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## A diary study of the phenomenology and persistence of compulsions

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### ABSTRACT

**Background and objectives:** Research on the persistence of compulsions has found that, when making the decision to stop a compulsion, people with OCD weigh sensory and memory information as more important than external criteria. At the same time, research has also found that repetition of behaviour has a deleterious effect on memory, sensory and cognitive confidence. These findings have important treatment implications but they are almost exclusively laboratory based. This study sought to examine compulsions as they occur *in vivo* using a structured diary format.

**Methods:** 22 People with a principal diagnosis of OCD completed measures of memory, sensory and cognitive confidence and used a structured diary to report on three compulsive episodes a day for three days.

**Results:** Despite repetition, a sense of certainty or the “right” feeling was achieved in over half of the compulsive episodes. The outcome of compulsive episodes was not influenced by distress over the obsession, nor was distress associated with negative beliefs about obsessions. Episodes in which certainty was not achieved were characterized by greater repetitions, greater memory, cognitive and sensory doubt and less certainty that the compulsion had been done properly.

**Limitations:** The sample size was modest, checking compulsions were over-represented and data were based on retrospective self-report, albeit 2-h on average.

**Conclusions:** Consistent with laboratory studies, repetition has insidious effects on the persistence of compulsions. However, compulsions yielded a sense of certainty half the time, despite repetitions.

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### 1. Introduction

Leading models of obsessive–compulsive disorder (OCD) implicate negative beliefs about and appraisal of obsessional thoughts as key factors in the development and persistence of the disorder (see Purdon, 2009 for a review). According to these models, negative beliefs and appraisal evoke distress which the individual attempts to ameliorate through covert or overt actions. The relief from distress negatively reinforces the action and the action terminates exposure to the obsession, which prevents extinction of the distress and new learning about the meaning of the obsession. The non-occurrence of the feared event represented in the obsession is then attributed to the performance of the action. Distress over the obsession persists, the action is more likely to be

conducted to ameliorate that distress, and over time it escalates into a compulsion. In the absence of distress over the obsession, then, the compulsion becomes obsolete. Thus in the past few decades research has focused on identifying the factors that evoke distress over obsessions and developing interventions to address them. However, this vast body of research has not yielded a significant change in treatment efficacy, which remains at an unimpressive 50% success rate (e.g., Tolin, 2009).

It is possible that leading models of OCD have underspecified the factors involved in the persistence of compulsions. Tolin, Abramowitz, Brigidi, and Foa (2003) found that people with OCD reported higher intolerance of uncertainty (IU) than nonanxious controls. Intolerance of uncertainty was also higher in people with checking and repeating compulsions than with other types of compulsions, such as washing. Tolin et al. proposed that checking and repeating might be driven in part by low tolerance of distress for uncertainty as to whether the action has achieved its goal. They recommend that exposure to uncertainty could be a potentially important component of treatment.

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Meanwhile, a growing body of research demonstrates that repetition of a behaviour tends to decrease, rather than increase, certainty. Evidence from numerous studies indicates that as a behaviour is repeated, confidence in memory, sensory perception, attention and concentration declines. In one of the earliest studies of its kind, van den Hout and Kindt (2003) monitored memory accuracy and confidence over a series of trials in which participants checked a virtual stove to ensure its safety. Across rounds of checking, actual memory accuracy remained stable but memory confidence declined. This effect has been replicated in a number of studies which have found that a decline in memory confidence occurs after repeatedly checking the same object (Radomsky, Gilchrist, & Dussault, 2006), after repeatedly washing a set of objects (Fowle & Boschen, 2011) and after a relatively limited number of repetitions (i.e., as few as 5 checks; Coles, Radomsky, & Horng, 2006). Other research suggests that a decline in memory confidence may be especially pronounced under conditions of high responsibility and on tasks relevant to current goals (Boschen & Vuksanovic, 2007; Radomsky, Dugas, Alcolado, & Lavoie, 2014).

