Cognitive confidence in obsessive-compulsive disorder: Distrusting perception, attention and memory

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Abstract

Previous studies have established that obsessive-compulsive disorder (OCD) is characterised by significant levels of distrust in memory (e.g. for actions). Ironically, this lowered confidence is at least in part due to repeated checking, which is assumed to lower perceptual processing and thereby reduces vividness and detail of the recollections. In a previous study, Hermans, D., Martens, K., De Cort, K., Pieters, G., and Eelen, P. [(2003). Reality monitoring and metacognitive beliefs related to cognitive confidence in OCD. \textit{Behaviour Research and Therapy}, 41, 383–401] observed that OCD is not only characterised by reduced confidence in memory, but also by a similar distrust in attention (Hermans et al., 2003). The present study aimed at replicating and extending this finding. It was observed (a) that patients suffering from OCD showed less confidence in attention and memory than a clinical and a nonclinical control group; (b) that confidence in attention was uniquely related to checking behaviour, and (c) that repeated checking caused increased levels of distrust in attention. In addition, it was observed that cognitive distrust while performing OCD-related actions not only extends to attention, but also to perception. It is argued that research on metacognition in OCD should move beyond the study of memory.

Keywords: OCD; Metacognition; Attention

Introduction

For someone who is not familiar with obsessive-compulsive disorder (OCD), compulsive actions and particularly repeated compulsive checking and washing can appear quite mysterious. These actions seem to violate the rational and functional basis of human behaviour. What makes a person check a gas stove more than 15 times in a row, while—at least for the outsider—one check would be more than sufficient to know that one can safely leave the kitchen?

Although already much is known about the psychological mechanisms involved in compulsive behaviours (e.g. Rachman, 2002), some key issues are still not completely resolved and await further study. One of these
issues pertains to the repeated character of some compulsive behaviours. Following the previous example, there are two separate questions: the first is why this person engages in checking whether the gas stove is out, the second why this checking is repeated. With respect to the first issue (checking engagement), it is known that fear reduction is a central motivator. In a situation where there is a high probability of serious harm combined with a high level of personal responsibility, most people will check to avoid this possibly harmful situation. This form of active avoidance behaviour is functional because it reduces the chance of encountering unwanted situations. It is known that increased perceptions of personal responsibility and biased assessments of the probability and seriousness of possible harm—which are observed in patients suffering from OCD—will increase the likelihood that one will engage in checking behaviour (e.g. Lopatka & Rachman, 1995; Rachman, 1993; Salkovskis, 1985, 1999).

For most people, after completion of the first check, the fear or apprehension that might be induced by a possibly harmful situation is reduced to the degree that one can leave the situation. For OCD patients this is typically not the case; an initial check will often be the first of a whole series. With respect to this second question of checking continuation, it is assumed that the aforementioned processes of increased personal responsibility and biased assessment of harm also play a pivotal role (Rachman, 2002). Nevertheless, additional processes will need to be invoked to explain why for persons suffering from OCD, one single check does not reduce the fear induced by the situation. In this context, several researchers have pointed to the role of memory.

Again from an outsider perspective, the role of memory impairment seems quite plausible. When someone returns to the stove for a second, third or fourth check this can easily be explained by assuming that the previous checks were simply just forgotten. Similar behaviour can be expected from someone suffering from amnesia. As a matter of fact, some studies have shown memory deficits in OCD. Ecker and Engelkamp (1995), for example, observed that OCD checkers showed poorer free recall of motorically encoded actions, which suggests a specific memory deficit concerning the processing of one’s own overt behaviours. Similar results have been observed by Sher, Frost, and Otto (1983), Sher, Frost, Kushner, Crews, and Alexander (1989), and by Rubenstein, Peynircioglu, Chambless, and Pigott (1993). Nevertheless, other studies failed to find differences between OCD and control groups in this respect (e.g. Foa, Amir, Gershuny, Molnar, & Kozak, 1997; Jelinek, Moritz, Heeren, & Naber, 2006; Kim et al., 2006; Simpson et al., 2006). As a matter of fact, evidence for memory deficits in OCD is mixed at best. Moreover, a possible weakness of many of the aforementioned studies is that the stimuli that had to be recalled, were neutral and unrelated to the specific concerns of the participants. When using OCD-relevant stimuli, Tolin et al. (2001) found no evidence for memory deficits in individuals with OCD as compared to anxious and nonanxious controls. Similar findings were observed by Ceschi, Van der Linden, Dunker, Perroud, and Brédart (2003) and by Karadag, Oguzhanoglu, Ozdel, Atesci, and Amuk (2005). Furthermore, Radomsky, Rachman, and Hammond (2001) observed that compulsive checkers even showed improved memory performance for threat-related information when under a condition of ‘inflated responsibility’ (for similar findings, see Radomsky & Rachman, 1999).

In addition to a more general memory deficit hypothesis, some studies suggest another way in which memory might be implicated in repeated checking. According to this assumption, the person has not ‘forgotten’ about the action (i.e. a memory trace is available), but has difficulties attributing the memory trace to either the perception of a real action or an imagination of that action. Put in other words, the person who just left the kitchen finds himself with a memory of having checked the stove, but has difficulty in assigning this memory (‘Have I really checked the stove, or did I just imagine doing so ?’). This phenomenon is known as a deficit in reality monitoring, which is the process whereby one determines whether a memory originated from perception or imagination (Anderson, 1984). A limited number of studies found evidence for impaired reality monitoring in OCD. This was the case in experiments by Rubenstein et al. (1993) and Zermatten, Van der Linden, Laröi, and Ceschi (2006) who studied a subclinical sample, as well as in the study by Ecker and Engelkamp (1995) who investigated a clinical group of OCD patients. In spite of these observations, other studies consistently failed to replicate (Brown, Kosslyn, Breiter, Baer, & Jenike, 1994; McNally & Kohlbeck, 1993; Merckelbach & Wessel, 2000; Sher et al., 1983). Brown et al. (1994) even found OCD to be associated with enhanced reality monitoring ability. However, similar to many of the studies that investigated a more general memory deficit, several of the reality monitoring studies used OCD-irrelevant materials. Hence, as an
additional test of the reality monitoring hypothesis, Hermans et al. (2003) employed ideographically selected OCD-relevant actions in a clinical group of OCD patients. In spite of these improvements and the use of a sensitive reality monitoring paradigm, no differences were observed between the OCD group and the controls. Based on these findings, one has to conclude that the evidence for a reality monitoring deficit in OCD is weak at best.

