



## Are patients with obsessive–compulsive disorder generally more doubtful? Doubt is warranted!

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### ABSTRACT

A number of neuropsychological models implicate disinhibition and a lack of response confidence in the pathogenesis of obsessive–compulsive disorder (OCD). To provide a fair test of the inhibition and confidence account, a variant of the directed forgetting (DF) paradigm with OCD-related and unrelated conditions was administered in 30 OCD patients and 20 healthy controls. First, 16 words were presented which the participant was subsequently instructed to forget. Then, 16 words were presented that should be memorized. After a short interval, patients were shown the to-be-forgotten and the to-be-remembered items along with new items in random order. The subjects were instructed to recollect both the to-be-remembered and the to-be-forgotten items. The subject was asked to grade responses according to confidence. In accordance with prior findings from our group, patients did not differ from controls on overall recollection, response confidence, and the recollection of to-be-forgotten (allegedly inhibited) information. Our study cannot refute the claim that disinhibition plays a role in OCD in view of the vast array of paradigms tapping different aspects of inhibition. Still, we deem a psychological understanding more fruitful that looks at dysfunctional coping strategies and false beliefs as mechanisms for the persistence and pervasiveness of obsessive thoughts.

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### 1. Introduction

Obsessive–compulsive disorder (OCD) is a predominantly chronic disorder characterized by repetitive, intrusive, and bothersome thoughts or images (i.e., obsessions) that the OCD patient tries to ban or neutralize by ritualized cognitive (e.g., counting) or motor (e.g., checking) behavior (i.e., compulsions). Prominent theories link obsessive thoughts to problems with inhibition and response confidence (for a review see Chamberlain et al., 2005; Olley et al., 2007). The disinhibition model assumes that some kind of cognitive “fire wall” is deficient in OCD so that thought contents and impulses that are normally blocked from consciousness enter awareness. While simple and intuitive at first sight, the model faces some theoretical and also empirical problems. Firstly, intrusive and obsessive thoughts are well-known to nonclinical subjects as well and are therefore not pathological per se. For example, in line with the seminal work of Rachman and de Silva (1978), we found that one third of nonclinical subjects endorsed items like “I am often concerned with the idea of being responsible for a fire breaking out in my home” (Moritz, 2010; Moritz et al., 2010a). Accordingly, many psychological researchers imply that the appraisal rather than the contents of intrusive obsessions distinguish OCD patients from controls (Salkovskis and

Forrester, 2002). Secondly, patients do not generally show disinhibition. Otherwise one would expect more problems with interference/attention as well as stronger impulsive behavior in this population. In fact, patients with OCD are typically very controlled and manage to subdue unwanted, for example, aggressive impulses (Moritz et al., 2009b). The minds of OCD patients are not bombarded or bothered by any external or internal stimuli as the inhibition account may suggest but, as a rule, they are pre-occupied only with a defined set of thoughts circling around taboo themes such as sexuality, aggression, and morality. Thirdly, whereas inhibition is a prominent concept in both experimental and clinical research (e.g., Anderson, 2003; Bäuml et al., 2010), researchers have recently casted doubt on the validity of the account (MacLeod et al., 2003). Some tests allegedly tapping into inhibitory functions, like negative priming (cognitive inhibition) or go/no-go-paradigms, on which OCD patients have obtained deviant scores in some studies, may be reconciled in terms of other (noninhibitory) cognitive functions (MacLeod et al., 2003), for example, by memory problems, distraction, or general slowness (see Milliken et al., 1998 on negative priming). Whereas reviews on neurocognitive and neuroimaging findings usually endorse the idea of disinhibition in OCD, some important empirical exceptions should be noted. For example, newer studies did not find reduced cognitive inhibition in OCD (MacDonald et al., 1999; Moritz et al., 2010b). In addition our group did not detect deviant response patterns on the Stroop-task (Moritz et al., 2004b, 2008a), task switching and backward inhibition (Moritz et al., 2004a), inhibition of return

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(Moritz and von Muhlenen, 2005), or retrieval induced forgetting (Jelinek et al., submitted for publication). In addition, deficits on tasks of inhibition have been found across many psychiatric disorders, especially schizophrenia and depression (Stefanopoulou et al., 2009) as well as attention deficit disorder (Adams et al., 2008) and their explanatory value for the pathogenesis of OCD is therefore limited.