At the same time a number of studies have found that individuals with OCD have less confidence in their memory, cognitive and sensory faculties overall than do individuals with another psychiatric diagnosis or individuals with no diagnosis (Hermans, Marten, De Cort, Pieters, & Eelen, 2003; Nedeljkovic & Kyrios, 2007; Nedeljkovic, Moulding, Kyrios, & Doron, 2009; van den Hout, Engelhard, de Boer, du Bois, & Dek, 2008), particularly when referencing OCD-relevant actions such as locking a door (Hermans et al., 2008). Confidence in memory, attention, and perception have also been found to predict greater self-reported checking symptoms over and above other OCD-relevant cognitions, such as increased responsibility and confidence in memory (Bucarelli & Purdon, 2009). Indeed, Alcolado and Radomsky (2011) recently showed that poor memory confidence may be a risk factor for repeated checking.

In his model of checking compulsions Rachman (2002) proposed that when responsibility for harm and the perceived likelihood and severity of harm are all high, investment in establishing certainty that preventative acts have been done properly is also high. The degree of certainty required is often elusive and so the act is repeated, which in turn reduces confidence that it has been done properly, which in turn evokes more repetition. Radomsky, Shafran, Coughtrey, and Rachman (2010) suggested that psycho-education about this insidious process and restoration of confidence in cognitive abilities, particularly memory, may improve treatment outcome in cases of compulsive checking.

If poor confidence in memory and cognitive abilities result in greater repetition and less certainty, how does the cycle stop? There is surprisingly little research on “stop” rules. Szechtman and Woody (2004) proposed that compulsions are safety behaviours that are voluntarily terminated when the individual is confident that danger has passed. Since it is not possible to know with certainty that danger has passed (that is, one cannot prove the null hypothesis) the individual is instead guided by an implicit, internal, felt sense that danger has passed. Woody and Szechtman argued that people with obsessive–compulsive disorder have a disruption in their ability to achieve that implicit, felt sense and are thus compelled to repeat the behaviour. Consistent with this, Woody et al. (2005) found that people who were unable to achieve a sense of satisfaction during washing indeed washed longer.

O'Connor and Robillard (1995) and O'Connor (2002) asserted that obsessions are the product of *inverse inference*, or, the hypothesis that a feared event has happened or will happen despite evidence to the contrary (“even though that table looks clean I expect that it is dirty”; guilty until proven innocent). Since the feared event is wholly imaginary there is very little objective

evidence in the environment that the individual can use to disconfirm the conviction, and existing evidence is discounted on the basis that if the person were to probe more deeply evidence confirming the conviction would be found (e.g., “If I had a microscope, I’m sure I would find dirt on this table”). This results in repeated attempts to redress the concern (i.e., compulsion), which persists until the individual achieves an adequate sense of certainty that the ritual is no longer necessary (e.g., there is no longer a chance of harm).

Wahl, Salkovskis, and Cotter (2008) interviewed people with and without OCD about the criteria they used to terminate a washing behaviour and also observed their washing behaviour in a laboratory setting. People with OCD reported using more criteria overall to make the decision to terminate than did those without OCD. Furthermore, those with washing compulsions used subjective criteria more frequently and tended to weight those criteria more heavily than others when making the decision to stop. Coughle, Goetz, Fitch, and Hawkins (2011) assessed not-just-right experiences in a sample of healthy controls and had them undergo a washing challenge in which they dirtied their hands and were allowed to wash. Self-reported frequency and intensity of not-just-right experiences was positively correlated with greater washing time. These findings are consistent with the idea that stop rules for compulsions reference internal sensations. However, Wahl et al. (2008) noted that people with OCD relied on external criteria as well as internal criteria and that decision making was quite conscious and effortful, as opposed to implicit and automatic. Thus both trait (e.g., negative beliefs about obsessions, inferential confusion, memory confidence) and, as per Rachman (2002), situational factors (amount of distress the obsession gives rise to, perceived threat in the moment, need for certainty that the compulsion will be done properly before enacting it) may influence compulsions.

If we are going to apply lab-based research on repetition to understanding and treating OCD we need to know whether people tend to repeat their compulsions frequently enough for the insidious effects to emerge and whether repetition does, indeed, foster doubt. There is little phenomenological data on compulsions. Zor et al. (2009) found that compulsions were characterized by the performance of behaviours irrelevant to the task and with frequent repetitions of both relevant and irrelevant behaviours. However, there was no investigation of the impact of repetition on emotional, cognitive and behavioural aspects of the compulsion. At this time, then, we know very little about compulsion parameters, such as the average number of repetitions within and across episodes and the frequency with which the goal of the compulsion is achieved. Furthermore, research on the influence of memory confidence on compulsions has been largely lab-based and so we lack phenomenological data on the impact of *in vivo* repetition on memory.

