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The impact of attentional and emotional demands on memory performance in obsessive-compulsive disorder

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ABSTRACT

Lower performance on memory tests in obsessive-compulsive disorder (OCD) has been repeatedly observed. However, the origins of these performance deficits are not sufficiently explained. In this study we tested if OCD-related extensive focus of attention on thoughts (heightened self-consciousness) could be an explanatory mechanism for lower memory performance. Heightened situational self-consciousness was manipulated by instructing participants to either monitor neutral thoughts or to monitor OCD-related thoughts. We included a Behavioral Avoidance Task based on individual obsessions and compulsions to induce OCD-related thoughts. Participants were asked to perform these monitoring tasks in parallel to a taxing verbal memory task, resulting in learning under divided attention. The two conditions of learning under divided attention were compared to a single-task condition. Twenty-four participants with OCD and 24 healthy controls took part in these three learning conditions. The results indicate that in both groups memory performance deteriorated in the two conditions with divided attention compared to the single task condition. In the OCD-related thought monitoring condition (OTM) self-consciousness and Behavioral Avoidance Task-induced stress and fear were particularly increased and memory performance further deteriorated in the OCD group. This finding highlights an important and underestimated mechanism (personal involvement) which might serve to better understand lower memory performance in OCD.

1. Introduction

People with obsessive-compulsive disorder (OCD) spend a lot of their daily time thinking about what dangerous things might happen and how this might be avoided (Salkovskis, 1999; Salkovskis & Harrison, 1984; Rachman & de Silva, 1978). This self-directed, negative perservative thinking in OCD results in high costs for cognitive processing (e.g. Kuelz, Hohagen, & Voderholzer, 2004), which reduces capacity for other basic cognitive processes (e.g. memory, learning, attention) (e.g. Chamberlain, Blackwell, Fineberg, Robbins, & Sahakian, 2005). The aim of the present study is to better understand the mechanisms underlying increased self-directed recurrent thinking and its role as a potential causal factor for lower memory performance in OCD.

Besides the obsessive thoughts and impulses mentioned above, OCD is characterized by repetitive behaviors (compulsions) to avoid anxiety or to neutralize the obsessions (American Psychiatric Association, 2013). There is some neuropsychological evidence that these OCD symptoms might be the result of malfunctioning executive processing, more specific impaired executive inhibition (Chamberlain et al., 2005). Impaired executive inhibition, defined as the inability to have control over internal cognitions (e.g. intrusive thoughts) and externally manifested motor activities (e.g. environmental checking), leads to problems in disengaging from recurrent thinking. Recurrent thinking itself requires great amounts of executive resources, which might result in a lack of resources for other cognitive processes like memory performance. There is a large body of evidence for non-verbal lower memory performance in OCD (Boone, Ananth, Philpott, Kaur, & Djenderedjian, 1991; Christensen, Kim, Dysken, & Maxwell Hoover, 1992; Savage et al., 2000), whereas findings concerning lower verbal memory performances are less consistent (Deckersbach, Otto, Savage, Baer, & Jenike, 2000; Kuelz et al., 2004; Muller & Roberts, 2005; Segalàs et al., 2008; Savage et al., 2000). One line of research suggests that lower memory performance in OCD is due to the impaired

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implementation of appropriate organizational and mnemonic strategies (Kuelz et al., 2004; Deckersbach et al., 2000).

From a different (though not incompatible) perspective, a metacognitive approach postulates that appraisals and control of the thinking process might be one important developmental and maintenance factor of OCD (Fisher, 2009; Wells, 2000). In this account, the content of thoughts is not as relevant for the development and persistence of mental disorders as the classification of thoughts as important or dangerous: the "thinking about thinking". According to the metacognitive model, mental disorders are associated with the activation of a problematic perseverative program, called "cognitive attentional syndrome" (CAS) (Wells, 2000). This program consists of worrying, rumination, focusing attention on threatening objects and dysfunctional regulation strategies such as suppression and avoidance. The persistence of the CAS is followed by continuing aversive emotions and feelings of personal threat as well as increased self-directed attention to control for "thoughts which should not be there" (e.g. intrusions). This threat-monitoring control function was named cognitive self-consciousness (Wells, 2000). In general, self-consciousness is defined as the "enduring tendency of persons to direct attention towards themselves" (Fenigstein, Scheier, & Buss, 1975). According to Fenigstein (1979) it can be differentiated in public self-consciousness ("awareness that others are aware of the self"), and private self-consciousness ("awareness of one's personal thoughts and feelings"). Private self-consciousness can be further divided in a cognitive, affective and physiological component. In recent studies to OCD, the cognitive component −awareness and control of own thoughts and cognitive processes – was most investigated (e.g. Goldman et al., 2008; Janeck, Calamari, Riemann, & Heffelfinger, 2003; Kikul, Van Allen, & Exner, 2012; Wells & Papageorgiou, 1998). Accordingly, people with OCD seem to monitor their thoughts even more intensive than people with anxiety disorders, major depression episodes or healthy controls (Barahmand, 2009; García-Montes, Pérez-Alvarez, Soto Balbuena, Perona Garcelán, & Cangas, 2006; Hermans, Martens, de Cort, Pieters, & Eelen, 2003; Janeck et al., 2003). In the present study, the broader concept of situational self- consciousness was applied, including private and public self-consciousness, because people with OCD focus their attention highly on cognitive (thoughts, appraisals), somatic and affective information, as well as on others, to validate whether unwanted intrusions occur (Wells, 2000; Wells & Matthews, 1996). This problematic allocation of attentional resources could cause a division between the internal thoughts and requirements from the external environment in people with OCD (Weber et al., 2014). Thus, solving problems or memorizing information from the external environment might be difficult. Thereby, one explanation for the limited memory performance might be that divided attention disturbs the encoding process in memory tasks (e.g. Baddeley, Lewis, Eldridge, & Thomson, 1984; Craik, Fergus, Govoni, Naveh-Benjamin, & Anderson, 1996; Naveh-Benjamin, Guez, & Marom, 2003). A second metacognitive process that could reduce memory performance in OCD might be reduced cognitive confidence in memory capacities. Reduced memory confidence has been shown to mediate lower memory performance in people with checking compulsions (Hansmeier, Glombiewski, Rief, & Exner, 2015). Therapeutic techniques aimed at reducing dysfunctional beliefs about memory and increasing cognitive confidence, have recently been shown to increase memory confidence, memory performance and reduce OCD checking pathology (Alcolado & Radomsky, 2016). Thus following the metacognitive account, the memory deficits in OCD would be not a neuropsychological symptom or even causal factor of the disorder but rather the consequence of disorder-specific psychopathological symptoms, namely the tendency to focus on internal states, the difficulty to disengage from intrusive thoughts and feelings as well as reduced cognitive confidence in memory performance.

