Running Head: AN EXPERIMENTAL INVESTIGATION OF FACTORS INVOLVED IN EXCESSIVE REASSURANCE SEEKING

An Experimental Investigation of Factors Involved in Excessive Reassurance Seeking: The Effects of Perceived Threat, Responsibility and Ambiguity on Compulsive Urges and Anxiety

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Abstract

Excessive reassurance seeking is a common problem among individuals diagnosed with Obsessive-Compulsive Disorder (OCD). Given the proposed functional similarities between OCD-related reassurance seeking and compulsive checking (Rachman, 2002), it was hypothesized that some of the factors contributing to the onset and maintenance of episodes of these two behaviours might be shared, whereas other factors (e.g., ambiguity of feedback) may play a unique role in the persistence of reassurance seeking. The current experiment examined how manipulations of threat, responsibility, and ambiguity of feedback impacted upon non-clinical participants' (N = 176) anxiety and compulsive urges (to seek reassurance and to check) in a series of experimental vignettes. Consistent with hypotheses, higher levels of perceived threat, responsibility and ambiguity of feedback were associated with higher anxiety and compulsive urges. Results are discussed in terms of cognitive-behavioural models of, and treatments for OCD.

KEYWORDS: OCD; Responsibility; Threat; Ambiguity; Reassurance seeking; Checking

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Introduction

Excessive reassurance seeking (ERS) has been reported to be a hallmark feature of Obsessive-Compulsive Disorder (OCD) by several researchers (e.g., Clark, 2004; Morillo, Belloch & Garcia-Soriano, 2007; Rachman & Hodgson, 1980; Salkovskis, 1985, 1999; Steketee, 1993; Tolin, 2001). In the context of OCD, reassurance seeking can be defined as the repeated solicitation of safety-related information from others about a threatening object, situation or interpersonal characteristic, despite having already received this information. As with other potentially maladaptive behaviour, reassurance seeking becomes excessive when it leads to significant distress and/or interference in an individual's life. Individuals with OCD commonly report seeking reassurance about the completion and/or accuracy of anxiety-provoking tasks (e.g., "Did you see me lock the door?"; "Are you certain that you turned the stove off completely?"), decision-making (e.g., "Are you sure I won't regret buying this item?"), the meaning of their obsessions (e.g., "Does having these thoughts mean that I am going crazy?"), and the potential for contamination (e.g., "Has this hospital room been sterilized?"), among other concerns. The following statement made by an individual with OCD provides a clear illustration of this process:

> It started 3 years ago when we were running late for lunch with friends. I didn't have time to check everything as I usually do; I could only check each thing once. I asked my boyfriend if the stove was off, and he said "yeah", but I didn't trust his answer completely. Through the rest of the evening, I kept asking and he kept saying "don't worry; it's probably fine". Now, I won't let him get away with that anymore. Now, whenever I ask, he has to say, "I saw it; I heard it; I know it; and I promise".

This example clearly highlights the highly ritualized and compulsive form that OCD-driven reassurance seeking can take, such that reassurance may not be 'accepted' unless it is provided a certain way or a certain number of times. This also suggests that reassurance seeking is not motivated by the desire to solicit *novel* information. Importantly, these repeated pleas for assurance can place considerable strain on interpersonal and romantic relationships, as friends and significant others may become irritated with the unrelenting requests for reassurance (Rachman & Hodgson, 1980; de Silva & Rachman, 2009; see also Benazon, 2000; Coyne, 1976; Joiner, Alfano & Metalsky, 1992; Joiner & Metalsky, 2001; Prinstein, Borelli, Cheah, Simon, & Aikins, 2005). Therefore, family members may be more likely to provide feedback which is perceived to be ambiguous or insincere, which might *increase* the recipient's anxiety and urges to seek further reassurance within a given episode, thereby creating a vicious cycle (*cf.* Coyne, 1976). At the same time, the occasional provision of assuring and believable feedback is likely to (temporarily) decrease anxiety, and thus, to maintain reassurance seeking behaviour over the long term via negative reinforcement. Additionally, as with other maladaptive anxiety control strategies (Parrish, Radomsky & Dugas, 2008), ERS may serve to maintain catastrophic beliefs by preventing their disconfirmation. Thus, studies aimed at better understanding this maladaptive behaviour are clearly warranted.

