II following the heuristic procedure described by Baron and Kenny (1986). Such mediation models have been previously used in OCD memory research to assess influence of organizational strategies on memory performance (Deckschabach et al., 2000; Savage et al., 1999; Savage et al., 2000). We tested the hypothesis that levels of cognitive self-consciousness mediated memory deficits of OCD participants. In such a model causal ordering is established a priori and direct and indirect models of the independent variable group (OCD = 1, controls = 0) on the dependent variable Logical Memory (immediate recall and delayed recall, respectively) are tested via linear regression (see Fig. 1). Self-reported trait Cognitive Self-Consciousness (CSC-E scores) was the hypothesized mediator. In order to establish that a variable (M) mediates the effect of the independent variable (X) on a dependent variable (Y) all of the following conditions must be true:

(1) Variations in level of the independent variable X (group) significantly account for variations in the dependent variable Y (Logical Memory, immediate recall and Logical Memory, delayed recall, respectively), when considered alone (Fig. 1, direct model, path c).

(2) Variations in level of the independent variable X (group) significantly account for variations in the hypothesized mediator M (Cognitive Self-Consciousness), when considered alone (Fig. 1, indirect model, path a).

(3) In a multiple regression model from the independent variable X (group) and the mediator M (Cognitive Self-Consciousness) on the dependent variable Y (Logical Memory,
immediate recall and Logical Memory, delayed recall, respectively), the mediator must affect the criterion significantly (Fig. 1, indirect model, path b).

(4) In this multiple regression model (3) the effect of the independent variable (group) on the dependent variable Y controlling for the mediator should be significantly reduced (Fig. 1, indirect model, path c') compared to the direct path c.

The heuristic procedure of Baron and Kenny (1986) described above was followed up by direct statistical testing of the indirect effect of X on Y mediated by M. Size of the indirect effect is defined as the product of path a and path b. In order to conduct a test of significance of that indirect effect a bootstrap approach has been suggested by Preacher and Hayes (2004). Bootstrapping is a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic. It produces a test that is not based on large-sample theory, thus can be applied to small samples with more confidence. It was conducted here using the SPSS macro provided by these authors.

All statistical comparisons were performed using the Statistical Package for the Social Sciences (SPSS for Windows, Version 15.0).

3. Results

3.1. Memory performance of OCD participants and healthy controls

Main results reflecting episodic memory performance of OCD and control participants are presented in Table 2. A multivariate ANOVA was run across the four verbal memory measures, which revealed a significant overall effect of GROUP. Post-hoc univariate ANOVA models showed significant differences between groups on Logical Memory, immediate and delayed recall. A separate multivariate ANOVA was run across the four visual memory measures, which revealed no significant overall effect of GROUP. No differences between groups emerged in a third multivariate ANOVA run across the five different measures of organizational strategies.

3.2. Higher cognitive self-consciousness in OCD

Participants with OCD showed significantly increased levels of cognitive self-consciousness (CSE-E) relative to controls (see Table 1). Cognitive self-consciousness in the OCD sample was specifically related to the subscale Rumination from the Padua Inventory (PI-R) (r = 0.492, P = 0.017, n = 23). There were only low, non-significant correlations between CSC-E and the other four PI-R subscales of obsessive-compulsive symptoms: impulses r = 0.182, washing r = −0.03, checking r = −0.101, precision r = −0.153; all Ps > 0.4). Cognitive self-consciousness was not significantly related to general severity of OCD symptoms (Y-BOCS, r = 0.194; P = 0.387) or depression (BDI, r = 0.293; P = 0.175).