The second account relevant to this study assumes that OCD patients are generally more doubtful than controls. Indeed, doubt is a key aspect in OCD and the disorder has been frequently dubbed the “disorder of doubt”. Whereas some studies are in accordance with this assumption (Dar et al., 2000; Hermans et al., 2008; for a discussion see Moritz et al., 2009a), others suggest that excessive doubt in OCD is confined to situations and cognitions relevant to OCD. For example, situations that trigger OCD-related beliefs and biases such as inflated responsibility (Cogle et al., 2007; Moritz et al., 2007). Prior studies conducted by our group did not obtain evidence that patients with OCD are generally less confident (e.g., Moritz et al., 2006, 2009a). In the discussion we will deal with an alternative cognitive account that highlights the role of dysfunctional beliefs and coping as well as cognitive biases for the formation of OCD.

The present study used the directed forgetting (DF) paradigm in order to capture inhibition and response confidence concurrently. In the literature, two different DF tasks have been employed: the item-method and the list-method task. In the item-method task, participants study a list of items. Each single item is followed by a cue asking the participant to either remember or forget it. On a later memory task showing all previously presented items, to-be-remembered items are typically better memorized than to-be-forgotten items. In the list-method task, two variants have been employed. In variant 1, participants study two lists of items. After studying list 1, participants receive a cue to either forget or continue remembering all items on the list. Then participants are asked to study a second list and again instructed to either remember or forget the items. After the subsequent study of list 2, a recall and/or recognition test is conducted in which participants are asked to remember all of the previously presented items, including those they were originally cued to forget. In variant 2 of the list-method task, participants always receive a forget cue after study of list 1 and performance of the to-be-forgotten first list is directly compared with performance of the to-be-remembered second list. Again, memory is typically higher for the to-be-remembered than the to-be-forgotten items in both variants of the list method (MacLeod, 1998). A nice feature of the DF paradigm is that malfunctioning is manifested in better performance (i.e., superior memory for the to-be-forgotten items) thus ruling out a generalized performance deficit. If patients have decreased inhibition (and holding that the inhibition construct is actually valid) one would expect better recollection for the to-be-forgotten list in patients compared to controls (controlled for baseline performance).

Three previous trials have investigated DF in OCD. Wilhelm et al. (1996) used an item-method with subsequent free recall and recognition. OCD patients showed problems forgetting negative material as opposed to positive and neutral material under both free recall and recognition when compared to controls. According to the authors, OCD patients encoded negative words in an elaborative fashion, which enhanced their memorability regardless of instructions. Tolin et al. (2002) also found an effect of item type in that patients were worse at forgetting OCD-relevant words in an item method paradigm under the recognition condition but not free recall. In general, patients displayed no decrease in DF. A final study investigated OCD and trichotillomania (TTM) patients (Bohne et al., 2005) using the list-method task (second variant with free recall and recognition). From the results, the authors infer that the performance of OCD participants indicated a specific deficit in inhibiting the retrieval of negatively valenced information.

The present study aimed to build upon the findings of Bohne et al. (2005). We employed a similar DF list-method task (second variant, see above) with however some important methodological modifications.

Items were compiled from four conditions, two of which covered common OCD-related concerns. Moreover, we asked subjects to express response confidence in order to examine if they are generally more doubtful in their responses. Thus, we were able to assess inhibition and response confidence at the same time. As we pursued the null hypothesis, we calculated effect sizes because the nonsignificance of an effect may either indicate its absence or a lack of power. In addition, all participants were asked to judge the personal valence of the material to explore if salience moderates performance. This allowed us to explore if DF is generally smaller in OCD or only decreased for OCD-related items, perhaps owing to “pop-out” and salience effects, respectively (i.e., items are less successfully “suppressed” because they are personally potent and thus more easily triggered).