The current study offers a preliminary examination of the phenomenology of compulsions and explores whether the factors identified in the persistence of compulsions are observed in an *in vivo* setting. Individuals with a principal diagnosis of OCD completed self-report measures of inferential confusion, memory and cognitive confidence and negative beliefs about obsessions. They then used a structured diary to report on compulsive episodes three times a day for three days. The diary asked about basic parameters of the compulsion (length, number of repetitions), events prior to compulsions (distress, level of harm and danger, need for certainty that the compulsion will be done properly), events during the compulsion (erosion of memory, sensory and cognitive confidence, increases and decreases in certainty that the compulsion is meeting its goal), termination criteria, and relief afforded by the compulsion.

Our first goal was to obtain phenomenological data on the basic parameters of compulsions such as their length, the number of repetitions within an episode, reasons for terminating, and how often compulsions achieved their goal of having averted the feared or aversive event. Our second goal was to examine how trait factors such as inferential confusion, memory and cognitive confidence, and negative beliefs about obsessions were associated with the persistence of compulsions. According to leading models, all three trait factors should be associated with factors that evoke compulsions, including distress associated with the obsession, threat overestimation and need to achieve certainty that the compulsion will be done properly. These trait factors should also be associated with the extent to which individuals' compulsive episodes achieved their goal of successfully averting aversive consequences; i.e., compulsive episodes that are terminated because the individual feels certain that it is okay to stop.

Our third goal was to compare compulsive episodes that were terminated because the sense of certainty that it was “okay”, or “safe” to stop was achieved with those that were terminated for other reasons. Based on leading cognitive models of OCD we expected that stronger negative beliefs about obsessions, greater inferential confusion and poorer memory and cognitive confidence would be associated with fewer episodes in which certainty is obtained. Based on laboratory research we also expected that overall sensory and cognitive doubt would be associated with fewer episodes in which a sense of certainty was achieved. In turn, we expected that episodes in which certainty was achieved would be associated with fewer repetitions and less sensory and cognitive doubt reported *in vivo*.

## 2. Methods

### 2.1. Participants

Participants were people with a principal diagnosis of OCD who had been recruited for an unrelated study through the Anxiety Studies Division (ASD) of the University of Waterloo Centre for Mental Health Research participant pool. The ASD recruits people with and without anxiety disorders from the Region of Waterloo community to participate in research on anxiety. To establish diagnostic status each member of the research participant pool is administered the MINI International Neuropsychiatric Interview (Sheehan et al., 1998). The MINI is administered in person by senior graduate students in the University of Waterloo PhD programme in Clinical Psychology under the supervision of the ASD co-Directors, one of whom is the second author. All participants ( $N = 30$ ) in the unrelated study were invited to participate in the current study and 29 consented. Of those, five (17%) did not return their diary. There were no differences in symptom severity or demographics between those who agreed to complete the diary and those who did not. The diary of one participant was excluded because the entries did not concern compulsive episodes relevant to obsessions and compulsions. Of those 23 participants one completed only two entries and was excluded from further analyses.

The final sample comprised 22 participants (13 females) ranging in age from 18 to 65 with a mean age of 33.11 years ( $SD = 14.01$ ) who were predominantly Caucasian and the majority of whom had at least some post-secondary education. The mean score of the sample on the Vancouver Obsessive Compulsive Inventory was 107.47 ( $SD = 38.40$ ) which is about .5 standard deviations above the mean level of symptoms reported by the clinical sample on which the measure was validated (Thordarson et al., 2004). Two participants had a co-principal diagnosis of either social anxiety disorder or major depressive disorder and 19 (86%) had a co-morbid diagnosis of social anxiety disorder ( $n = 11$ , 50%), generalized anxiety

disorder ( $n = 4$ , 22%), panic disorder ( $n = 2$ , 9%) or anxiety disorder not otherwise specified ( $n = 1$ ). Six participants reported that they were taking medication for their anxiety, including citalopram ( $n = 3$ ), venlafaxine ( $n = 1$ ), bupropion hydrochloride ( $n = 1$ ) and “anxiety medication” ( $n = 1$ ). Those taking medication had had no changes in dose or type in the 6 weeks prior to the first day of the study and for its three-day duration. Upon return of the diary participants received a \$30.00 remuneration in appreciation of their time.