3.3. Relationship between cognitive self-consciousness and memory performance: path models

Our a priori hypothesis was that levels of cognitive self-consciousness would mediate memory problems in OCD. Based on differences found between OCD participants and controls on Logical Memory, immediate and delayed recall (Logical Memory I and II) we chose those two memory measures from the WMS-R as dependent variables. The mediation hypothesis was then evaluated in two separate three-variable path models for Logical Memory, immediate recall and Logical Memory, delayed recall, respectively. Self-reported cognitive self-consciousness (CSC-E score) was entered into the model as the hypothesized mediator. Logical Memory, immediate recall: We first followed the heuristic procedures suggested by Baron and Kenny (1986) and outlined above in the methods section. All four conditions of that heuristic model were met. β coefficients and significance levels are presented in Table 3 and Fig. 1. In the direct model (see Fig. 1, upper panel, path c) group had a significant direct effect on Logical
Memory, immediate recall \( (B = 4.54, \beta = 0.356, P = 0.016) \). Please note: This result is equivalent to the significant univariate ANOVA showing group differences between OCD participants and controls on Logical Memory, immediate recall (see Section 3.1 and Table 2). Simple regression analysis also revealed a significant effect of group on the hypothesized mediator cognitive self-consciousness \( (B = -7.502, \beta = -0.477, P = 0.001) \). In the indirect, mediated model (multiple regression equation) cognitive self-consciousness still had a significant influence on Logical Memory, immediate recall \( (B = -2.64, \beta = -0.325, P = 0.043, \text{see Fig. 1, lower panel, path b}) \), but the effect of group was reduced in absolute size and dropped below statistical significance \( (B = 2.562, \beta = 0.201, P = 0.205, \text{see Fig. 1, lower panel, path c}) \). Direct statistical testing of the indirect effect of \( X \) on \( Y \) through \( M \) by a bootstrap approach revealed a significant indirect effect (critical value \( M = 1.98, \text{S.E.} = 1.079, 95\% \text{CI } 0.156–4.41 \)). Thus, group differences between OCD and control participants in verbal memory, immediate recall performance are mediated through the level of cognitive self-consciousness.

**Logical Memory, delayed recall**: We followed the same procedure in a separate three-variable path model with delayed recall performance of Logical Memory being the dependent variable. Three of the four conditions of the heuristic model were met: In the direct model (see Fig. 1, upper panel, path c) group had a significant direct effect on Logical Memory, delayed recall \( (B = 6.03, \beta = 0.428, P = 0.003) \). Please note: This result is equivalent to the significant univariate ANOVA showing group differences between OCD participants and controls on Logical Memory, delayed recall \( (B = 3.1, \beta = 0.325, P = 0.016) \). Please note: This result is equivalent to the significant univariate ANOVA showing group differences between OCD and controls on Logical Memory, delayed recall \( (B = 3.1, \beta = 0.325, P = 0.016) \).  

### Table 3
Summary data for analyses of the hypothesized three-variable path model.

<table>
<thead>
<tr>
<th>Correlations between variables</th>
<th>Group</th>
<th>Cognitive self-consciousness</th>
<th>Logical memory, immediate recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>–</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>Cognitive self-consciousness</td>
<td>–.477</td>
<td>–</td>
<td>–.421</td>
</tr>
<tr>
<td>Logical memory, immediate recall</td>
<td>.356</td>
<td>–</td>
<td>–.421</td>
</tr>
</tbody>
</table>

Regression of group on cognitive self-consciousness and Logical Memory, immediate recall

<table>
<thead>
<tr>
<th>( \beta^a )</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group on cognitive self-consciousness</td>
<td>–.477</td>
<td>–3.559</td>
</tr>
<tr>
<td>Group on Logical Memory, immediate recall</td>
<td>.356</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Multiple regression on Logical Memory, immediate recall

<table>
<thead>
<tr>
<th>( \beta^a )</th>
<th>( t )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
<td>.201</td>
<td>1.288</td>
</tr>
<tr>
<td>Cognitive self-consciousness</td>
<td>–.325</td>
<td>–2.083</td>
</tr>
</tbody>
</table>

Analysis of variance for full model

| Multiple R | 0.457 |
| Multiple R²| 0.209 |
| \( F \) ratio | 5.537 (\( P = 0.007 \)) |
| df1 | 2 |
| df2 | 42 |

\( ^a \) We report standard \( \beta \) coefficients (ranging between 0 and 1) for better representation of the strength of the relationship between variables.