Prior research on ERS has primarily focused on its potential consequences in the contexts of depression (e.g., Benazon, 2000; Joiner et al., 1992; Joiner & Metalsky, 2001; Joiner, Metalsky, Katz & Beach, 1999; Prinstein et al., 2005; Starr & Davila, 2008) and health anxiety/Hypochondriasis (e.g., Abramowitz & Moore, 2007; Hadjistavropoulos, Craig, & Hadjistavropoulos, 1998; Haenen, de Jong, Schmidt, Stevens & Visser, 2000; Salkovskis & Warwick, 1986). Despite its temporary anxiolytic effects (Abramowitz & Moore, 2007; Salkovskis & Warwick, 1986), ERS has been found to breed further reassurance seeking

behaviour and to contribute to interpersonal rejection, as well as increase one's vulnerability to depressive symptoms (Benazon, 2000; Joiner et al., 1992, 1999; Joiner & Metalsky, 2001; Prinstein et al., 2005). Anecdotal evidence suggests that similar problems may arise from OCD-related ERS (e.g., Clark, 2004; Rachman, 2002; Salkovskis, 1985), yet there is a paucity of research in this area, and much remains to be discovered about the mechanisms that underlie this problematic behaviour.

Rachman (2002) proposes that individuals with OCD may engage in ERS as a means of checking "by proxy", and that both checking and reassurance seeking can be conceptualized as "attempts to reduce the probability of a nasty event occurring or to reduce the effects of such an event" (p. 629). He also noted that both of these acts serve to (temporarily) decrease perceived responsibility for preventing harm, thus implying shared functions of these two compulsions. Given these proposed functional similarities, one might predict that factors involved in the onset and maintenance of compulsive checking episodes may also serve to perpetuate ERS.

For example, cognitive-behavioural theories of compulsive behaviour (e.g., Rachman, 2002; Salkovskis, 1985, 1989) posit that exaggerated threat appraisals (e.g., over-predictions of the likelihood and seriousness of potential threats), in conjunction with maladaptive responsibility beliefs, lead to heightened levels of anxiety and urges to check. Notably, Rachman (2002) has postulated that *repeated* checking will only occur if increases in perceived threat are accompanied by an inflated sense of responsibility, defined as "the belief that one possesses pivotal power to provoke or prevent subjectively crucial negative outcomes" (Salkovskis, Rachman, Ladouceur, & Freeston, 1992). Rachman has also suggested that repeated checking within a given episode results in paradoxical (further) increases in perceived threat and responsibility, as well as decreased confidence in memory for previous checks (see also Hout & Kindt, 2003a, 2003b; Radomsky, Gilchrist & Dussault, 2006; Tolin et al., 2001). Therefore,

compulsive checking is purported to activate a "self-perpetuating mechanism" (Rachman, 2002, p.629), in which each successive check leads to ever-increasing anxiety and urges to check (again). In line with these theories, a number of investigations have demonstrated that higher levels of perceived responsibility/threat are associated with greater checking behaviour and/or urges to check (e.g., Arntz, Voncken, & Goosen, 2007; Foa, Sacks, Tolin, Prezworski, & Amir, 2002; Ladouceur et al., 1995; Lopatka & Rachman, 1995; Parrish & Radomsky, 2006; Shafran, 1997). Thus, it is reasonable to suspect that cognitive biases involving exaggerated perceptions of threat and responsibility may also play an important role in triggering and/or maintaining reassurance seeking behaviour in OCD.