## 2. Methods

### 2.1. Participants

A total of 30 patients diagnosed with OCD according to DSM-IV criteria were compared to 20 healthy nonclinical participants. Patients were recruited via the University Medical Center Hamburg-Eppendorf (Germany). The healthy control group was recruited via an established subject pool and word-of-mouth. Diagnoses relied on the MINI Neuropsychiatric Interview (Sheehan et al., 1998) and were determined by experienced and trained staff. A diagnosis of bipolar disorder or schizophrenia, substance dependence, and a major neurological disorder (e.g., stroke) served as general exclusion criteria as well as age lower than 18 or higher than 65 years. A total of 16 OCD patients suffered from (secondary) comorbid Major Depression. The same number of patients was diagnosed with another anxiety disorder (mainly generalized anxiety disorder, social phobia or panic disorder) according to the MINI. Healthy subjects were carefully checked for the absence of any major axis I disorder according to the MINI interview.

To assess OCD symptom severity, the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS, Goodman et al., 1989; German translation by Hand and Büttner-Westphal, 1991) was administered. Y-BOCS items were segregated according to a three dimensional model (Moritz et al., 2002): severity of obsessions (items 1, 2 and 3), severity of compulsions (6, 7 and 8), and resistance to symptoms (4 and 9).

In addition, the Obsessive-Compulsive Inventory-Revised (OCI-R, Foa et al., 2002; German translation by Gönner et al., 2008) was administered. The Hamilton Depression Rating Scale (HDRS, Hamilton, 1960) was employed to assess depressive symptoms.

After a complete description of the study, written informed consent was obtained from all participants before assessment. The study was approved by the Ethics Committee of the Medical Board Hamburg.

### 2.2. Directed forgetting paradigm

#### 2.2.1. Selection of stimuli

Prior to the development of the DF paradigm, 200 negative, positive or neutral words that were either OCD-related or unrelated were collected and subsequently rated by 10 mental health professionals (extensive experience with OCD patients) with regard to their relevance for washing (1 = not relevant to 5 = highly relevant) as well as checking behavior (1 = not relevant to 5 = highly relevant), concreteness (1 = abstract to 5 = specific), and valence (1 = very negative to 3 = neutral to 5 = very positive). A final set of 64 stimuli was eventually selected representing four categories: washing-relevant, checking-relevant, neutral (OCD-irrelevant), and negative (OCD-irrelevant). Washing-related stimuli had to be rated as highly relevant for washing but not for checking, and vice versa. Negative and neutral stimuli were rated as neither washing- nor checking-relevant (itemwise mean score <2.4). While negative words were rated as negative (itemwise mean score <2.2), neutral words were rated as emotionally neutral (itemwise mean score >2.5 and <3.5). The average length of the words as well as their concreteness did not significantly differ across conditions.

#### 2.2.2. Procedure

Participants were individually tested as part of a larger test battery. The paradigm was administered on a Macintosh computer and constructed using Superlab Pro®. The experiment contained four phases which will be described in the following:

Phase 1, forgetting list: In random order, a total of 16 words from four conditions (washing, checking, neutral, and negative; see above) were displayed. Upon initial presentation subjects were told to memorize the items for a later recognition task. However, after the final item they were instead told that this was just a practice trial. They were reminded twice to forget these words (the forgetting instruction was displayed in bold font on the screen).

Phase 2, learning list: Subsequently, 16 different words, selected from the same initial item pool and representing the same conditions as in phase 1, were displayed in random order, which the subjects were instructed to memorize. Items in phase 1 or 2 were

displayed for 2000 ms. Words were written in font Times New Roman (size 28; black letters against white background). After phase 2, a letter cancelation task (Brickenkamp and Zillmer, 1998) was administered. Instruction and administration took approximately 7 min in length.

**Phase 3, recognition:** Participants were shown 64 words in random order: Half of these were previously displayed in phase 1 (to-be-forgotten) and 2 (to-be-remembered), while the other half was new and again evenly distributed across the four conditions. Recognition items were displayed in a different font (i.e., font Arial and color blue) than the items in phase 1 or 2 to prevent physical matching which is known to aid correct recognition. Below each item a six-point Likert scale was presented: 1 = 100% old, 2 = rather sure old, 3 = unsure old, 4 = unsure new, 5 = rather sure new, 6 = 100% new. The response options 1–3 were displayed in green, the response options 4–6 in red to facilitate comprehension. To illustrate, if a subject was sure that the respective item was not previously displayed he or she should press button “6”. If he or she leaned towards an old response but was very unsure, button “3” should be pressed. Four counterbalance lists were set up with four item sets for each of the four conditions. Each item set was once used for the learning and forgetting phase and served twice for the novel condition.