However, throughout these studies on OCD and memory, one finding that consistently emerged is that persons suffering from OCD exhibit significant levels of memory distrust. This lack of cognitive confidence, which can be regarded as a form of metacognition, has been observed in a long series of studies (e.g. Brown et al., 1994; Constans, Foa, Franklin, & Matthews, 1995; Cougle, Salkovskis, & Wahl, 2007; Dar, 2004; Dar, Rish, Hermesh, Taub, & Fux, 2000; Ecker & Engelkamp, 1995; Hermans et al., 2003; Karadag et al., 2005; MacDonald, Antony, MacLeod, & Richter, 1997; McNally & Kohlbeck, 1993; Sher et al., 1983; Tuna, Tekcan, & Topcuoglu, 2005; Zitterl et al., 2001). From a behavioural perspective, reduced memory confidence can have the same functional impact as a deficit in action memory or a reality monitoring deficit. After the patient checked the stove and left the kitchen, the person has a clear memory representation of the action and does not doubt its origin (perception or imagination), but mistrusts his memory for this action. This doubt in itself can be a source for renewed checking.

Given the apparent presence of reduced memory confidence in OCD, an important question that emerges concerns the origin of this doubt. One possibility is that it correctly reflects a genuine cognitive dysfunction in memory for OCD-related materials. However, as already indicated, the evidence for OCD-related memory deficits is mixed at best. Also, several studies have observed significant levels of memory distrust for OCD groups as compared to controls, in the absence of differences for actual memory performance (e.g. Hermans et al., 2003; Tolin et al., 2001). Moreover, intriguing experimental work by Van den Hout and Kindt (2003a, 2003b, 2004) has demonstrated that there might be a functional basis for memory distrust. In a series of studies with student samples, these authors asked participants to check a computerised gas stove with six knobs. The experimental group was asked to complete this check 21 times. The first and the last trial were test trials. At the completion of each of both test trials the accuracy of the participants’ memory for this check was assessed, and participants provided ratings for memory confidence, and detail and vividness of their memory of the check. During this pre- and post-test, the control group was also asked to check the gas stove and provide the ratings, but for the remainder of the 19 trials these participants checked a series of computerised light bulbs (irrelevant check). The results of these studies can be summarised as follows: repeated checking left memory accuracy intact, but it made the recollections less vivid, less detailed and, most importantly, repeated checking corrupted confidence in the recollection (Van den Hout & Kindt, 2003a, p. 311). Thus, instead of increasing their confidence in memory, the repeated checking of the gas stove in the experimental group ironically reduced memory confidence. According to the authors, this is due to the fact that repeated checking increases familiarity with the issues checked, which in turn promotes conceptual processing and inhibits perceptual processing. This makes recollections less vivid and detailed, which leads to reduced memory confidence.

Studies from other labs have replicated this finding. Radomsky, Gilchrist, and Dussault (2006) found similar effects employing a real gas stove instead of a computerised version. Coles, Radomsky, and Horng (2006) showed that a limited number of checks (between 2 and 10) is already sufficient to induce changes in memory confidence. Finally, Boschen and Vuksanovic (2007) were able to replicate the ‘checking breeds doubt’ effect in a clinical sample.

In summary, we can conclude that OCD is not likely to be characterised by deficits in memory for OCD-relevant issues (either recall/recognition or reality monitoring). In contrast, there exists robust evidence for reduced memory confidence in patients suffering from OCD. This is not based on actual memory problems, but ironically seems to result from the checking behaviour itself. Limited amounts of checking can already induce this metacognitive phenomenon. It is assumed that, possibly in interaction with experiences of personal responsibility and biased assessment of harm, reduced confidence negatively impacts checking continuation. Initial checks lead to lower levels of memory confidence, which in turn fuel subsequent checks.

An important characteristic of all previous studies is their unique focus on memory and memory confidence. In light of this, a finding that resulted from a study by Hermans et al. (2003) merits closer attention. These authors employed the cognitive confidence scale of the Meta-cognitions Questionnaire.
(MCQ; Cartwright-Hatton & Wells, 1997) to compare a group of OCD patients with a nonclinical control group. Replicating previous research, they observed that the OCD group had significantly lower levels of confidence in their memory for actions and their reality monitoring abilities. In addition, however, there was also a significant difference for a third cognitive confidence subscale, labelled ‘Confidence in keeping attentional focus’ (‘I am easily distracted’, ‘I have difficulty keeping my mind focused on one thing for a long time’). As a matter of fact, the effect for this attentional factor was statistically more pronounced than for the two memory factors. These data are a first indication that reduced cognitive confidence in OCD is not restricted to memory, but also pertains to attention. One could even hypothesise that memory confidence is (in part) based on confidence in attention. An example would be the person who checks for a second time whether he has put out his cigarette; not because he mistrusts his memory for this action, but mis-trusts his attention for having missed a possible flicker of red light in the ashtray. Distrust in attention might feed distrust in memory. If one is not sure that one has been sufficiently attentive, this will probably also lead to a lowered confidence in having a correct recollection.

Building on this empirical observation, the aim of the present study was to more directly study confidence in attention in a clinical sample of patients suffering from OCD (and matched clinical and nonclinical control groups). In addition to attention and memory, also confidence in perception was included. This was done to explore whether OCD is also related to reduced confidence at this basic level of processing (e.g. ‘I see the light is out, but I do not trust what I see’). Additionally, participants engaged in a conceptual replication of the experimental paradigm developed by Van den Hout and Kindt (2003a) to study the development of distrust in attention, memory and perception as a function of repeated checking. In contrast to previous studies that used the gas stove paradigm (either a real or computerised stove), we employed individually selected compulsive behaviours. Participants were asked to complete these compulsive behaviours five times. Confidence ratings were obtained at trials one, three and five. The course of cognitive distrust for the compulsive behaviours was compared to that of a set of OCD-irrelevant control actions.

Method

Participants

Forty-eight individuals participated in this study: 16 patients diagnosed with OCD, 16 yoked psychiatric controls (who did not meet criteria for OCD), and 16 yoked nonclinical controls.