\( ^* \) \( P > 0.05 \).
participants and controls on Logical Memory, delayed recall (see Section 3.1 and Table 2). The significant effect of group on the hypothesized mediator cognitive self-consciousness ($B = -7.502$, $\beta = -.477$, $P = 0.001$) was already known from the first mediated model (see preceding section). In the indirect, mediated model (multiple regression equation) cognitive self-consciousness only showed a tendency but no significant influence on Logical Memory, delayed recall ($B = -.250$, $\beta = -.279$, $P = 0.074$, see Fig. 1, lower panel, path b). But the effect of group was reduced in absolute size and dropped below statistical significance ($B = .4150$, $\beta = .294$, $P = 0.061$, see Fig. 1, lower panel, path c). Statistical testing of the indirect effect of X on Y through M, however, by a bootstrap approach revealed a significant indirect effect (critical value $M = 1.89, S.E. = 1.076, 95\% CI 0.135–4.322$). Thus, group differences between OCD and control participants in verbal memory, delayed recall performance are mediated through the level of cognitive self-consciousness.

To summarize, group differences between OCD and control participants on both Logical Memory, immediate recall and Logical Memory, delayed recall performance are mediated by the a self-conscious meta-cognitive style. The mediating effect of cognitive self-consciousness on verbal memory group differences seems greater for the immediate performance than for the delayed recall performance.

4. Discussion

4.1. Cognitive self-consciousness and memory in OCD

We found that OCD participants showed significantly increased levels of trait cognitive self-consciousness relative to controls. This finding lends further support to the claim that OCD is characterized by meta-cognitive abnormalities (Cartwright-Hatton & Wells, 1997; Jancek et al., 2003). OCD participants reported a higher awareness of own mental processes and a greater need to monitor, evaluate and control their thoughts. This meta-cognitive trait shares a conceptual overlap with the dimension Ruminative which is one aspect of OC pathology measured by the Padua Inventory (PI-R).

Our analyses further confirmed our hypothesis that high levels of cognitive self-consciousness mediate episodic memory deficits in OCD. Thus, findings of a former investigation (Exner et al., in press) that emphasized the close relationship between memory deficits and a ruminative cognitive style in OCD were confirmed and specified: It seems to be a dysfunctional focus on own mental processes that interferes with processes of learning and memory in OCD participants. Our new finding is also consistent with reports of other investigators who found reduced abilities of OCD participants on an implicit learning task to be related to heightened cognitive self-consciousness (Goldman et al., 2008; Mark et al., 2006). Cognitive self-consciousness seems to be a mental activity that – during a performance situation – competes with processes of task-related selective and sustained attention. Thus, a person with heightened cognitive self-consciousness might be constantly performing under the condition of divided attention. During encoding of complex verbal information (e.g., the short prose passages of the Logical Memory subtest) attentional capacity is distracted from processing and storing of incoming verbal information towards task-irrelevant self-focused meta-cognitive processes. Performance on verbal memory tasks that require a longer sustained attention and semantic processing (e.g. memorize a coherent text passage) might be especially compromised during encoding more than during retrieval by distracting meta-cognitive processes.

Our mediator model identified cognitive self-consciousness as a statistically significant mediator of memory deficits in OCD. However, other factors, such as the use of organizational strategies during encoding, might additionally influence memory performance in OCD, as these have been proved to be mediators of reduced memory performance (Savage et al., 2000).