**Phase 4, salience rating:** Finally, subjects were shown all 64 words from the DF paradigm along with other items. Each item had to be appraised on a five-point Likert scale according to valence: 1 = very positive, 2 = positive, 3 = neutral, 4 = negative, 5 = very negative. Subjects were asked to appraise the items according to personal evaluation and not to judge how other people may evaluate the items. In accordance with a prior study (Moritz et al., 2008b) we judged a rating of 1 or 5 as salient.

### 3. Results

As can be seen in Table 1, groups did not differ on socio-demographic background variables.

#### 3.1. Directed forgetting (pre-categorized conditions)

We conducted a  $2 \times 4 \times 3$  mixed ANOVA with Group (healthy, OCD) as between-subject factor and Item Type (washing, checking, neutral, negative) and Condition (forget, remember, new) as within-subject factors. The mean memory rating (1 = 100% old–6 = 100% new) served as dependent variable: Higher scores indicate that an item was judged as “new” rather than “old”. Neither the main effect of Group nor any of the interactions involving Group as a factor achieved significance (at least  $p > 0.1$ ,  $\eta^2_{\text{partial}} < 0.04$ ) indicating that groups did not differ on overall memory performance or on memory for the different word types whether or not these had to be forgotten or remembered. Both the main effects of Item Type,  $F(3,144) = 17.21$ ,  $p < 0.001$ , and Condition,  $F(2,96) = 118.66$ ,  $p < 0.001$ , were significant which was further qualified by their significant interaction,  $F(6,288) = 1.83$ ,  $p = 0.01$ . As can be seen in Fig. 1, both samples showed a small DF effect for neutral and washing-related items, while the opposite was true for negative and checking-related items. The figure also

explains the two significant main effects: As expected, novel items received higher scores (i.e., responses towards “new”) than old items. Further, neutral items were less well recognized than OCD-related and emotional items, respectively (i.e., emotional memory effect).

We re-ran the above analyses with a more complex  $2 \times 4 \times 3 \times 2 \times 2$  mixed ANOVA model. Group (healthy, OCD) was entered as the between-subject factor and Item Type (washing, checking, neutral, negative), Condition (forget, remember, new), Confidence (100% sure, rather sure, unsure) and Recognition (old, new) served as within-subject factors. Again, neither the main effect of Group nor any of the interactions involving Group achieved significance (at least  $p > 0.05$ ,  $\eta^2_{\text{partial}} < 0.06$ ). Variance was similar between groups.

When we calculated an ANOVA only considering items rated as personally very negative or very positive (salience, see Moritz et al., 2008b), the effect of Condition again was significant,  $F(2,84) = 39.35$ ,  $p < 0.001$ , but neither the main effect of Group,  $F(1,42) = 0.26$ ,  $p > 0.6$ , nor the interaction,  $F(2,84) = 0.57$ ,  $p > 0.5$ . Three participants in both groups each had to be excluded as they did not judge any of the items as salient.

Finally, we computed the signal detection parameters  $d'$  (discriminability index) and  $c$  (response bias) which however did not yield significant group differences ( $d'$ :  $t(48) = 1.56$ ,  $p > 0.1$ ;  $c$ :  $t(48) = 0.70$ ,  $p > 0.4$ ).

#### 3.2. Response confidence

We re-conducted the analyses, whereby we included only responses for which doubt was expressed (ratings 3 or 4). Recognition (old, new) was added as a further within-subject factor. The main effect of Group as well as all of the interactions involving Group as a factor did not achieve significance ( $p > 0.1$ ,  $\eta^2_{\text{partial}} < 0.04$ ). The insignificant main effect of Group in particular speaks against a generalized lack of response confidence in OCD.