### 2.2. Measures

#### 2.2.1. The Mini-International Neuropsychiatric Interview

The Mini-International Neuropsychiatric Interview (MINI; Sheehan et al., 1998) is a structured clinical interview for the major axis I disorders in the DSM-IV. The MINI has psychometric properties similar to lengthier structured interviews such as the Structured Clinical Interview for DSM-IV (Lecrubier et al., 1997; Sheehan et al., 1998).

#### 2.2.2. Repeated Actions Diary

The Repeated Actions Diary was designed for use in the current study and was based on the diary developed by Purdon, Rowa, and Antony (2005) to examine instances of thought suppression. Participants reported on one episode of a compulsive episode each morning, afternoon and evening for three consecutive days ( $N = 9$  entries), noting the time at which the episode took place, the time at which the entry was made and verbatim descriptions of the compulsive act and the obsession which evoked it. Participants then reported on their experience of the obsession prior to conducting the compulsion, rating how distressing the obsession evoking the compulsion was, how awful they believed the consequences of not performing the compulsion *at all* would be, how awful the consequences of not performing it *properly* would be and how certain they needed to be that the compulsion would be done properly heading into it. They then reported on how long the episode lasted and how often it was repeated within the episode.

Next, participants rated how much general relief the compulsion resulted in and how much relief from guilt, responsibility and distress the compulsion afforded specifically, using 7-point Likert scales (no relief/reduction at all to total and complete relief/reduction); these items are summed to form an aggregate variable labelled “Relief”. If the compulsion was repeated participants used 7-point Likert scales (strongly disagree to strongly agree) to report on the impact of its repetition on: a) how long the episode took; b) the amount of detail they needed to attend to and the amount evidence they required in order to establish it had been done properly (summed to form an aggregate variable labelled “Evidence Requirements”); c) their confidence in their sensory perception, memory and attention (creating an aggregate variable labelled “Sensory and Cognitive Doubt”) and, d) the extent to which their sense of certainty that the compulsion had been done properly increased or decreased (“Certainty”). Items in the Sensory and Cognitive Doubt and Certainty aggregate variables included ratings of the extent to which repetitions were associated with an increase in doubt/certainty across repetitions and with a decrease in doubt/certainty; the former are reverse coded.

Finally, participants reported on why the episode was terminated, rank ordering a list of nine reasons which included: felt certain it was okay to stop, felt certain enough that it was okay to stop, got the “right” feeling, had to stop because there was something else I had to do instead, was too tired to continue, was interrupted by someone or something, knew in my head it was okay to stop even if I didn't feel it, someone else reassured me that

it was okay to stop, and other (fill in the blank). These response options were based on Wahl et al. (2008) and from clinical anecdotal experience of the two authors.

### 2.2.3. Inferential Confusion Questionnaire (ICQ)

The ICQ (Aardema, O'Connor, Emmelkamp, Todorov, & Marchand, 2005) is a 15-item questionnaire assessing tendency to hypothesize that danger is present (inferential confusion) and a distrust of the senses. Items are rated on a five-point scale from 1 (strongly disagree) to 5 (strongly agree). The ICQ has good reliability and validity in non-clinical and clinical populations, is related to treatment outcome and has discriminant validity with measures of general distress. This measure was included to determine what aspects of compulsions are associated with inferential confusion.

### 2.2.4. Memory and Cognitive Confidence Scale (MACCS; Nedeljkovic & Kyrios, 2007)

This measure assesses beliefs about memory and related processes, such as confidence in decision-making abilities, concentration and attention using 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (agree very much). The MACCS has good internal consistency and adequate validity in initial investigations. This measure was included to assess which aspects of compulsions are associated with overall confidence in cognitive abilities.

### 2.2.5. Obsessive Belief Questionnaire (OBQ-44; Obsessive Compulsive Cognitions Working Group (OCCWG), 2005)

This is a 44 item self-report scale that measures belief domains linked to OCD. Participants indicate how much each statement reflects them using a 7-point scale, from 1 (disagree very much) to 7 (agree very much). Factor analysis has revealed a three-factor structure of this measure: (1) Responsibility/Overestimation of Threat, (2) Tolerance for Uncertainty/Perfectionism, and (3) Importance of Thoughts/Control of Thoughts which have good internal consistency and the overall scale has shown good criterion-related validity in non-clinical and clinical samples. This measure was included to assess which aspects of compulsions are associated with negative beliefs about the meaning of obsessional thoughts.