Although the primary factors responsible for the *onset* of compulsive checking and reassurance seeking episodes (e.g., increases in perceived threat and responsibility) may be similar, at least some of the mechanisms by which these behaviours are *maintained* within an episode may differ. For example, Rachman's (2002) model of compulsive checking asserts that decreased memory confidence is a key element of the "self-perpetuating mechanism" described above, and subsequent research has supported the hypothesis that repeated checking leads to increased doubt regarding the accuracy/effectiveness of previous checks and greater urges to re-check (e.g., Coles, Radomsky, & Horng, 2006; Hout & Kindt, 2003a, 2003b, 2004; Radomsky, Gilchrist, & Dussault, 2006). However, meta-memory declines seem less likely to play a major role in the maintenance of ERS. Although OCD sufferers may solicit reassurance habitually, repeating this behaviour should not distort their memories regarding the prior performance of actions (i.e., repeatedly asking whether one has properly turned off the stove should not affect the vividness or detail, and thus confidence, of one's memory for the physical act of turning it off).

The inherent differences between compulsive checking and reassurance seeking imply further possible distinctions between factors that are likely to maintain these two compulsions.

For example, reassurance seeking is an interactive process that involves the solicitation of feedback from other people, whereas compulsive checking is often performed in isolation (Rachman, 1976, 2002). Thus, interpersonal aspects of feedback provision are likely to play a key role in the maintenance of reassurance seeking, whereas their influence on checking behaviour may be less relevant, direct and/or powerful. For example, the manner in which feedback is communicated to those seeking assurance may directly influence subsequent reassurance seeking behaviour. Feedback which is perceived as ambiguous or uncertain (e.g., due to omission of important information, use of vague or unclear language, hesitant tone of voice, etc.) may ultimately exacerbate this behaviour in the short and/or long term, particularly if it is not part of a planned treatment strategy (e.g., exposure to uncertainty).

Several converging lines of evidence provide indirect support for this hypothesis, particularly in the context of OCD and other anxiety disorders. First of all, it has been shown that individuals who are clinically anxious (Eysenck, MacLeod, & Mathews, 1987; Eysenck, Mogg, May, Richards, & Mathews, 1991), as well as those who are highly intolerant of uncertainty (Dugas et al., 2005), are more likely to interpret ambiguous information as threatening than healthy controls and individuals who are more tolerant of uncertainty, respectively. Secondly, an increasing number of studies have found that intolerance of uncertainty (IU) plays a central role in OCD, particularly among individuals with checking compulsions (e.g., Holaway, Heimberg, & Coles, 2006; Obsessive Compulsive Cognitions Working Group [OCCWG], 2005; Steketee, Frost, & Cohen, 1998; Tolin, Abramowitz, Brigidi, & Foa, 2003; however, see Norton, Sexton, Walker, & Norton, 2005; Sexton, Norton, Walker, & Norton, 2003, for contrasting results); in turn, IU leads to increased information-seeking in response to ambiguity (Ladouceur, Talbot, & Dugas, 1997). Lastly, recent evidence suggests that first-time mothers with high state and trait anxiety are more likely than less anxious mothers to exhibit a threat bias when interpreting

ambiguous information, and to want to seek reassurance in response to these perceived threats (Challacombe, Feldmann, Lehtonen, Craske, & Stein, 2007). Taken together, these findings suggest that individuals with OCD (and perhaps Generalized Anxiety Disorder; see Dugas et al., 2005) may be especially likely to interpret ambiguous stimuli and events (such as unclear feedback) in a threatening manner, and to exhibit ERS in these situations.

In summary, several cognitive factors including biased perceptions of threat, inflated responsibility beliefs, and biased (i.e., threatening) interpretations of ambiguous feedback, may contribute to the onset and maintenance of OCD-related reassurance seeking. The purpose of the current study is to examine how manipulations of perceived threat, responsibility, and ambiguity of feedback in a series of experimental vignettes impact upon participants' anxiety and compulsive urges (to seek reassurance and to check).

Hypotheses

Based on the above, the following hypotheses are proposed: 1) Individuals should report higher levels of anxiety and compulsive urges (to seek reassurance and to check) under conditions of (a) high (*vs.* low) perceived threat and (b) high (*vs.* low) responsibility, and 2) individuals who are provided with ambiguous feedback regarding potentially threatening situations should report subsequent increases in their anxiety, urges to check, and (especially) urges to seek reassurance, compared to those who receive low-ambiguous feedback.