All persons in the OCD group were inpatients at the University Psychiatric Centre in Kortenberg, Belgium. They were interviewed using the OCD module of the Structured Clinical Interview for DSM-IV (SCID; First, Gibbon, Spitzer, & Williams, 1996; Dutch version: van Groenestijn, Akkerhuis, Kupka, Schneider, & Nolen, 1999) and fulfilled criteria for OCD. Information about other comorbid conditions was not collected. Although a minority of four participants in this group primarily suffered from compulsive washing, all OCD patients reported extensive checking behaviours. The mean illness duration was 55 months (range = 1.5–240; SD = 62.4), with a mean number of .6 previous psychiatric hospitalisations (range = 0–3; SD = .96).

Participants in the two control groups did not meet criteria for OCD and had not received previous treatment for OCD or related problems. The psychiatric control group (PC) suffered from various disorders, mainly depression and/or personality disorders. Psychotic disorder was an exclusion criterion. All but one—who received outpatient treatment—were inpatients at the University Psychiatric Centre in Kortenberg, Belgium. They reported a mean illness duration of 43 months (range = 2.5–360; SD = 87.8) and a mean number of .3 previous psychiatric hospitalisations (range = 0–1; SD = .48). All but three patients in the psychiatric control group (13/16) and all but three patients in the OCD group (13/16) were taking psychotropic medication. The nonclinical control group (NC) consisted of volunteers recruited within and outside the hospital. Several were employed as nurses or administrative staff; others were technical or cleaning personnel.

Descriptive information about the three participant groups can be found in Table 1. Due to close matching of control participants to OCD patients, no differences were found for proportion of men and women, age and years of education.
Table 1
Characteristics of the OCD group and the two control groups (SD within brackets)

<table>
<thead>
<tr>
<th></th>
<th>OCD patients</th>
<th>Psychiatric controls</th>
<th>Nonclinical controls</th>
<th>F(2,45)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion men/women</td>
<td>6/10</td>
<td>6/10</td>
<td>6/10</td>
<td>.02</td>
<td>n.s.</td>
</tr>
<tr>
<td>Age (years)</td>
<td>31.88 (8.65)</td>
<td>31.13 (9.39)</td>
<td>31.50 (9.62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education (years)</td>
<td>14.94 (2.21)</td>
<td>15.06 (3.42)</td>
<td>14.81 (3.85)</td>
<td>.09</td>
<td></td>
</tr>
<tr>
<td>Padua Inventory—Revised</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>115.44 (26.61)</td>
<td>77.25 (20.79)</td>
<td>53.44 (8.25)</td>
<td>38.86</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Checking</td>
<td>21.94 (8.02)</td>
<td>13.38 (4.19)</td>
<td>9.94 (2.70)</td>
<td>20.56</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Washing</td>
<td>28.69 (10.17)</td>
<td>16.13 (7.56)</td>
<td>12.44 (1.59)</td>
<td>21.35</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Rumination</td>
<td>36.44 (9.19)</td>
<td>27.00 (7.04)</td>
<td>15.75 (3.57)</td>
<td>35.06</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Precision</td>
<td>14.88 (4.91)</td>
<td>9.81 (5.02)</td>
<td>7.88 (2.42)</td>
<td>11.36</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>Impulses</td>
<td>13.50 (5.44)</td>
<td>10.94 (3.19)</td>
<td>7.44 (.81)</td>
<td>10.99</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>BDI-II</td>
<td>20.88 (11.58)</td>
<td>25.50 (12.19)</td>
<td>2.31 (3.44)</td>
<td>24.54</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>MCQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>149.38 (28.31)</td>
<td>130.50 (22.65)</td>
<td>91.19 (14.58)</td>
<td>27.70</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Positive worry beliefs</td>
<td>31.94 (8.39)</td>
<td>28.81 (7.85)</td>
<td>24.94 (4.33)</td>
<td>3.91</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Uncontrollability and danger</td>
<td>45.25 (11.73)</td>
<td>40.81 (10.91)</td>
<td>21.63 (4.75)</td>
<td>27.11</td>
<td>&lt;.000001</td>
</tr>
<tr>
<td>Cognitive confidence</td>
<td>22.50 (6.90)</td>
<td>18.75 (4.12)</td>
<td>13.63 (3.69)</td>
<td>12.19</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>General memory confidence</td>
<td>12.56 (4.90)</td>
<td>10.69 (2.85)</td>
<td>8.56 (2.68)</td>
<td>4.89</td>
<td>&lt;.05</td>
</tr>
<tr>
<td>Reality monitoring confidence</td>
<td>4.06 (2.26)</td>
<td>2.81 (2.98)</td>
<td>2.06 (.25)</td>
<td>7.96</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Confidence in attentional focus</td>
<td>5.88 (1.86)</td>
<td>5.25 (1.48)</td>
<td>3.00 (1.41)</td>
<td>14.35</td>
<td>&lt;.0001</td>
</tr>
<tr>
<td>General negative beliefs</td>
<td>29.81 (7.13)</td>
<td>24.44 (6.89)</td>
<td>17.31 (3.89)</td>
<td>16.63</td>
<td>&lt;.000005</td>
</tr>
<tr>
<td>Cognitive self-consciousness</td>
<td>19.88 (4.51)</td>
<td>17.88 (4.01)</td>
<td>13.69 (3.48)</td>
<td>9.85</td>
<td>&lt;.0005</td>
</tr>
</tbody>
</table>

Different superscripts indicate significant contrasts.

Assessment

Padua Inventory Revised (Padua-R: Van Oppen, Hoekstra, & Emmelkamp, 1995)

The Padua-R is a 41-item self-report scale, which is a revised version of the original 60-item Padua Inventory by Sanavio (1988). It is developed to measure both obsessions and compulsions. Items are rated on five-point scales ranging from 0 (not at all) to 4 (very much). Research on the factor structure of the (Dutch) Padua-R by Van Oppen et al. (1995) revealed a five-factor structure, which is reflected in subscales concerning impulses, washing, checking, rumination, and precision. Internal consistency of the subscales varied from .77 to .93 (Chronbach’s alpha) with an $\alpha$-value of .89 for the total scale in a group of OCD patients.