### 2.2.6. Vancouver Obsessional Compulsive Inventory (VOCI; Thordarson et al., 2004)

This 55-item self-report measure assesses OCD symptom severity and composes six subscales: contamination, checking, obsessions, hoarding, just right, indecisiveness. Participants use a 5-point Likert scale to indicate the extent to which each of the 55 statements is true of them. The VOCI has good internal consistency, adequate test-retest reliability, as well as acceptable convergent and divergent validity in a student sample.

## 2.3. Procedure

Participants completed a study unrelated to the diary study, in the context of which they completed a self-report questionnaire packet which included the measures described above. After completion of the unrelated study participants were invited to participate in the diary study. If they agreed information/consent was obtained and the diary was reviewed in detail with the first author (BB). A definition of obsessions and compulsions was provided and participants identified one or two examples of each that they had experienced frequently within the past week which they then recorded on the front page of the diary. Participants were asked to report on the occurrences of these "target" compulsions over the following three days. Each question in the diary was then

reviewed and clarified. The researcher emphasized the importance of completing the diary entries as soon as possible after the episode. The diary also provided the researcher's contact information and participants were invited to call if there were any questions or concerns. An appointment was scheduled for four to seven days later at which they would return the diary and receive remuneration.

## 3. Results

Prior to conducting analyses data were checked for univariate outliers and adjusted such that the outlying case was given a value one unit above the second-highest value in the distribution. Analyses in which this occurred are noted. Average single and aggregate variables (see description of the Repeated Actions Diary above) were created by summing them across diary entries and dividing by the number of total entries. One participant completed 8 entries and the rest completed 9 entries.

### 3.1. Nature and parameters of compulsive episodes

The average latency between the time compulsive episodes occurred and the time they were entered in the diary was 129.9 min ( $SD = 130$ ). Out of 183 episodes in total, 113 (62%) were checking compulsions, 42 (23%) were washing compulsions, 21 (12%) were ordering/arranging compulsions (of which 19 were motivated by harm avoidance concerns) and 7 were symmetry/exactness compulsions (2%). Participants reported on generally the same type of compulsion across episodes (76% same type,  $SD = 21$ , range 33–100%). The average length of each compulsive episode was 34.36 min ( $SD = 30.96$ ; range 2.78–125.83). The average number of repetitions was 6.08 ( $SD = 4.09$ ; range 0–14.)

### 3.2. Correlations between trait measures and response to obsessions

Zero-order correlations between the self-report measures of the VOCI, OBQ scales, the MACCS and the ICQ with the variables assessing response to the obsession prior to the compulsion are presented in Table 1. As expected, higher scores on the VOCI and the ICQ were significantly associated with greater discomfort over the obsession. The ICQ also had a positive correlation with perceived severity of the consequences of not performing the compulsion and a marginally significant positive correlation ( $p < .06$ ) with need for certainty that the compulsion would be done properly, as did the MACCS. Contrary to expectations, the OBQ was not significantly correlated with distress over the obsession,

**Table 1**

Zero-order correlations between self-report measures and response to obsession.

|             | Distress over obsession | Severity of consequences of not doing the compulsion | Need for certainty that compulsion is done properly |
|-------------|-------------------------|--|---|
| VOCI        | .53**                   | .21  | .31   |
| OBQ-Resp    | .35                     | .34  | .28   |
| OBQ-Perfect | .22                     | .19  | .33   |
| OBQ-ImpTh   | .17                     | .12  | .22   |
| MACCS       | .33                     | .05  | .42*  |
| ICQ         | .72***                  | .53**  | .42*  |

Note: \* $p < .06$ , \*\* $p < .02$ , \*\*\* $p < .001$ ;  $n$ 's vary from 19 to 21.

VOCI = Vancouver Obsessive-Compulsive Inventory; OBQ-Resp = Obsessive Beliefs Questionnaire Responsibility scale; OBQ-Perfect = OBQ Perfectionism scale; OBQ-ImpTh = OBQ Importance of thoughts scale; MACCS = Memory and Cognitive Confidence Scale; ICQ = Inferential Confusion Scale.

consequences of not doing the compulsion properly nor need for certainty.