Method

Participants

One hundred seventy-six volunteer undergraduate students from the Psychology Department at Concordia University in Montréal, Canada, participated in this study. Participants' mean age was 22.95 (*SD* = 5.37, range = 17-54) years, and 83.0% of participants were female. Participants were compensated for their time with either course credit or entry in a

draw for a cash prize. Participants' scores on relevant self-report symptom (and other) measures (see below) are displayed in Table 1.

Materials

Experimental vignettes.

In order to examine how manipulations of perceived threat, responsibility and ambiguity of feedback impact upon participants' anxiety and compulsive urges (to seek reassurance/check), a series of five (i.e., three target and two filler) vignettes were developed for this study. Each vignette was comprised of two sections: in the first section, participants imagined themselves in a hypothetical scenario that portrayed a potential threat (e.g., fire, theft, flood, wasted electricity/water, etc.), while the second section provided participants with hypothetical feedback (i.e., reassurance) regarding this potential threat (see Appendix for sample vignette; all vignettes are available from the corresponding author). In each of the target (as opposed to filler) vignettes, threat and responsibility for harm were manipulated within the body of the hypothetical scenario, while the ambiguity level of feedback was manipulated in the second section of the vignette. Thus, we constructed eight versions of each of the three target vignettes (i.e., high *vs.* low threat X high *vs.* low responsibility X high *vs.* low ambiguity of feedback), which resulted in eight participant conditions (each participant was assigned to only one condition). In addition, two filler vignettes were included in the study to reduce demand characteristics. The filler vignettes, which depicted somewhat commonplace scenarios (e.g., deciding which product to buy at the supermarket), were excluded from our analyses, as perceived threat, responsibility, and ambiguity were not manipulated in these vignettes.

For each vignette, participants were asked to provide a series of subjective ratings at two points in time (i.e., Time 1 = pre-feedback, Time 2 = post-feedback) using a 0-100 scale. The first three ratings served as manipulation checks for: (i) perceived threat ("How

threatening/dangerous do you feel this situation would be?"), (ii) perceived responsibility for preventing harm ("How responsible would you feel for making sure that you ___ if you were in this situation?"), and (iii) perceived ambiguity of feedback ("How ambiguous would you feel the feedback from ___ was in this situation?"). The next two ratings (taken at time 1 and 2, respectively) assessed the ease with which participants were able to imagine the hypothetical scenario, and the feedback provided in each vignette, respectively. Finally, the last three ratings served as the main dependent variables: (i) subjective anxiety, (ii) urges to seek reassurance, and (iii) urges to check, in relation to the hypothetical scenario. Urges to seek reassurance were defined as *"the urge to obtain anxiety-reducing information from other individuals about something you are concerned about"*; while urges to check were defined as *"the urge to check something related to your concern(s) yourself"*. For the purpose of statistical analyses, participants' mean ratings (across the three target vignettes) were calculated for each dependent variable at both time 1 and time 2.

Obsessive Beliefs Questionnaire – 44 (OBQ-44; OCCWG, 2005).

This 44-item questionnaire measures respondents' level of agreement with a number of maladaptive OCD-related beliefs. Items are rated on a scale of 1-7, with higher ratings indicating greater agreement with each belief. The OBQ includes 3 subscales that represent separate cognitive constructs hypothesized to be highly relevant to OCD: 1) responsibility and threat estimation (15 items), 2) perfectionism and intolerance for uncertainty (17 items), and 3) importance / control of thoughts (12 items). This scale possesses excellent internal consistency among individuals with OCD (Cronbach's $\alpha = .95$), and comparable reliability was found in a student sample (OCCWG, 2005).