Meta-Cognitions Questionnaire (MCQ: Cartwright-Hatton & Wells, 1997)

The MCQ is a 65-item self-report measure that was developed to measure dimensions of metacognitive beliefs, cognitive confidence judgments and selective attention to mental events (cognitive self-consciousness). This questionnaire consists of five factor-derived subscales: positive worry beliefs (subscale 1; e.g. “Worrying helps me cope”), negative beliefs about worry focusing on uncontrollability and danger (subscale 2; e.g. “When I start worrying, I cannot stop”), cognitive confidence (subscale 3; e.g. “I have a poor memory”), negative beliefs about thoughts including themes of superstition, punishment, responsibility and need for control (subscale 4; e.g. “Not being able to control my thoughts is a sign of weakness”), and cognitive self-consciousness (subscale 5; e.g. “I pay close attention to the way my mind works”). The subscales of the MCQ show adequate to good internal consistency in an undergraduate and graduate sample ($\alpha$’s ranging from .72 to .89) and adequate to very good test–retest reliability over 5 weeks among a university community sample ($r$’s ranging from .76 to .89 with an $r$ of .94 for the total scale) (Wells, 2000). For the Dutch translation of the MCQ (Hermans, Crombez, Van Rijsoort, & Laeremans, 1998) similar results for internal consistency have been observed in a sample of undergraduate students ($\alpha$’s ranging from .75 to .91, with an $\alpha$ of .93 for the total questionnaire) and
an unselected clinical inpatient sample (z's ranging from .73 to .92, with an z of .93 for the total questionnaire) (Hermans, Crombez, Van Rijsoort, & Laeremans, 2002).

**Brief Cognitive Confidence Questionnaire (BCCQ)**

To measure cognitive confidence in attention, memory and perception, a brief questionnaire was constructed. This consisted of nine items, which had to be completed with respect to an action that was just performed. Three items assessed confidence in memory: ‘My memories for the action are correct’, ‘I have actually performed the action and not only in my thoughts’ and ‘I can remember all details of the action’. Three other items pertained to confidence in attention: ‘While performing the action, I have not been distracted for a moment’, ‘I have succeeded to keep my attention continuously with the action’, and ‘If I made mistakes during the action, I have noticed them’. The final three items assessed confidence in perception during the action: ‘What I have seen, is reliable’, ‘What I have heard, is reliable’ and ‘The impressions I got when I have touched something, are reliable’. With the specific action in mind, each of these statements had to be rated on a five-point scale: ‘I do not doubt this at all’ (1), ‘I doubt this slightly’ (2), ‘I doubt this moderately’ (3), ‘I doubt this much’ (4) and ‘I doubt this very much’ (5).

**Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996)**

The BDI-II is a widely used self-rating measure for severity of depressive symptoms and consists of 21 four-choice statements. Participants are asked to mark the statements that best describe how they felt during the past 2 weeks. The Dutch version by Van der Does (2002) is used, for which adequate reliability is reported with Cronbach’s z of .92 and .93 in a psychiatric and student population, respectively.

**Compulsive actions and control actions**

During the experiment, participants were asked to perform four different actions. The first was a normatively selected, non-specific compulsive action (NC). This was an action that, in principle, could be relevant for patients suffering from OCD, but that was not identified as specifically relevant for the patients included in this study. It was the same for all participants and consisted of lighting a candle, blowing it out, putting the candle on the top shelf of a cupboard and closing its doors. The candle was fitted in a black holder, so the participant could not continue checking whether it was really out while placing it in the cupboard.

Although several studies have employed fixed sets of normatively selected compulsive actions (e.g. Constans, Foa, Franklin, & Matthews, 1995), previous work from our lab has shown that individualised selection of actions is essential if one wants to include appropriate anxiety-evoking behaviours (Hermans et al., 2003). As a consequence, in addition to the normatively selected non-specific compulsive action, an ideographically selected specific compulsive action was included in the design (IC). Based on information obtained from the treating psychiatrist or psychologist, this action was selected by the experimenter as being relevant for the specific patient’s current compulsions. It was related to a stimulus or situation that was known to induce high levels of anxiety for this specific person, and for which this person engaged in extensive escape and/or avoidance behaviour. Examples are putting out a cigarette, turning on and subsequently turning off a gas stove, meticulous washing of the hands and copying sentences in handwriting. The participant was asked to carry out the action without additional checking behaviour. For instance, a participant could be asked to turn on the gas stove and subsequently turn it off, and then to step away from the stove without additional checking whether it was really out. Participants in the control groups were asked to perform the action that was selected for the participant of the OCD group to whom they were yoked.

Finally, two neutral actions were included (N). These were not supposed to be associated with anxiety or escape/avoidance behaviour for any of the participants in the OCD group. For the first neutral action (N1) the participant was handed a set of pages that were kept together with a paperclip. The participant was asked to take away the paperclip, to place the pages in reversed order and to attach the paperclip again. For the second neutral action (N2) the participant was asked to look up a chapter in the index of a book, to place a small card at the page where this chapter started, to close the book and to lock it in a cupboard.
Procedure

Each participant was tested individually. The experimenter explained that the study aimed at investigating processes that might be involved in the onset or pathogenesis of compulsive symptoms. After written informed consent, the clinical status of the participant was assessed using the OCD module of the SCID. The remainder of the study consisted of two major parts: during the first phase the participant was asked to perform a number of actions (the repeated actions task), after which additional information was obtained by means of a number of questionnaires (the questionnaire assessment).

During the ‘repeated actions task’ each of the four actions had to be performed five times in a row. The order of the four actions was randomised for each individual participant, with the restriction that the two ‘compulsive’ actions (NC and IC) or the two ‘neutral’ actions (N1 and N2) could not be presented consecutively. This resulted in eight possible orderings which were used twice within the group of 16 OCD patients. The participants in the control groups received the same ordering as the participant from the OCD group to which they were yoked. Participants were informed that after the first, third and fifth performance of each action they would be asked to provide a number of ratings. At these moments, the participant first rated the extent to which the action had elicited fear. For the question: ‘Did this action induce fear’, there were three options: ‘No, I did not feel anxious’, ‘Yes, I felt anxious’ and ‘Yes, I felt really anxious’, which were scored as 0, 1 or 2 respectively. Next it was asked to fill out the BCCQ. This assessed confidence in attention, memory and perception concerning the action that was just completed.

The questionnaire assessment: After the ‘repeated actions task’, participants were handed a series of questionnaires, including the Padua-R, the MCQ and the BDI-II. Participants were asked to complete these questionnaires and to return them to the experimenter after completion. It was stressed that the information that was obtained would be kept completely confidential, and would be used for research purposes only. The participants were thanked again for their voluntary participation in this study.

