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# Selective attention deficits in obsessive–compulsive disorder: The role of metacognitive processes

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ABSTRACT

While initial studies supported the hypothesis that cognitive characteristics that capture cognitive resources act as underlying mechanisms in memory deficits in obsessive–compulsive disorder (OCD), the influence of those characteristics on selective attention has not been studied, yet. In this study, we examined the influence of cognitive self-consciousness (CSC), rumination and worrying on performance in selective attention in OCD and compared the results to a depressive and a healthy control group. We found that 36 OCD and 36 depressive participants were impaired in selective attention in comparison to 36 healthy controls. In all groups, hierarchical regression analyses demonstrated that age, intelligence and years in school significantly predicted performance in selective attention. But only in OCD, the predictive power of the regression model was improved when CSC, rumination and worrying were implemented as predictor variables. In contrast, in none of the three groups the predictive power improved when indicators of severity of obsessive–compulsive (OC) and depressive symptoms and trait anxiety were introduced as predictor variables. Thus, our results support the assumption that mental characteristics that bind cognitive resources play an important role in the understanding of selective attention deficits in OCD and that this mechanism is especially relevant for OCD.



## 1. Introduction

Cognitive impairments have been frequently reported in individuals with obsessive–compulsive disorder (OCD) (for a review see Kuelz et al., 2004). While deficits in learning and memory for nonverbal material are the most common findings, a substantial number of studies also reported deficits in selective attention, a cognitive process which is limited in its capacity (for a review on selective attention research see for example Driver, 2001). Using different measures for assessing selective attention, Clayton et al. (1999) demonstrated that OCD participants showed reduced performance in the Test of Everyday Attention (TEA; Robertson et al., 1994), while Dittrich et al. (2012) report selective attention effects in OCD studying manual movement control. Further, Enright and Beech (1993) could demonstrate reduced cognitive inhibition in a semantic negative priming task in OCD participants. Studies using the Stroop test (Stroop, 1935) for assessing selective attention show mixed results concerning deficits in OCD participants: Moritz et al. (2002) for example failed to show deficits, while Penadés et al. (2007) and Kashyap et al. (2012) showed impaired response inhibition in OCD. In addition, it has been proven that experimentally provoked anxiety led to further reduction of performance in a selective attention task in OCD participants (Y. Cohen et al., 2003). This effect was not present in the healthy control group. Taken together, the majority of studies has found deficits of selective attention in OCD, although the use of different test measures complicates comparisons across studies.

Deficits of OCD participants on selective attention tests (including response inhibition) have been discussed within the framework of two different models: Within a neuropsychological model of OCD (see for instance Chamberlain et al., 2005) selective attention deficits – indicative of a more broader response inhibition deficit – are interpreted as a vulnerability for the disorder, thus *preceding* the development of OCD. Contrary, the metacognitive model of emotional disorders by Wells and colleagues (see for instance Wells and Matthews (1996) and Wells (2011)) would imply that selective attention deficits are rather a *consequence* of a dysfunctional cognitive style inherent to OCD and a number of other anxiety and affective disorders.

Wells (Wells and Matthews, 1996; Wells, 2011) postulates that a cognitive style named "cognitive attentional syndrome (CAS)" is responsible for the development and maintenance of psychological disorders. Among other dysfunctional features, this cognitive style is characterized by its perseverating, self-directed modus of attention that results in perpetuating negative emotions. It also requires a great amount of cognitive resources so that other cognitive processes might be disturbed. High cognitive self-consciousness

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(CSC), rumination and worry have been descripted as indicators of this unconstructive repetitive negative thinking style in different disorders (see for review Ingram (1990), Nolen-Hoeksema et al. (2008), and Olantunji et al. (2013)). Although they differ with regard to their thought contents, all three concepts share the perseverating, self-referential style of information processing.

