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Differential memory effects for encoding and retrieving disorder-relevant contents in relation to checking

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ABSTRACT

Background and objectives: Obsessive-compulsive (OC) checkers have been shown to be impaired in memory. However, when encoding OC-related material, OC checkers exhibit superior recall. This study aims to investigate emotion-related memory performance in relation to checking using newly developed OC-specific material. Additionally, metacognitive characteristics such as cognitive confidence were considered.
Method: In a sample of 63 participants (including 26 participants with obsessive-compulsive disorder), immediate and delayed recall for neutral stories and for OC-specific stories containing checking- and washing-related content were assessed. Regression analyses were applied to investigate the relationship to checking symptoms. The influence of metacognitive characteristics on recall was also examined.
Results: Higher checking was related to significantly better memory performance for a checking-related story as compared to two neutral stories. However, higher checking was also related to higher rates of forgetting of the OC-specific material over the delay period. Rates of forgetting in relation to checking were mediated by cognitive confidence. Diagnostic status was not predictive of any outcome variables.
Limitations: The use of typical and not idiosyncratic verbal material may limit the ecological validity of these findings.
Conclusions: In relation to high checking, different disorder-related cognitive and affective processes seem to interfere with memory encoding and retrieval at different stages. Metacognitive therapy methods might address these processes and thereby lead to a reduction of both cognitive impairment and OC symptoms.

1. Introduction

Although several studies have investigated memory performance in relation to obsessive-compulsive (OC) checking, the findings remain ambiguous: on the one hand, OC checkers have been shown to be impaired on many types of memory tasks, such as verbal episodic memory (for a meta-analytic review, see Woods, Vevea, Chambless and Byen, 2002), which supports the theory of a general memory deficit hypothesis. However, other findings suggest facilitated recall by OC checkers under certain circumstances: in comparison with controls, OC checkers exhibited superior recall for previously completed actions, but only for those that elicited anxiety (Constans, Foa, Franklin, & Mathews, 1995). Similarly, an additional study found a positive memory bias for threat-relevant information related to checking (e.g., how many times they touched a stove) (Radomsky, Rachman, & Hammond, 2001).

One factor that might account for these diverging findings is the influence of emotions on recall for specific material. Many studies have found that, relative to neutral stimuli, emotional stimuli can enhance memory strength (for reviews, see Hamann, 2001; Levine & Edelstein, 2009). In clinical populations, anxious individuals frequently experience enhanced memory performance for threatening information (for a review, see Mitte, 2008). From an evolutionary perspective, enhanced memory for threat-relevant material is clearly adaptive. In episodic memory, emotions are not only associated with a facilitation of memory recall: a certain degree of emotional arousal is actually a precondition for memory formation and emotions become integral parts of memory (Dere, Zlomuzica, Huston, & De Souza Silva, 2008).

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However, there is also evidence of *impaired* episodic memory in relation to OC symptoms. A number of studies using neutral learning material have shown impairments in verbal episodic memory among patients with obsessive-compulsive disorder (OCD) in general (e.g., Deckersbach, Otto, Savage, Baer, & Jenike, 2000; Savage et al., 2000; Zitterl et al., 2001). Especially when semantic gist has to be extracted from complex, orally presented sentences (Cabrera, McNally, & Savage, 2001) or short stories (Exner, Kohl, et al., 2009; Exner, Martin, & Rief, 2009), participants with OCD show deficits. Also OC checkers seem to be impaired in the ability to recall stories (Sher, Mann, & Frost, 1984). However, verbal episodic memory with tasks requiring semantic processing has not been investigated using OC-relevant material among OC checkers.

In addition to the influence of emotions, memory performance may be affected by metacognitive beliefs and strategies. Confidence in one's own cognitive abilities, also called cognitive confidence, has been shown to be lower for various memory tasks among OC checkers (e.g., Constans et al., 1995; Tolin et al., 2001). Some studies suggest that cognitive confidence in OCD may be especially low for OC-specific material (e.g., Cougle, Salkovskis, & Wahl, 2007; Foa, Amir, Gershuny, Molnar, & Kozak, 1997). Considering that beliefs in one's own abilities have been shown to be related to the cognitive performance in other fields of research (Valentine, DuBois, & Cooper, 2004), cognitive confidence may affect the memory performance of high checkers. High cognitive self-consciousness, the tendency to monitor one's thoughts and cognitive processes, has been shown to be related to cognitive deficits in OCD (e.g., Exner, Kohl, et al., 2009; Kikul, Vetter, Lincoln, & Exner, 2011).