Results

Participant characteristics

As can be seen from Table 1, the OCD group had significantly higher scores on the Padua-R as compared to both control groups. Simple contrasts revealed that this was the case for the total score as well as for each of the five subscales of the Padua (all $F$s $> 11$), except for the impulses subscale for which the difference was marginally significant, $F(1, 45) = 3.90$, $p = .054$, MSE = 13.48. The two control groups did not differ from each other, except for the rumination and impulses subscales, for which the nonclinical control group had significantly lower scores than the psychiatric control group, $F(1, 45) > 7$.

The two clinical groups (OCD and PC) had significantly higher levels of depressive symptomatology (BDI-II) as compared to the nonclinical control group (both $F$s $> 28$), but did not differ between each other $F(1, 45) = 1.7$, n.s., MSE = 98.2. The three groups were matched for gender, age and education.

Questionnaire data

All participants completed both the Padua-R and the Metacognitions Questionnaire. In line with previous findings, we predicted that the OCD group would be characterised by significantly higher scores on metacognitive beliefs related to ‘cognitive confidence’. In addition, we hypothesised that the level of checking symptoms in the OCD group would be uniquely predicted by metacognitive beliefs related to ‘cognitive confidence’.

Metacognitive beliefs

The total score and subscale means for the MCQ are presented in Table 1. Consistent with previous studies, planned comparisons revealed significant differences between OCD-patients and nonclinical controls for all subscales of the Metacognitions Questionnaire. As expected, these were least pronounced for the ‘Positive beliefs’ subscale, which is assumed to reflect a nonpathological type of metacognitions (i.e. belief that worrying
thoughts can be helpful; for instance as a means of problem solving). Interestingly, the comparison with the psychiatric control group indicated that the OCD patients had distinctively higher scores for the ‘Cognitive confidence’ and the ‘General negative beliefs’ subscales. Whereas the first indicates that the OCD group displayed higher levels of distrust in cognitive capacities, the latter scale indicates that the OCD group was characterised by more pronounced negative beliefs about thoughts including themes of superstition, punishment, responsibility and need for control.

Relation between OCD symptoms and metacognitive beliefs

To assess the relationship between metacognitive beliefs and compulsive checking, and because of significant correlations among the scales of the MCQ, a multiple regression analysis was conducted with the checking subscale of the Padua-R as criterion variable and the five subscales of the MCQ as predictor. In all analyses, the BDI was added as an additional predictor variable. For the OCD group, this analysis revealed that the ‘Cognitive confidence’ scale was the only variable that was significantly associated with checking behaviour, $t(9) = 2.42, p < .05, \beta = .72$ (all other $p$’s $>.33$).

To assess whether this result was restricted to checking behaviour, or also applied to other types of OCD symptoms, this regression approach was repeated for each of the other Padua-R subscales (washing, rumination, precision, and impulses). For none of these, cognitive confidence was a significant predictor. Also, neither the BDI nor any of the other MCQ subscales was significantly associated with these OCD symptoms. The results thus suggest a unique link between checking behaviours and metacognitions concerning cognitive confidence.

To further explore this relationship, a finer differentiation was made within the cognitive confidence subscale of the MCQ. Previous research (Hermans et al., 2003, p. 396) has revealed that this scale can be broken down in three separate factors, which were identified as ‘General confidence in memory’ (e.g. ‘My memory misleads me at times’, ‘I do not trust my memory’), ‘Reality monitoring confidence’ (e.g. ‘I have difficulty knowing if I have actually done something, or just imagined it’, ‘I imagine having not done things and doubt my memory for doing them’) and Confidence in keeping attentional focus’ (‘I am easily distracted’, ‘I have difficulty keeping my mind focused on one thing for a long time’). These three factors were entered as separate predictors in the previous multiple regression analysis (replacing the overall ‘Cognitive Confidence’ subscale). This analysis revealed that ‘Confidence in keeping attentional focus’ was the sole predictor of the level of checking behaviour, $t(7) = 3.13, p < .05, \beta = .63$.

Although the level of checking symptoms was much lower in the psychiatric control group and particularly low in the nonclinical control group, the regression analyses for these participants were also repeated (including the five subscales of the MCQ and the BDI-II). For the psychiatric controls, checking was significantly associated with higher scores on the BDI-II, $t(9) = 2.90, p < .05, \beta = .87$. However, none of the metacognitive variables came out as a significant predictor of compulsive checking. Likewise, for the nonclinical group, none of the variables reliably predicted the level of checking behaviour (all $p$’s $>.13$).

The ‘repeated actions’ task

In addition to completing the questionnaires, all participants took part in an experimental study that investigated changes in cognitive confidence as a function of repeated performance of different types of actions. After the first, third and fifth performance, cognitive confidence in memory, attention and perception was assessed for that specific action, using the BCCQ. It was predicted that (a) as compared to the two control groups, the OCD group would show more distrust in memory and attention, and (b) that this difference would be most pronounced for the individually selected compulsive actions. Additionally, we wanted to investigate similar differences concerning distrust in perception. Finally, and in line with previous work by Van den Hout and Kindt (2003a, 2003b), we predicted that repeated checking would lead to an increase in memory distrust. It was hypothesised that this effect would be stronger for the OCD group, and in particular for OCD-related actions (see Tolin et al., 2001). Similar effects for distrust in attention and perception were explored.

The results of this experimental part of the study will be discussed successively. First, the effects of the experimental manipulation concerning different types of actions will be presented. Subsequently, confidence in
perception, attention and memory will be discussed as a function of the three groups and the types of actions. Finally, the effects of the repeated performance of the actions on these metacognitions will be reported.

**Manipulation check**

In this experiment, three different types of actions were included: ideographically selected compulsive actions (IC), normatively selected compulsive actions (NC) and neutral control actions (N1 and N2). Although normatively selected actions have been used in several studies (e.g. Constans et al., 1995), a previous study from our lab indicated that normatively selected actions induce significantly less fear than actions that were selected on an individual basis, and might therefore be less appropriate for this type of research (Hermans et al., 2003).