### 3.3. “Certain” and “uncertain” compulsive episodes

“Certain” episodes were identified as those in which the top three ranked reasons for termination were “felt perfectly certain it had been done properly”, “felt certain enough that it had been done properly” or “got the ‘right’ feeling”. “Uncertain” episodes were identified as those in which the top three ranked reasons for termination were one of the other listed reasons for terminating. The percentage of “Certain” episodes ranged from 0 ( $n = 1$ ; 4.8% of the sample) to 100 ( $n = 1$ ) with a mean of 53% ( $SD = 29$ ).

#### 3.3.1. Factors associated with percentage of certain compulsions

Zero-order correlations between the self-report measures and percentage of Certain episodes are presented in Table 2. As expected, higher VOICI and OBQ Responsibility and Perfectionism scores were significantly associated with fewer episodes in which certainty was achieved, although OBQ Importance of Thoughts was not. Higher MACCS scores were marginally associated with fewer Certain episodes ( $p < .06$ ).

#### 3.3.2. Certain vs. uncertain episodes

Paired sample  $t$ -tests were conducted to compare Certain and Uncertain episodes on: their parameters, response to the obsession yielding the compulsion, impact of repetition of the compulsion on Sensory and Cognitive Doubt, Evidence Requirements, Certainty and perceived length, and the extent to which the compulsive episode resolved feelings of responsibility and discomfort. Averages were created by summing variables across Certain and Uncertain episodes and dividing by the number of total episodes of each, respectively. Thus, if a participant reported that the day 1 morning, day 3 afternoon and day 3 evening episodes were terminated because certainty or the “right” feeling was achieved, the average length of Certain episodes would be calculated by summing the length for those particular three episodes and dividing by three.

Results are presented in Table 3. The  $n$ 's for these analyses vary due to missing data, because one participant had only Certain episodes and one had only Uncertain episodes, and one did not report termination criteria. Furthermore, items on impact of repetitions were only completed if repetitions occurred. Prior to conducting the  $t$ -tests the average episode length of one case and the average number of repetitions of another were adjusted because they were more than three standard deviations above the mean.

Contrary to hypotheses, there were no significant differences across episode type in distress evoked by the obsession or in the need to achieve certainty that the compulsive act would be done

**Table 2**

Zero-order correlations between self-report measures and number of certain compulsive episodes.

|             | Percentage of compulsive episodes in which certainty was achieved |
|-------------|---|
| VOICI       | -.65***   |
| OBQ-Resp    | -.51**  |
| OBQ-Perfect | -.51**  |
| OBQ-ImpTh   | -.17  |
| MACCS       | -.43*   |
| ICQ         | -.36  |

Note: \* $p < .06$ , \*\* $p < .02$ , \*\*\* $p < .003$ ;  $n$ 's vary from 18 to 20.

VOICI = Vancouver Obsessive–Compulsive Inventory; OBQ-Resp = Obsessive Beliefs Questionnaire Responsibility scale; OBQ-Perfect = OBQ Perfectionism scale; OBQ-ImpTh = OBQ Importance of thoughts scale; MACCS = Memory and Cognitive Confidence Scale; ICQ = Inferential Confusion Scale.

**Table 3**

Paired-sample  $t$ -tests comparing uncertain and certain episodes.

|                                       | Uncertain |       | Certain |       | $t$      |
|---------------------------------------|-----------|-------|---------|-------|----------|
|                                       | $M$       | $SD$  | $M$     | $SD$  |          |
| <b>Events prior to the compulsion</b> |           |       |         |       |          |
| Distress from the obsession           | 10.64     | 1.92  | 10.14   | 2.02  | 1.07     |
| Need for certainty                    | 5.71      | 1.44  | 5.71    | .94   | 0        |
| <b>Compulsive episode parameters</b>  |           |       |         |       |          |
| Length in minutes                     | 33.56     | 24.42 | 24.20   | 27.07 | 1.42     |
| Number of repetitions                 | 7.29      | 4.47  | 4.49    | 4.20  | 2.37**   |
| <b>Impact of repetitions on ...</b>   |           |       |         |       |          |
| Sensory/cognitive doubt               | 20.75     | 5.44  | 15.55   | 5.21  | 3.40***  |
| Certainty                             | 10.55     | 2.61  | 8.63    | 3.21  | 2.45**   |
| Evidence requirements                 | 8.19      | 2.51  | 6.64    | 2.33  | 2.08*    |
| Perceived length of episode           | 4.63      | 1.04  | 3.56    | 1.45  | 2.50**   |
| <b>After the compulsive episode</b>   |           |       |         |       |          |
| Relief                                | 16.68     | 3.53  | 20.31   | 4.02  | -5.48*** |