In OCD, cognitive self-consciousness – an exaggerated, dysfunctional tendency to focus on and to be aware of one's thoughts and cognitive processes – has been identified as the most pronounced form of a dysfunctional self-referential negative thinking style (e.g., Janeck et al., 2003) that is able to distinguish persons with OCD from individuals with other emotional disorders (Cartwright-Hatton and Wells, 1997). Focussing on one's thoughts and cognitive processes requires a high amount of cognitive resources, which are then no longer available for other tasks and might thus disturb the performance in those tasks. Recent studies supported this assumption: Exner et al. (2009) found that differences in episodic memory between OCD participants and healthy controls were significantly mediated by self-reported CSC. Further, it could be demonstrated that visual (Kikul et al., 2011) and verbal (Kikul et al., 2012; Weber et al., 2014) memory performance in OCD was reduced when situational CSC was experimentally raised in comparison to the experimental condition where full attention capacity was available.

Apart from CSC, other indicators of repetitive negative mental processes, such as rumination and worrying, have been reported to be elevated in OCD as well, although to a lesser degree than in depression and generalized anxiety disorder (e.g., Watkins, 2009; Fergus and Wu, 2010). Similar to high CSC rumination about one's thoughts and feelings draws on cognitive resources and thus has a deteriorating influence on cognitive task performance (e.g., Davis and Nolen-Hoeksema, 2000; Watkins and Brown, 2002; Levens et al., 2009; Owens and Derakshan, 2013).

Hence, the aim of this study was to investigate

a) whether we could replicate selective attention deficits in OCD,
b) whether such deficits might be related to indicators of unconstructive and repetitive self-referential negative thinking, first of all high levels of CSC in OCD (while rumination and worrying were included as control variables),
c) whether such associations might be specific for OCD or also present in other emotional disorders, e.g. depression.

Following the assumptions of Wells model, we expected OCD participants with high levels of CSC or other indicators of repetitive, self-directed and negative thinking (namely rumination and worry) to have selective attention deficits because selective attention is limited in its capacity and thus might be negatively influenced by mental processes that capture important cognitive resources.

## 2. Methods

### 2.1. Participants

Study participants were 36 subjects (21 female, mean age=33.33, SD=12.11) with a current primary diagnosis of OCD according to the DSM-IV (American Psychiatric Association, 1994a), 36 subjects (25 female, mean age=47.05, SD=10.85) with a current episode of major depression (MD) according to DSM-IV and 36 healthy controls (21 female, mean age=32.81, SD=9.96) with no current or lifetime Axis I disorder. Clinical status was assessed with the structured clinical interview for DSM-IV (SCID; American Psychiatric Association, 1994b). Nineteen of the participants with OCD had comorbid psychiatric disorders: depression ($n=10$), dysthymia ($n=5$), social phobia ($n=4$), hypochondriasis ($n=3$), specific phobia ($n=2$), panic disorder with agoraphobia ($n=2$) and general anxiety disorder ($n=1$). Twenty-two of them were taking psychotropic medication at the time of testing: selective serotonin reuptake inhibitors ($n=16$), tricyclic antidepressants ($n=3$), serotonin noradrenalin reuptake inhibitors ($n=1$), tetracyclic antidepressants ($n=1$), atypical antipsychotics and selective serotonin reuptake inhibitor ($n=1$). Finally, 15 participants of the OCD group were classified as "washers", 13 participants were classified as "checkers" and eight participants suffered both from obsessive checking and washing.

Fifteen participants in the depression group had new-onset MD; the remaining 21 participants were suffering from recurrent MD. Current comorbid Axis I disorders were: social phobia ($n=3$), specific phobia ($n=3$), dysthymia ($n=2$), pain disorder ($n=1$), panic disorder ($n=1$) and agoraphobia with panic disorder ($n=1$). Twenty-six of the MD participants (72.2%) were on psychotropic medication: selective serotonin reuptake inhibitors ($n=15$), tetracyclic antidepressants ($n=6$), tricyclic antidepressants ($n=4$), selective serotonin noradrenalin reuptake inhibitors ($n=2$), atypical antipsychotics ($n=2$) and norepinephrine-dopamine reuptake inhibitors ($n=1$).