There is evidence for the relationship between self-consciousness and lower memory performance in OCD from correlative studies (Exner, Martin, & Rief, 2009; Goldman et al., 2008; Marker, Calamari, Woodard, & Riemann, 2006) and experimental studies (Kikul et al., 2012; Kikul, Vetter, Lincoln & Exner, 2011; Weber et al., 2014). Experimental manipulation of self- consciousness resulted in reduced visual memory test in OCD participants, compared to healthy controls (Kikul et al., 2011). Kikul et al. (2012) adopted the same experimental design for a verbal learning task and included a group of diagnosed major depression disorder patients. Although experimentally induced self-consciousness again deteriorated verbal memory performance in OCD participants, there was no group difference. These results disagree with the assumption that self-consciousness is a specific factor exclusively affecting memory performance in OCD. To improve the experimental design of Kikul et al. (2012), which lacked sufficiently challenging executive demands and external validity, a further adaptation of the experiment was implemented by Weber et al. (2014). In this study memory performance was assessed through a paired-associate learning task (Blumenfeld & Ranganath, 2007). Here, participants had to inhibit a prior learned distractor word association to recall a new word association, which was the measure for memory performance. The external validity was improved by increasing the threat-monitoring context in the self-consciousness condition by instructing participants to monitor thoughts which "endangered the learning success". The results showed lower memory performance in the self-consciousness condition, but again across all groups. This missing specificity was explained by the context-relevant, but disorder-irrelevant thought monitoring instruction in the self-consciousness condition.

To overcome this limitation for the present investigation, the experimental design was modified by inducing OCD-relevant thoughts in one condition (OCD-relevant Thought-Monitoring condition, OTM) through a Behavioral Avoidance Task (Steketee, Chambless, Tran, Worden, & Gillis, 1996). The Behavioral Avoidance Task is a standardized, stepwise procedure to measure behavioral avoidance and was implemented to increase the frequencies of OCD-related thoughts in the present experiment. While learning, participants were instructed to monitor the Behavioral Avoidance Task induced OCD-related intrusions. To address the question, whether the suggested lower memory performance in OCD is primary caused by fear through OCD intrusions or merely caused by a reduction of cognitive resources a Neutral-Thought-Monitoring condition was included. In this condition participants were instructed to monitor word intrusions while learning the new word pairs.

Based on the metacognitive model of emotional disorders (Wells, 2000; Wells & Matthews, 1996) we predicted that both dual- task conditions would deteriorate memory performance in both OCD and healthy participants by drawing on limited cognitive resources. We further expected that performance would suffer even more, when personally relevant and emotional engaging thought contents would be elicited by individual symptom provocation. In subjects with OCD this condition was expected to activate what Wells calls the Cognitive Attentional Syndrome and thus to hamper the switch of attentional focus from internal targets toward the external memory task. Hypothesis 1a thus predicts that the monitoring of neutral and OCD-relevant thoughts during the learning task will lead to a greater increase in situational self-consciousness in comparison to the control condition. Hypothesis 1b predicts that state anxiety will be increased in the OCD-relevant Thought-Monitoring condition compared to Neutral-Thought-Monitoring condition and standard control condition and this effect will be amplified in the OCD group. Hypothesis 2 predicts that memory performance is deteriorated in the two conditions of divided attention compared to the standard control condition. Hypothesis 3a predicts that the OCD-relevant thought monitoring condition increases self-consciousness more strongly in the OCD group compared to the healthy control group. Hypothesis 3b predicts that the OCD-relevant thought monitoring impairs memory performance more strongly in the OCD group compared to the healthy control group.