$n$ 's Vary from 15 to 17; \* $p < .056$ , \*\* $p < .03$  \*\*\* $p < .001$ .

properly prior to commencing the compulsion. There was also no significant difference in the length of compulsive episodes. However, consistent with hypotheses, the average number of repetitions in the Uncertain episodes was significantly higher than that in the Certain episodes. Furthermore, Uncertain episodes were associated with significantly greater Sensory and Cognitive Doubt, perceived length of the compulsion, significantly less Certainty and, marginally, greater Evidence Requirements ( $p < .056$ ). Finally, Uncertain episodes were associated with significantly less relief.

## 4. Discussion

The first goal of this study was to obtain basic parameters on compulsive episodes. Compulsive episodes were time-consuming, taking an average of 34 min and requiring an average of six repetitions per episode. Laboratory studies have found that repetition has an insidious effect in as few as five repetitions (e.g., Coles et al., 2006) so the data suggest that *in vivo*, compulsions are indeed repeated often enough to produce a decline in memory, sensory and cognitive confidence. We also found that over half of participants' compulsive episodes resulted in a sense of certainty or in the “right” feeling; that is, compulsions “work” half the time. Thus, compulsions produce a reinforcement schedule that is exceptionally difficult to extinguish.

Our second goal was to examine the extent to which specific trait factors are associated with response to the obsession, perceived harm and need for certainty heading into the compulsion. Inferential confusion was associated with distress over the obsession, severity of consequences of not performing the compulsion properly and need for certainty heading into the compulsion. Overall memory and cognitive confidence was associated with need for certainty that the compulsion is done properly. This lends support to O'Connor's (2002) idea that obsessions are a state of mind in which inferences of harm and danger are made in the absence of evidence. The data also support the laboratory finding that poorer overall memory and cognitive confidence is associated with a greater need for certainty that a compulsion is done properly. It may be the case that when the obsession occurs, poor confidence in memory/cognitive abilities and the tendency to assume danger is present until proven otherwise causes it to capture attention, lends it credibility and evokes the compulsion.

Contrary to hypotheses, and, in fact, quite surprisingly, negative beliefs about obsessions were not significantly associated with response to the obsession. This finding may best be understood

within the context of our findings from comparing Certain and Uncertain episodes. The Responsibility and Perfectionism scales of the OBQ (although not the Importance of Thoughts scale) were negatively correlated with proportion of Certain episodes; that is, more negative beliefs about obsessions were associated with fewer Certain episodes. However, as noted, negative beliefs about obsessions did not predict distress over obsessions, and distress over obsessions did not differ across Certain and Uncertain episodes. Negative beliefs about obsessions, then, appeared to be associated with events that occurred during, rather than before, the compulsion, which is at odds with leading cognitive models. It is possible that these findings are simply artefacts of the structured diary in which participants reported on their response to the obsession after the compulsive episode was over. Another possibility, though, is that situational distress over the obsession is informed primarily by contextual factors, such as mood state and external pressures, but once the compulsion is underway beliefs about the obsession influence investment in doing the compulsion properly and *ensuring* that it is done properly.

Poorer memory and cognitive confidence was associated with a greater proportion of Uncertain episodes. Uncertain episodes were also characterized by a greater number of repetitions and greater self-reported impact of repetitions on perceived length of the compulsive episode, sensory and cognitive doubt, evidence requirements and overall certainty that the compulsion had been done properly. Together these findings offer support for [Rachman's \(2002\)](#) model of compulsive checking. Given that 38% of the compulsive episodes reported on did not involve checking compulsions it may be the case that repetition has the same impact on other types of actions as well, which is consistent with [Fowle and Boschen \(2011\)](#).