Hence, we first wanted to check whether the ideographically selected actions were indeed more fear arousing. The analyses were based on the fear ratings that were obtained when the action was performed for the first time (see Fig. 1). Because a preliminary analysis showed that the two neutral actions did not differ from each other, these data were averaged. A 3 (group: OCD, psychiatric controls, nonclinical controls) × 3 (type: normatively selected, ideographically selected, neutral) ANOVA with type as a repeated measures variable, revealed a significant interaction between group and type of action, \( F(4, 90) = 7.65, p < .0001, \text{MSE} = .054 \). Planned comparisons showed that for the OCD group the IC actions induced significantly more fear than the neutral control actions, \( F(1, 45) = 43.5, p < .0001, \text{MSE} = .052 \). Moreover, the ideographically selected stimuli also induced significantly more fear than the normatively selected compulsive actions, \( F(1, 45) = 23.71, p < .0001, \text{MSE} = .065 \). Importantly, the difference between this latter type of actions and the neutral control actions did not reach the level of significance, \( F(1, 45) = 1.56, \text{n.s., MSE} = .045 \). For the two control groups, none of the three contrasts reached the level of significance (\( F < 1 \) for all comparisons).

Based on these analyses, we can conclude that the ideographically selected actions were indeed sufficiently relevant for the participants of the OCD group. The fixed set of normatively selected actions, on the other hand, did not arouse more anxiety than the neutral control actions. Hence, all further analyses are restricted to the individually selected actions and the neutral control actions (averaged over \( N_1 \) and \( N_2 \); referred to as \( N \)).

**Confidence in attention, memory and perception**

The data of the three subscales of the BCCQ were analysed using a 3 (group: OCD, psychiatric controls, nonclinical controls) × 2 (action type: ideographically selected compulsive, neutral) × 3 (cognition: memory, attention, perception) ANOVA with repeated measures for the last two variables. First of all, the analysis revealed a main effect of group, \( F(2, 45) = 7.14, p < .005, \text{MSE} = 27.83 \). Regardless of the type of action and the cognitive process, participants from the OCD group expressed higher levels of cognitive doubt (\( M = 11.76 \)), as compared to the psychiatric control group, \( M = 9.59, F(1, 45) = 8.10, p < .01, \text{MSE} = 27.83, \text{MSE} = \).
and the nonclinical control group, $M = 9.03$, $F(1, 45) = 12.80$, $p < .001$, MSE = 27.83. In addition, there was a significant main effect of action type, $F(2, 45) = 7.85$, $p < .01$, MSE = 8.67. Significantly more cognitive doubt was experienced when OCD actions were performed ($M = 10.61$) than when neutral actions were performed ($M = 9.64$). A group $\times$ action type interaction, $F(2, 45) = 5.92$, $p < .01$, MSE = 8.67, revealed that this latter main effect was largely due to the OCD group. As can be seen from Fig. 2, the OCD group expressed more doubt than the nonclinical control group for both types of actions, but this difference was more prominent for the OCD actions, $F(1, 45) = 13.88$, $p < .001$, MSE = 28.24, than for the neutral control actions, $F(1, 45) = 5.75$, $p < .05$, MSE = 8.26. Interestingly, there was no main effect or interaction with the cognition variable, which indicates that the significantly higher levels of cognitive doubt that were expressed by the OCD group, were not different when pertaining to memory, attention or perception (see also Fig. 2).

Confidence in attention, memory and perception as a function of repeated performance

To investigate the effect of repeated performance of the actions, separate ANOVA’s were conducted for each of the subscales of the BCCQ (memory, attention, perception). For the memory data, the 3 (group: OCD, psychiatric controls, nonclinical controls) $\times$ 3 (moment: 1, 3, 5) $\times$ 2 (action type: ideographically selected compulsive, neutral) ANOVA revealed main effects of group, $F(2, 45) = 6.43$, $p < .005$, MSE = 4.42, and action type, $F(1, 45) = 7.41$, $p < .01$, MSE = 1.80, as well as an interaction between both variables, $F(2, 45) = 5.32$, $p < .01$, MSE = 1.80. The interpretations of these effects are in line with those described for the total BCCQ (see previous section); the OCD group reported more distrust in memory than the control groups (both $F$'s > 8), and this was particularly the case for the compulsive actions ($M_{\text{OCD-IC}} = 4.58$, $M_{\text{psychiatric-IC}} = 3.43$, $M_{\text{nonclinical-IC}} = 3.21$, $M_{\text{OCD-N}} = 3.07$, $M_{\text{psychiatric-N}} = 3.00$, $M_{\text{nonclinical-N}} = 3.00$). None of these effects, however, interacted with the moment variable. Also, there was no main effect of moment ($F < 1$). Hence, repeated performance had no effect of the extent of memory distrust displayed by the OCD group while performing the actions.

For the attention ratings a different pattern emerged. The ANOVA revealed a main effect of group, $F(2, 45) = 4.43$, $p < .05$, MSE = 4.98; the OCD group reported more distrust in attention than the control groups ($M_{\text{OCD}} = 3.98$, $M_{\text{psychiatric}} = 3.38$, $M_{\text{nonclinical}} = 3.03$). However, interestingly, this main effect significantly interacted with the moment variable, $F(4, 90) = 3.21$, $p < .05$, MSE = .36. Simple main effects for each of the three groups revealed that for the OCD group distrust in attention increased as a function of the number of performances, $F(2, 30) = 4.02$, $p < .05$, MSE = .67, $M_1 = 3.66$, $M_3 = 4.06$, $M_5 = 4.22$. For the two control groups this effect was not present, $F < 1$ (psychiatric controls: $M_1 = 3.39$, $M_3 = 3.44$, $M_5 = 3.30$; nonclinical controls: $M_1 = 3.06$, $M_3 = 3.03$, $M_5 = 3.00$). Fig. 3 summarises these data and makes an additional differentiation between compulsive actions and neutral control actions. As can be seen from this figure, the effect of repeated performance on distrust in attention that was observed in the OCD group was

![Fig. 2. Distrust in memory, attention and perception (BCCQ ratings) as a function of group (OCD, psychiatric control, nonclinical control) and type of action [compulsive actions (IC) and neutral control actions (N)]. Higher scores represent more distrust.](image-url)
somewhat more pronounced for the OCD actions. Nevertheless, the interaction between moment, group and type of action was not significant, $F(4, 90) = 1.08$, n.s, which suggests that the impact of repeated checking on attention distrust was independent of the type of action in this study.