#### 3.3. Correlations

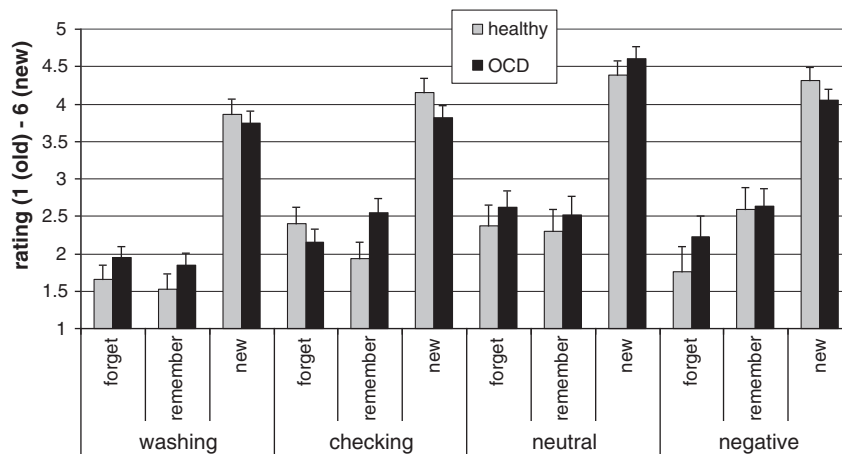
Age, gender (dummy coded), and education level did not significantly correlate with any of the experimental variables, even before correcting for multiple comparisons. For the clinical variables (Y-BOCS, OCI-R and HDRS total and subscores) we set a more conservative threshold ( $p = 0.01$ ; a Bonferroni-correction was deemed as overly strict) and again did not observe significant differences.

### 4. Discussion

The present study pursued the goal to challenge the disinhibition and memory confidence accounts of OCD. For the latter theory, in particular, results are straight-forward and in line with our main hypothesis: OCD participants were not more doubtful in their responses, neither for neutral nor for OCD-relevant words. After all, this finding is in accordance with the claim that decreased confidence

**Table 1**  
Sociodemographic and psychopathological characteristics of the sample.

Variable	Healthy ( $n = 20$ )	OCD ( $n = 30$ )	Statistics
Sex (male/female)	11/9	12/18	$\chi^2(1) = 1.09$ , $p > 0.2$
Age in years	31.75 (12.47)	30.03 (7.04)	$t(48) = 0.62$ , $p > 0.5$
Formal school education in years	11.75 (1.52)	11.43 (1.55)	$t(48) = 0.71$ , $p > 0.4$
Admissions	–	2.46 (1.98)	–
Y-BOCS total	–	25.23 (6.45)	–
OCI-R total	–	27.03 (11.86)	–
HDRS total	–	11.78 (6.74)	–



**Fig. 1.** Regardless of group status, neutral words and previously unstudied words were more likely to be judged as “new” relative to valenced and previously studied OCD-relevant words. A slight directed forgetting effect emerged for the neutral and washing condition but was not moderated by group status.

in OCD is restricted to OCD-related *scenarios* and situations that trigger dysfunctional beliefs, such as inflated responsibility (Cougle et al., 2007; Moritz et al., 2007). Moreover, patients with OCD did not recollect items worse than controls in contrast to a general memory deficit model in OCD (for a discussion see Moritz et al., 2009a).<sup>1</sup> Importantly, group differences neither occurred for material pre-categorized as OCD-related versus unrelated nor for items with personal meaningfulness (salience). The effect sizes indicate that results are not simply due to a lack of power.