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

This 55-item self-report measure assesses a broad range of OCD symptoms. Respondents rate each item on a scale of 0-4, and higher scores indicate more severe symptoms. The VOCI includes 6 subscales, corresponding to the 6 factors revealed by factor analysis: checking, contamination, obsessions, hoarding, "just right", and indecisiveness. The VOCI possesses good inter-item reliability in student, community, OCD, and clinical control populations (Cronbach's α = .96, .90, .94, and .98 respectively). Test-retest reliability for the VOCI total score is very high in student samples (Pearson's r = .91, $p < 0.001$; Radomsky et al., 2006).

Intolerance of Uncertainty Scale (IUS; Buhr & Dugas, 2002).

This 27-item questionnaire assesses several aspects of intolerance of uncertainty (IU) that are commonly found among individuals suffering with Generalized Anxiety Disorder (GAD). Each item is rated on a 5-point scale, and higher scores indicate greater IU. The IUS has demonstrated excellent internal consistency (α = .94), and good test-retest reliability (r = 0.74) over a five-week period in a student sample (Buhr & Dugas, 2002).

Beck Anxiety Inventory (BAI; Beck, Epstein, Brown & Steer, 1988).

This 21-item self-report measure assesses the severity of respondents' somatic anxiety symptoms during the past week. The BAI is widely used in both research and clinical settings and has been demonstrated to be highly reliable in student populations (Cronbach's α = .91; Borden, Peterson, & Jackson, 1991).

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

This 21-item self-report measure assesses the severity of respondents' depressive symptoms over the course of the previous two weeks. The BDI-II is a widely-used assessment tool, which has been shown to be highly reliable in a large student sample (Cronbach's α = .91; Dozois, Dobson, & Ahnberg, 1998).

Procedure

This study employed a 2 (time) x 2 (threat condition) x 2 (responsibility condition) x 2 (ambiguity condition) mixed design, in which threat, responsibility for harm and ambiguity of feedback were experimentally manipulated. Thus, eight experimental conditions were created, and the dependent variable ratings were collected at two points in time (pre- and post-ambiguity manipulation). In each of the eight randomly-assigned conditions, participants were administered five vignettes in total, including three target vignettes all within the same condition (e.g., high threat-low responsibility-high ambiguity) and two filler vignettes.

All of the study measures were completed online. Research has found that the online administration of self-report measures of OCD symptoms and beliefs (e.g., OBQ-44) and depressive symptoms (e.g., BDI), yields comparable results to traditional paper and pencil methods (Coles, Cook & Blake, 2007; Schulenberg & Yutrzenka, 2001). Participants were asked to imagine themselves in each scenario as they read the experimental vignettes. For each vignette, participants read the first section (which contained the threat and responsibility manipulations), and provided time 1 ratings of anxiety, urges to seek reassurance, urges to check, ease of imagining the scenario, perceived threat, and perceived responsibility, based on how they felt while imagining themselves in the scenario. Next, participants imagined that they had asked for reassurance regarding the potential threat presented in the vignette (e.g., whether or not they remembered to extinguish a set of dinner candles before leaving the house). They were given hypothetical feedback that was either ambiguous (e.g., "I think you *might* have … everything is *probably* fine.") or unambiguous (e.g., "Don't worry. I remember seeing you blow out the candles."), depending upon their condition. Participants then completed each of the aforementioned ratings a second time (with "ease of imaging feedback" substituted for "ease of imagining scenario"), and rated the ambiguity of the feedback they received. Finally, participants

filled out a brief questionnaire package which included the other study measures (i.e., OBQ, VOCI, IUS, BAI and BDI), and were debriefed about the purpose of the study.

Results

Participant Characteristics

Participants in the eight conditions did not differ with respect to age, $F(7, 149) = .54$, *n.s.*, nor did they differ in terms of their mean total scores on the OBQ[1], the VOCI, the BAI, or the BDI, F*'s*$(7, 168) < 2.04$, *n.s.* However, there was a significant difference between groups with respect to scores on the IUS, $F(7, 168) = 2.27$, $p < .05$ (see Table 1), although this group difference was absent when pairwise comparisons were conducted using a Bonferroni correction. A chi-squared analysis revealed that the proportion of males to females did not differ significantly across the eight conditions (χ^2 [7, N = 176] = 8.84, *n.s.*).