Finally, the pattern for the perception items was similar to that of the memory items. The ANOVA revealed main effects of group, $F(2, 45) = 3.54$, $p < .05$, MSE = 4.91, and action type, $F(1, 45) = 4.65$, $p < .05$, MSE = 1.38, as well as an interaction between both variables, $F(2, 45) = 5.98$, $p < .05$, MSE = 1.38. The OCD group reported more distrust in perception than the control groups (both $F$s > 4.7), and this was exclusively the case for the compulsive actions ($M_{OCD-IC} = 4.21$, $M_{psychiatric-IC} = 3.33$, $M_{nonclinical-IC} = 3.08$, $M_{OCD-N} = 3.06$, $M_{psychiatric-N} = 3.00$, $M_{nonclinical-N} = 3.00$). Importantly, none of these effects interacted with the moment variable. Also, there was no main effect of moment ($F < 1$). Hence, repeated performance had no effect on the extent of distrust in perception displayed by the OCD group while performing the actions.

4. Discussion

Recent studies have repeatedly shown that OCD is characterised by significantly lower levels of cognitive confidence in memory as compared to control groups. This metacognitive phenomenon is assumed to play a role in the continuation of checking behaviour. Mistrust concerning the recollection of a previous check might be an impetus for subsequent checking rituals. Ironically, this cognitive distrust seems to result, at least in part, from the checking behaviours themselves (Van den Hout & Kindt, 2003a). This might lead to a spiral where checking leads to reduced memory confidence, which in turn leads to more checking.

All previous studies exclusively focused on confidence in memory. Data from a clinical study by Hermans et al. (2003), however, indicated that cognitive distrust in OCD might also extend to attentional processes. Persons suffering from OCD might mistrust the accuracy or completeness of previous checks because important elements of this behaviour have been missed due to distraction or moments of lessened attention. As a matter of fact, it might even be hypothesised that reduced confidence in attention is a source of reduced memory confidence.

The present study aimed at further investigating cognitive confidence in attention and memory. In addition, confidence in perception was included. The results replicate and extend the previous findings from our lab. First, as was already demonstrated, the data from the cognitive confidence subscale of the MCQ showed that the OCD group had significantly lower levels of confidence in general memory abilities, reality monitoring and attention. In line with the findings of Hermans et al. (2003), the difference from the nonclinical control group was most evident for the attention factor. In addition, multiple regression analyses showed that when the scores of the other metacognitive subscales were taken into account, the cognitive confidence scale was the only one that was reliably associated with compulsive checking. This is an interesting finding as previous studies have shown that also other scales of the MCQ are associated with OC symptoms. Cohen and Calamari (2006), for example, showed that an extended version of the self-consciousness scale correlated significantly with symptoms of OCD in a student sample. However, in this study no other subscales of the MCQ were
included in the regression analysis. Other studies have either used the MCQ-total score (e.g. Mather & Cartwright-Hatton, 2005) or only used a limited subset of the subscales of the MCQ (e.g. Myers & Wells, 2005). In a nonclinical study by Gwilliam, Wells, and Cartwright-Hatton (2004) four of the five subscales of the MCQ (including cognitive self-consciousness) were entered in a multiple regression analysis to predict self-reported OC symptoms. Interestingly, in addition to the ‘general negative beliefs’ subscale, the cognitive confidence scale appeared to have a unique contribution in predicting general measures of OC symptoms. Given the correlations among different types of metacognitive beliefs, we believe that future studies should focus on weighing their relative contribution in OCD. Furthermore, it will be important to assess their relation to more specific obsessive compulsive symptoms (e.g. checking, intrusions).

In a further refinement of our own analysis, we observed that within the cognitive confidence subscale, the attention factor uniquely predicted checking behaviours. This observation is of theoretical and clinical importance, and is in line with a view that would place mistrust in attention at a more primary and central level than mistrust in memory. Nevertheless, this finding needs further replication before firm conclusions can be drawn. To this end, we are currently developing a measure that assesses confidence in a variety of cognitive processes, including attention (Coles, Cook, & Hermans, 2007).

The data from the MCQ were corroborated by the results of the BCCQ that was repeatedly administered during the repeated actions task. The participants from the OCD group exhibited significantly less confidence in attention and memory as compared to the control groups. Interestingly, this effect was also present for the items that assessed confidence in perception. Again this points to the fact that cognitive mistrust extends beyond memory. Although the OCD group displayed less confidence for both the neutral actions and the relevant compulsive actions, this effect was most evident for the latter. One possibility is that memory confidence is influenced by feelings of responsibility. This view would fit with recent work by Moritz and colleagues who experimentally manipulated level of responsibility and found that lower levels of memory confidence were particularly observed under conditions of high perceived responsibility (Moritz et al., 2007).

Finally, the results of the repeated actions task showed that repeated checking significantly increased distrust in attention. Given that only five checking trials were used for each action, this is a remarkable finding. To our knowledge, this is the first time that the effect of repeated checking on attention was investigated and observed. Also, it is the first time that the ‘checking breeds doubt effect’ was studied employing individually selected compulsive actions (instead of the normative use of a virtual or real gas stove). Although not statistically different, this effect was more pronounced for the individually selected actions. This is in line with results from a study by Tolin et al. (2001). Using a different type of paradigm, these authors observed a significantly more manifest decline in memory confidence for objects that were regarded as OC relevant as compared to neutral objects.

In contrast with other studies (e.g. Van den Hout & Kindt, 2003a), we did not observe a significant effect of repeated checking on confidence in memory. One reason for the absence of the effect of repeated checking on memory confidence might be related to the design. Whereas other studies have typically used a control action for which the participants only did two checks (at pre- and post-measurement), the present study used a mixed between/within subjects design, comparing repeated checking for OCD-relevant and irrelevant materials in three different groups. Although it cannot be excluded that a significant effect would have been observed when we would have compared memory confidence for items that were repeatedly checked with non-checked items, this is not very likely. As a matter of fact, memory confidence in the OCD group (as well as the other groups) remained unchanged as a result of repeated checking (OCD group: $M_1 = 4.03$, $M_3 = 3.97$, $M_5 = 4.01$). In all previous studies on memory confidence, the crucial decline was situated in these trials (while no decline is observed for the nonchecked items). A more plausible reason for the absence of a reduction in memory confidence is the limited number of trials that was used in this study. Whereas most other studies used about 20 checking trials, our study only included five checks for each action. This was due to the nature of our actions, which were individually selected actions that were central to the patients’ primary pathology. Carrying out these actions—each participant completed $4 \times 5$ actions—was relatively time consuming, and the inclusion of more trials would have made the experiment exceedingly lengthy. Although Coles et al. (2006) observed effects on memory confidence using a limited amount of trials, this effect predominantly emerged around 10 checks. Similarly, Boschen and Vuksanovic (2007) found that only after 10 trials there was a decline in memory confidence. Hence, it can be predicted that with an increasing number of trials a similar reduction in memory confidence would have been observed.
Nevertheless, in spite of this limited series of trials, a significant effect of repeated checking was observed for confidence in attention. Together with the observation that the checking subscale of the Padua was uniquely related to confidence in attention, this finding might suggest that mistrust in attention should be situated at a more primary and central level than mistrust in memory. When engaging in a checking cycle, distrust in attention might emerge prior to memory distrust. Whether this is the case, is a question for subsequent experimentation. Such a study would need to include a longer series of checking trials (preferably for OCD relevant issues) whereby confidence in attention and memory are continuously assessed. Based on the aforementioned hypothesis, we would predict that the decline in confidence in attention would have a faster onset than the decline in memory confidence. Given the present findings, it would also be interesting to include questions regarding confidence in perception.