The aim of the present study was to investigate possible emotion-related effects on verbal episodic memory performance in relation to high checking by using newly developed OC-related material. Based on the assumption that OC-related material will elicit higher arousal among individuals who engage in frequent checking behaviors ("high checkers"), we hypothesized that higher checking would be related to enhanced memory performance for material related to checking symptoms. Concerning the influence of metacognitive variables, we hypothesized that cognitive confidence and cognitive self-consciousness would mediate the memory performance in OC-related material in relation to high checking.

2. Methods

2.1. Participants

This study aims to investigate memory performance in relation to the checking subtype of OCD. Data from both nonclinical and clinical participants were collected in this study in order to assess the full range of checking behaviors. Previous studies (for reviews, see Abramowitz et al., 2014; Gibbs, 1996) found support for considering analog samples in the research of OCD. Among other things, their findings indicate that thoughts and behaviors seen in OCD (including checking behavior) differ more in quantitative than in qualitative aspects to those observed in non-clinical individuals, supporting the idea of a continuum between OCD patients and nonclinical individuals. A cognitive bias toward threat-relevant information as well as metacognitive beliefs might constitute vulnerability factors preceding clinical manifestations of OCD (for a review, see Muller & Roberts, 2005). Therefore, consideration of nonclinical controls seems to be especially important.

The sample included a total of 63 participants. Twenty-six participants diagnosed with OCD were recruited from our outpatient clinic ($n = 9$), from an outpatient practice ($n = 6$), and from two psychiatric hospitals ($n = 11$). Structured interviews (see Section 2.2) indicated that all participants fully met criteria for OCD based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (American Psychiatric Association, 1994a). The subsample of nonclinical participants ($n = 37$) did not undergo structured interviews. It included students recruited by announcements posted on bulletin boards at university. Students received class credit for participation. Three participants were excluded from analyses because they were identified as outliers on measures of intelligence and memory and because German was not their native language. Written informed consent was obtained from all participants. The study was approved by the Ethical Committee of the Psychology Faculty of the University of Marburg. Participants' demographic and clinical characteristics are summarized in Table 1.

2.2. Clinical assessment

The German version (Wittchen, Wunderlich, Gruschwitz, & Zaudig, 1997) of the Structured Clinical Interview for DSM-IV (SCID) (American Psychiatric Association, 1994b) was administered to assess current and lifetime psychiatric diagnoses. OC symptoms were rated using the German Palatine Revision of the Padua Inventory (PI-PR) (Gönner, Ecker, & Leonhart, 2010), a 24-item questionnaire designed to assess obsessional and compulsive symptoms in both healthy and clinical populations. The PI-PR checking subscale has shown good psychometric properties and covers typical checking behavior and cognitive aspects of checking. Cognitive aspects of checking were not part of previous revisions of the Padua Inventory and have not yet been investigated in relation to neuropsychological performance. Cognitive confidence and cognitive self-consciousness were assessed using the German version (Hoyer & Möbius, 2003) of the Meta-Cognitions Questionnaire (MCQ; Cartwright-Hatton & Wells, 1997). The MCQ includes a 10-item subscale assessing cognitive confidence and a 7-item subscale assessing cognitive self-consciousness. Self-reported depressive symptoms were assessed using the German

Table 1
Demographic and clinical characteristics of participants ($N = 63$).

Variable[a]	
Age	27.1 ± 10.6
Education[b]	14.7 ± 2.8
Sex, no. (%) female	39 (61.9)
OCD diagnosis, no. (%)	26 (41.3)
WAIS-III, scaled scores	
Information	10.2 ± 2.7
Similarities	9.5 ± 2.8
Block design	10.1 ± 3.2
WMS-R, digit span	16.6 ± 3.5
WMS-R, LM, immediate recall	16.3 ± 3.5
WMS-R, LM, delayed recall	14.9 ± 3.9
PI-PR, total	.9 ± .6
Impulses	.4 ± .5
Washing	1.2 ± 1.2
Checking	1.1 ± .9
Rumination	1.5 ± 1.0
Numbers	.5 ± .8
Dressing/grooming	.8 ± 1.0
MCQ-CC	3.2 ± .6
MCQ-CSC	2.4 ± .6
BDI, total raw score	12.3 ± 10.3

WAIS-III: Wechsler Adult Intelligence Scale, German Version; *WMS-R*: Working Memory Scale-Revised, German Version; *LM*: Logical Memory Performance; *PI-PR*: Padua Inventory, Palatine Version; *MCQ-CC*: Meta-Cognitions Questionnaire, Cognitive Confidence Scale; MCQ-CSC: Meta-Cognitions Questionnaire, Cognitive Self-Consciousness Scale; *BDI*: Beck Depression Inventory.

[a] Table values are given as mean ± SD unless indicated otherwise.

[b] Number of years spent in full-time education.