Imagery ability

Participants did not differ in their ability to imagine the hypothetical scenarios across threat conditions, $F(1, 168) = 3.86$, *n.s.* ($M = 77.18$ [$SD = 18.41$] *vs*. 70.99 [$SD = 23.20$]), or responsibility conditions, $F(1, 168) = 1.43$, *n.s.* ($M = 75.97$ [$SD = 19.91$] *vs*. 72.20 [$SD = 22.20$]), and did not differ in their ability to imagine the feedback they received across ambiguity conditions, $F(1, 168) = 1.00$, *n.s*. ($M = 74.75$ [$SD = 22.79$] *vs*. 77.89 [$SD = 19.71$]). These group means indicate that participants were able to imagine the hypothetical scenarios and the feedback depicted in the vignettes with considerable ease.

Manipulation checks

As predicted, participants in the high threat conditions rated the vignettes as significantly more threatening/dangerous than participants in the low threat conditions, $F(1, 168) = 82.70$, $p < 0.001$, $r = .57$ ($M = 63.62$ [$SD = 23.24$] *vs*. 34.52 [$SD = 18.90$], respectively). Likewise, participants in the high responsibility conditions reported feeling significantly more responsible

for preventing a negative outcome than participants in the low responsibility conditions, $F(1, 168) = 47.97$, $p < 0.001$, $r = .47$ ($M = 77.28$ [$SD = 17.34$] *vs*. 56.50 [$SD = 23.39$], respectively). Lastly, participants in the high ambiguity conditions rated the feedback they received as significantly more ambiguous than participants in the low ambiguity conditions, $F(1, 168) = 147.20$, $p < 0.001$, $r = .68$ ($M = 66.44$ [$SD = 19.56$] *vs*. 28.50 [$SD = 23.44$], respectively). The medium-to-large effect sizes associated with these results indicate that the threat, responsibility and ambiguity of feedback manipulations were all effective.

Multivariate analyses

To test our hypotheses, a 4-way mixed MANOVA was conducted. Time was the within-participants factor; while threat, responsibility and ambiguity conditions served as between-participants factors. For the multivariate analysis, the dependent variable was a composite rating that comprised the collective mean of participants' ratings of anxiety, urges to seek reassurance, and urges to check. Statistically significant results from the MANOVA were further explored by conducting univariate ANOVAs for each of the individual dependent variables. For the sake of brevity, we use the term 'compulsive urges' when referring collectively to urges to seek reassurance and urges to check in the remainder of the article.

Results revealed significant main effects of time, $F(3, 166) = 61.04$, $p < .001$, $r = .52$, threat condition, $F(3, 166) = 11.59$, $p < .001$, $r = .26$, responsibility condition, $F(3, 166) = 6.38$, $p < .001$, $r = .19$, and ambiguity condition[2], $F(3, 166) = 9.62$, $p < .001$, $r = .23$, on participants' composite rating. In addition, significant interaction effects were found for time x threat condition, $F(3, 166) = 4.98$, $p < .01$, $r = .17$, time x ambiguity condition, $F(3, 166) = 62.47$, $p < .001$, $r = .52$, and time x threat condition x ambiguity condition, $F(3, 166) = 3.94$, $p < .01$, $r = .15$. However, the time x responsibility condition, $F(3, 166) = .65$, *n.s.*, and threat x responsibility condition interactions were not statistically significant, $F(3, 166) = 1.31$, *n.s.*, nor was the

interaction between time, responsibility condition and ambiguity condition, $F(3, 166) = 2.13$, *n.s.* Likewise, the 4-way interaction between time, threat condition, responsibility condition and ambiguity condition was not statistically significant, $F(3, 166) = .26$, *n.s.*[3]