4.2. Verbal episodic memory deficits in OCD

We found verbal episodic memory for short prose passages (Logical Memory from the WMS-R) to be impaired in our OCD sample relative to controls (medium to large effects) whereas verbal episodic memory for a word list and for complex visual designs was not significantly reduced. The finding of deficient Logical Memory performance replicates our results from a former investigation in OCD (Exner et al., in press). In this latter study we found that OCD participants showed impaired Logical Memory performance relative to controls and lower than could be expected from their intellectual or educational level. Verbal memory deficits in OCD were also reported by other researchers, mostly on the basis of list-learning (CVLT or others) or paired associates paradigms (Deckersbach et al., 2000; Savage et al., 1999; Savage et al., 2000; Sawamura, Nakashima, Inoue, & Kurita, 2005; Tuna, Tekcan, & Topcuoglu, 2005; Zieleninski, Taylor, & Juzwin, 1991; Zitterl et al., 2001). The difficulties of people with OCD to memorize complex and coherent verbal information may be related to their reduced ability for semantic processing. People with OCD also have difficulties to extract semantic meaning from complex sentences (Cabrera, McNally, & Savage, 2001) or to cluster verbal material semantically (Deckersbach et al., 2000). Impoverished semantic processing will especially hamper encoding of new verbal material. The increase cognitive self-focus we found in OCD participant might compel them to adopt an ineffective strategy when memorizing the Logical Memory stories from the WMS-R: While trying to keep track of every single detail of the story they might miss the overall semantic gist of the story.

Our results differ from previous reports of memory deficits in OCD with respect to preserved performance on the CVLT and on visual memory tests. OCD participants in our study were also not significantly impaired on memory organization relative to controls. Looking at the effect sizes the differences between OCD participants and controls in our sample were of a smaller magnitude than those in previously reported investigations (Deckersbach et al., 2000; Savage et al., 1999; Savage et al., 2000). This might be due to sample characteristics. In contrast to other investigations a higher percentage of OCD and control participants in our study had high educational attainments (an average 17.1 years spent in full time education) and high average intellectual abilities. This high background cognitive ability level might have led to ceiling effects on tests of only average difficulty.

4.3. Methodological considerations

The heuristic three-variable mediator model we applied depends on the causal ordering of the incorporated variables. We a priori selected trait cognitive self-consciousness as the hypothesized mediator because it is a trait measure and has been assessed before the administration of memory tests. Thus, it preceded Logical Memory performance temporally. However, in the long run the relationship between memory performance and cognitive self-consciousness might well be bi-directional: repeated experience of memory failure might cause distrust in memory performance (reduce cognitive confidence) and thus increase the urge to monitor and control mental processes.

The self-report measure we used (Cognitive Self-Consciousness Scale-Expanded) to study cognitive self-consciousness is only able to reflect a dispositional (trait) self-conscious style. Whether participants with elevated scores on CSC-E were actually hampered
by self-focused attention in the memory test situation cannot be concluded with certainty. Other measures that experimentally manipulate the actual stream of thinking while participants deal with a memory task are required to analyze the causal relationship between situational self-focused attention and memory performance.

4.4. Conclusions and directions for further research

Cognitive self-consciousness provides a concept that establishes a link between appraisal-belief models (Rachman, 1997, 1998; Salkovskis, 1985, 1989) and findings of general information processing deficits in OCD. Heightened levels of cognitive self-consciousness in OCD participants might be seen as a predisposition that hampers subjects during effortful cognitive tasks (e.g., encoding and storing of verbal material) because it draws on the limited resources of focused attention. Increased attentional focus on one's own mental processes might also increase the probability that irrelevant intrusive thoughts enter awareness and are judged as important consequences, thus leading to OCD symptoms. The concept of increased cognitive self-consciousness could thus contribute to the explanation of both obsessive-compulsive psychopathology and reduced episodic memory performance in persons with OCD and might thus bridge cognitive and neuropsychological models of OCD.

Wells (2000, 2005, 2007) has suggested meta-cognitive therapeutic strategies that are expected to reduce self-focused attention and the need to control one's own thoughts (“detached mindfulness”). On the basis of our findings one could propose: If (meta-)cognitive therapy succeeds in reducing cognitive self-consciousness it should be able to simultaneously diminish both obsessive-compulsive symptoms and verbal memory problems in OCD.

Acknowledgements

We express our appreciation to the participants who participated in this study. We thank management and staff of the Psychosomatic Clinics in Bad Arolsen and Windach for support in patients’ recruitment and assessment.

References