We found that evidence requirements increased across repetitions to a greater extent in Uncertain episodes, which is consistent with [Wahl et al.'s \(2008\)](#) observation that people with OCD require more evidence to determine whether or not to terminate the compulsion. The finding is also consistent with [Boyer and Liénard's \(2006\)](#) suggestion that as a behaviour is repeated, behavioural parsing takes place such that it is broken down into ever smaller elements, each of which must be conducted properly before the act as a whole can be considered to have been done properly. This would introduce a considerable tax on working memory, leading to poorer memory which could readily undermine memory confidence. This could also explain the finding that in Uncertain episodes repetition was more strongly associated with perceived increased length of the episode even though Certain and Uncertain episodes did not differ in actual length; the more steps an action has the longer it may feel that it takes. It was interesting to note, though, that the average number of repetitions in Certain episodes was still four. Is there a critical threshold over which repetition has its effect, or are their other situational and contextual factors that influence feelings of uncertainty – for example, mood state – that influence whether or not the sense of certainty is achieved? These are empirical questions that will be important to address in future studies.

The current study was based on a relatively small sample of participants with OCD who reported retrospectively on their compulsive episodes. The average time between the episode and the diary report was 2 h so data may have been influenced by mood state following the episode and by intervening events. Participants were also required to report on one episode every morning, afternoon and evening but they may not always have experienced a meaningful episode during that time. Finally, checking compulsions were over-represented in the current sample so it is not possible to determine the extent to which the findings are representative of other types of compulsions. A superior design would involve a large

enough sample of participants that comparisons across different types of compulsions, performed *in vivo*, could be made. However, given the lacunae in phenomenological data these data contribute modestly to our understanding of the nature of compulsions and provide some validation of laboratory findings.

One clinical implication of these data is that as per [Radomsky et al. \(2010\)](#) we should include psycho-education about compulsions and their persistence as part of treatment. When people with OCD are unable to resist doing a compulsion they view themselves as weak-willed and yet in fact these data are telling us that: a) compulsions actually “work” over half of the time in achieving a sense of certainty; and b) when that sense of certainty is not achieved repetition of the compulsion erodes confidence, which likely yields the urge to repeat. Thus, compulsions are, well, compelling. Given that negative beliefs about obsessions were associated with the percentage of Certain episodes it may be especially important to assess beliefs that occur within the context of performance of the compulsive episode and focus restructuring on acquiring new meaning about the necessity of conducting the compulsion perfectly and/or getting the “right” feeling.

A further implication is that, as per [Tolin et al. \(2003\)](#) exposure to uncertainty may be a key element of successful treatment. Rather than prohibiting compulsions entirely, there may be considerable merit in having people conduct the compulsion once (although not excessively) and then stop, which would allow for extinction of the feelings that *failing to have achieved perfect certainty* evokes. This may be an easier sell as it allows people to enact a safety behaviour that is consistent with important values and goals (e.g., protecting the family, being conscientious) but with the potential for them to learn that once is, in fact, enough. This might help people recalibrate both their internal, felt sense that danger has passed and their perspective on responsibility, such that they may begin to recognize that conducting a safety act once fully discharges one's responsibility. Finally, by enacting the compulsion once without catastrophic effects people may begin to rebuild confidence in their competence and in memory, sensory and cognitive skills. Given that ritual is a very normal behaviour (e.g., [Boyer & Liénard, 2006](#)) perhaps people with OCD can be given permission to engage in it within reasonable parameters.

In sum, we found that general memory and cognitive confidence was associated with the frequency with which compulsive episodes yielded a sense of certainty or the “right” feeling. Compulsive episodes which did not yield a sense of certainty or the “right” feeling were associated with greater repetitions, poorer *in vivo* confidence in memory and cognitive and sensory processes, an increase in the amount of evidence required to make the decision to terminate and less relief. These findings are consistent with leading models of compulsive checking and with laboratory findings. What remains unclear is, first, why, negative beliefs about obsessions were more strongly associated with aspects of compulsions than with distress over obsessions, and, second, why, despite repetition, over half of the time compulsions yielded a sense of certainty or the “right” feeling. Further investigation is needed to understand how and under what circumstances the insidious cycle of repetition and doubt is broken. Future studies might want to consider factors such as mood state, intolerance of uncertainty, behavioural parsing, and degree of reliance on internal, felt sensations to guide the decision to terminate. Until we have a better understanding of why compulsions persist we remain disadvantaged in our efforts to treat them.

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