Participants were only included in the healthy control group when they were without a history of psychiatric and neurological disturbances and were taking no psychotropic medication. The clinical participants were recruited from an inpatient treatment facility for psychological disorders located in Bad Arolsen, Germany ($n=66$ inpatients), and through posted flyers and advertisements in the greater Marburg area, Germany ($n=6$ outpatients), where also all control participants were recruited.

Exclusion criteria in the two clinical groups were current or a history of psychotic disorders (e.g., schizophrenia), bipolar disorders, any drug or alcohol dependence or neurological disturbances (e.g., craniocerebral injury, neurodegenerative diseases).

The three groups differed with respect to age, $F(2, 107)=19.38$, $p<0.001$, but not with respect to gender, $\chi^2(2)=1.26$, $p>0.05$. Bonferroni-corrected post-hoc tests indicated that the MD group was older than the OCD group ($p<0.001$; $d=1.19$) and than the healthy control group ($p<0.001$; $d=1.37$), while the OCD group and the healthy control group did not differ with respect to age ($p=1$). Although an ANOVA showed a significant main effect concerning years in school, $F(2, 107)=3.31$, $p<0.05$, pairwise comparisons were not significant. Sociodemographic characteristics are summarized in Table 1.

### 2.2. Materials

The following battery of measures was administered: the *Yale–Brown Obsessive–Compulsive Scale* (Y-BOCS; Goodman et al., 1989; only in OCD participants), the *Padua Inventory-Washington State University Revision* (PI-WSUR; Burns et al., 1996), the *Beck Depression Inventory -II* (BDI-II; Beck et al., 1996), the *Penn State Worry Questionnaire* (PSWQ; Meyer et al., 1990), the *State-Trait Anxiety Inventory* (STAI; Spielberger et al., 1983), *subscale "Trait anxiety"*, the *Response Styles Questionnaire* (RSQ; Nolen-Hoeksema and Morrow, 1991), *subscale "Rumination"*, and the *Meta-Cognitions Questionnaire* (MCQ), subscale "CSC-E", developed by Janeck et al. (2003).

Selective attention was measured using the d2 *test of attention* (Brickenkamp, 2002). Fourteen rows of 47 printed characters on a paper test form are presented to the participant. Each character consists of the letters *d* or *p* marked with one, two, three or four dashes. The participant is asked to cross out all occurrences of the letter *d* with two dashes with a time limit of 20 s for each row. While numerous parameters can be calculated, only the concentration performance score as a measure of selective attention was used for the purpose of our study. The concentration performance score is the number of correctly processed items minus errors of commissions. The d2 test of attention shares demands on the ability to selectively attend to relevant stimuli while filtering out irrelevant ones with the Stroop test (Stroop, 1935), the probably most widely used test of selective attention. In contrast, the Stroop test demands more inhibitory control, as individuals have to inhibit a very prepotent response tendency (reading). Test–retest reliabilities of the d2 test of attention are reported high, mostly ranging between 0.75 and 0.92. Internal consistency and split-half reliability vary between 0.95 and 0.98 (Brickenkamp, 2002).

To obtain estimates for verbal and nonverbal intelligence, participants completed the subtests "Information" and "Block Design" of the *Wechsler Adult Intelligence Scale-III* (WAIS-III; Wechsler, 1997).

### 2.3. Study design and assessment procedure

The Ethical Committee of the German Psychological Society (DGPs) approved of the study design. Potential participants were given a complete oral and written description of the study and written informed consent was collected. Following informed consent, participants completed the SCID interview. Clinical baseline assessments were administered to the participants who met the inclusion criteria. After that, participants were asked to complete the d2 test of attention, the two subtests of the WAIS-III, the subscale "CSC-E" of the MCQ, the subscale "Rumination" of the RSQ, the PSWQ and the subscale "Trait Anxiety" of the STAI.

### 2.4. Statistical analyses

We used the Statistical Package for the Social Sciences (SPSS, Version 11.5) to analyze the data. We carried out one-way ANOVAs and Bonferroni-corrected post-hoc tests in order to check for group differences concerning levels of selective attention and clinical and sociodemographic characteristics. In addition, we used independent *t*-test to check for differences in selective attention between medicated and unmedicated participants and used bivariate correlations to analyze the relationship between CSC,