Results are difficult to interpret, however, with respect to the disinhibition hypothesis. In line with some studies on inhibitory functions (Moritz et al., 2004a, 2004b; Moritz and von Muhlenen, 2005; Moritz et al., 2008a), OCD patients performed comparable to healthy subjects in the DF experiment: The to-be-forgotten (allegedly inhibited) words were as accessible to patients as controls regardless of item type. Closer inspection revealed neither a correlation with symptom scores nor a differential pattern of results across OCD (washing, checking) versus non-OCD conditions (neutral, negative). However, a fundamental problem with the paradigm was that it did not fully capture the DF effect. While for neutral and washing-relevant words an insignificant DF effect was found, to-be-forgotten words in the other two conditions were recognized better than the to-be-remembered items. In other words, the chosen methodology was not able to elicit a reliable DF effect. In previous work, listwise DF has been mostly found in recall tests (Sego et al., 2006; Zellner and Bäuml, 2006) and has often been absent using item recognition (but see Benjamin, 2006; Sahakyan and Delaney, 2005, for exceptions). Finally, alternative explanations of DF might be considered, like the selective rehearsal account, according to which participants selectively rehearse the R items which are detrimental to the retrieval of the F items (see MacLeod et al., 2003); or the context change account, according to which the forget cue leads to a change in people's internal context which induces a mismatch between people's context at encoding and their context at test, and thus causes the forgetting (Sahakyan and Kelley, 2002).

But if not inhibition – what else could explain the intrusive nature of obsessive thoughts? As an alternative account, clinical researchers have proposed a number of cognitive biases, dysfunctional beliefs, and coping styles that may contribute to the formation and maintenance of symptoms (Obsessive Compulsive Cognitions Working Group, 1997, 2001, 2003; Okasha et al., 2000). Unlike neuropsychological deficits, cognitive biases are not “cold” impairments that manifest in disorder-neutral situations but refer to either processing abnormalities of certain kinds of items with strong salience (personal

meaningfulness) or else dysfunctional processing strategies. One candidate process is, for example, thought–action fusion (TAF), which is the belief that thoughts may induce actions or are equivalent to them (Rachman et al., 1995). Indeed scales measuring TAF have found strong ties with OCD patients (e.g., Yorulmaz et al., 2008) which may well explain why thoughts plague OCD patients irrespective of inhibitory functioning: If one thinks that bad thoughts will kill people or create disasters, it is quite understandable that such thoughts evoke fear and are accordingly not easily expelled from consciousness. Other relevant processes refer to over-estimation of threat, inflated responsibility (Salkovskis and Forrester, 2002), perfectionism, and dysfunctional coping strategies like rumination and thought suppression which are frequently adopted by OCD patients (Fisher and Wells, 2009; Moritz et al., 2010c). In fact, the attempt to suppress thoughts even counter-intuitively enhances the magnitude of obsessive thoughts and offers a nice model of why unwanted thoughts are so strong in OCD patients, again without the presence of disinhibition.

As mentioned in the introduction, we face a deadlock situation regarding the question whether or not OCD patients share problems with inhibition. Notwithstanding theoretical problems with the inhibition construct, its measurement (see Introduction), and an increasingly equivocal empirical basis, most review articles endorse rather than challenge this account (for reviews see Chamberlain et al., 2005; Muller and Roberts, 2005). While the investigation of inhibition paradigms will continue, we think that cognitive biases and false metacognitive beliefs deserve more consideration in neuropsychological research. Currently, there are two rather distinct research fields in OCD. The first is one is deficit-oriented and looks for performance dysfunctions as well as neural abnormalities. The second is driven by a psychological understanding, mainly adopted by researchers with a cognitive-behavioral perspective on OCD (Obsessive Compulsive Cognitions Working Group, 1997, 2001, 2003; Okasha et al., 2000). It may be fruitful to blend the approaches. For example, neurocognitive deficits may partially stem from or are aggravated by psychological processes not covered in standard neuropsychological tests. To illustrate, when a subject performs a cognitive task he or she may ruminate about committed mistakes, the opinion of the experimenter and the outcome of the tests, be pre-occupied about a dirty mouse pad, plagued by checking impulses or frustrated because the subjective performance does not match with perfectionistic performance standards. This may result in secondary task impairment. Indeed, we recently found that checking behavior during the testing situation as well as poor motivation negatively impacted on several neuropsychological parameters (Moritz, submitted for publication) which may explain the secondary impairment of task performance, especially for more difficult conditions. Some dysfunctional beliefs (e.g., thought–

<sup>1</sup> More refined accounts of this theory would object, however, that deficits are expected for non-verbal rather than verbal information.



action fusion) may in turn be more prominent in people with low neurocognitive performance and education.

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