The present results evoke at least two new questions. The first relates to the pervasiveness of reduced cognitive confidence in OCD, the second to the mechanisms involved. If OCD is not only characterised by mistrust in memory but also by mistrust in perception and attention, one might wonder whether we are not tapping into a more general and pervasive characteristic of persons suffering from OCD. Maybe this lack of confidence extends to all areas of cognitive functioning. Work by Dar and colleagues (Dar, 2004; Dar et al., 2000) does seem to suggest that at least other cognitive domains are implicated. For instance, studying the domain of ‘personal knowledge’, Dar et al. (2000) gave OC checkers and participants from two control groups a 100-item general knowledge test with two alternatives for each item. After choosing one of the answers, participants were asked to rate their confidence that the chosen answer was the correct one. An example of these items is: ‘solar wind is (a) an arctic storm; (b) emission of atomic particles from the sun’. Results showed that OC patients were less confident in their personal knowledge than the nonclinical control group. More recently, a pilot study on six OC checkers and six nonclinical controls revealed that when a set of the more difficult items from the knowledge test was repeatedly presented (i.e. three times) the OC group demonstrated a significant decrease in their personal knowledge, while a significant increase was observed for the control participants (Dar, 2004; Experiment 3). The generality that is suggested by these findings stands in contrast with work by Moritz et al. (2007) who failed to find differences in cognitive confidence in a memory test, except when participants were part of a condition in which a high level of subjective responsibility was induced. This suggests that more general differences (e.g. concerning personal knowledge) between patients suffering from OCD and controls might only appear in interaction with factors like perceived responsibility (but see Dar, 2004). This was already pointed out in the introduction, when checking continuation was described as resulting from an interaction between memory processes (confidence), increased personal responsibility and biased assessment of harm. Further research will need to examine the pervasiveness of cognitive distrust in OCD. Although relevant to this question, the knowledge test employed by Dar and colleagues is still strongly based on memory processes. So other cognitive domains need to be explored. Also, even when lack of confidence would appear as a broader characteristic of OCD, it remains to be tested whether all forms are equally implicated in compulsive behaviour. At least in the present study, distrust in attention, but not distrust in memory or reality monitoring, was associated with compulsive checking.

A second, related question concerns the mechanisms underlying distrust in attention and the apparent effect of repeated checking on this metacognition. In this context it remains unclear whether the mechanisms are similar to those involved in memory confidence. With respect to the effects of repeated checking, Van den Hout and Kindt (2003a) argued that the perceptual processing that is dominant in early encounters with the stimulus switches to a higher level of ‘conceptual’ processing which inhibits perceptual processing, making recollections less vivid and detailed. This, in turn, leads to reduced memory confidence and a different type of memory (i.e. ‘knowing’ instead of ‘remembering’). It is possible that this type of process is also involved in lowered confidence in attention; inhibited perceptual processing might indeed impact the confidence one has in his attentional capacities. Another possibility is that during the initial encounters, when perceptual processing is still dominant, the person discovers more and more aspects of the situation. For instance, someone who pulls the handbrake to prevent the car from moving and accidentally killing a child, might gradually notice that this very simple action is associated with more perceptual input than initially expected. Going from check to check, this person might notice that one can hear three ‘clicks’ before the brake is securely pulled, that the last of these clicks is louder than the previous two, that the break can slip back one click if it is released too early, that this particularly happens if the hands are sweaty, etc. Hence, subsequent checks might reveal an
increasing number of perceptual elements that need to be attended before one can be 'sure'. This perceptual 'enrichment' might reduce confidence in attention. A next step in this process emerges when one moves towards more conceptual processing, which inhibits the perceptual level (see Van den Hout and Kindt, 2003a). This might further hamper the desired attentional processing, while simultaneously corrupting confidence in memory. Future research will need to further assess these possibilities.

In line with the cognitive model presented by Rachman (2002), the present data indicate that OCD is associated with cognitive distrust. According to Rachman distrust (in memory) is one of four elements of a self-perpetuating mechanism that promotes the recurrence of checking. It fuels into the compulsive behaviour. This makes cognitive distrust a clinically relevant phenomenon.

With respect to the clinical implications, at least two issues arise. The first pertains to treatment. If subsequent research would demonstrate a causal status of cognitive distrust in the origin or maintenance of OCD, it will be important to investigate whether interventions that target cognitive confidence would provide a clinically significant addition to standard treatments for OCD (e.g. exposure). The second issue relates to the generality of cognitive distrust in OCD. Most studies to date have largely focused on the relation between cognitive confidence and checking behaviour. We believe, however, that it should not be excluded that the observed mistrust in perception, attention and memory also extends to patients whose primary symptoms are washing or doubting. Patients with contamination fears, for example, will extensively wash, and while doing so often continuously check whether this ritual is carried out in a correct and complete fashion. Doubt about whether certain areas have been overlooked or insufficiently cleaned can lead to the repetition of the washing ritual. Also, a patient might doubt about whether or not he passed the section of the supermarket where the herbicides are sold, and subsequently go home to shower, just to be sure. Similarly, patients who extensively ruminate about options, might find a lack of cognitive confidence to be an extra source of stress. The possibility that particular consequences of certain choices might have been forgotten or overlooked, might instigate further rumination. In the present study, a small subset of patients primarily engaged in washing behaviours. Based on this small sample, it is difficult to conclude whether or not they contributed to the overall effects in a similar fashion as those patients who primarily engaged in compulsive checking, but at this point we see no reason to assume that this would not be the case. Future studies will need to consider these aspects of generality and treatment potential.

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