Univariate analyses

Participants' mean ratings across time and condition are presented in Table 2. There was a significant main effect of time on anxiety ratings, $F(1, 168) = 126.60$, $p < .001$, $r = .66$, urges to seek reassurance, $F(1, 168) = 177.41$, $p < .001$, $r = .72$, and urges to check, $F(1, 168) = 123.98$, $p < .001$, $r = .65$, such that ratings on all 3 variables decreased significantly from time 1 to time 2 when collapsing across all conditions. In addition, a significant main effect of threat condition was found for anxiety ratings, $F(1, 168) = 34.82$, $p < .001$, $r = .41$, urges to seek reassurance, $F(1, 168) = 26.65$, $p < .001$, $r = .37$, and urges to check, $F(1, 168) = 24.73$, $p < .001$, $r = .36$, such that ratings for all 3 variables were higher in the high *vs.* low threat conditions. Likewise, there was a significant main effect of responsibility condition on anxiety ratings, $F(1, 168) = 5.14$, $p < .05$, $r = .17$, and urges to check, $F(1, 168) = 10.88$, $p < .001$, $r = .25$, such that participants' ratings for both of these variables were higher in the high *vs.* low responsibility conditions. However, the effect of responsibility condition on urges to seek reassurance was not statistically significant, $F(1, 168) = .76$, *n.s.*

The time x threat condition interaction was significant for anxiety ratings, $F(1, 168) = 10.44$, $p < .01$, $r = .24$, and urges to check, $F(1, 168) = 4.48$, $p < .05$, $r = .16$, but was not significant for urges to seek reassurance, $F(1, 165) = .66$, *n.s.* Specifically, the decrease in participants' anxiety and urges to check from time 1 to time 2 was significantly greater in the high *vs.* low threat conditions, when collapsing across responsibility and ambiguity conditions. In addition, the time x ambiguity condition interaction was significant for anxiety ratings, $F(1, 168) = 185.15$, $p < .001$, $r = .72$, urges to seek reassurance, $F(1, 168) = 91.31$, $p < .001$, $r = .59$,

and urges to check, $F(1, 168) = 125.25$, $p < .001$, $r = .65$. This indicates that the amount of change in participants' pre- to post-feedback ratings for each of the main dependent variables (i.e., anxiety and compulsive urges) differed according to the type of feedback (i.e., high *vs.* low ambiguity) they received. Specifically, participants in the low ambiguity conditions reported significantly greater decreases in their anxiety ratings and compulsive urges from time 1 to time 2 than those in the high ambiguity conditions (see Figures 1a-1c)[4].

The 3-way interaction between time, threat condition and ambiguity condition was significant for anxiety ratings, $F(1, 168) = 10.87$, $p < .01$, $r = .25$, urges to seek reassurance, $F(1, 168) = 9.45$, $p < .01$, $r = .23$, and urges to check, $F(1, 168) = 8.27$, $p < .01$, $r = .22$. As illustrated in Figures 2a-2c, the ambiguity of feedback manipulation had a larger effect on participants' anxiety and compulsive urges in the high *vs.* low threat conditions.

Discussion

Consistent with our predictions, high (*vs.* low) levels of perceived threat in a series of imagined scenarios were associated with greater self-reported anxiety and compulsive urges. Likewise, high (*vs.* low) levels of perceived responsibility for preventing harm were associated with higher ratings of anxiety and greater urges to check. However, contrary to prediction, manipulations of responsibility did not significantly affect participants' urges to seek reassurance. In partial support of our hypotheses, low-ambiguous feedback regarding potential threats led to immediate and sizeable decreases in anxiety and compulsive urges, whereas ambiguous feedback did not. Although ambiguous feedback did not lead to significant *increases* in participants' anxiety and compulsive urges, it appeared to prevent decreases in these ratings when compared to non-ambiguous feedback.

The present findings are highly consistent with cognitive-behavioural conceptualizations of OCD (e.g., Rachman, 1997, 2002; Salkovskis, 1985, 1989; van Oppen & Arntz, 1994). As

would be predicted by Rachman's (2002) model of compulsive checking, perceived threat and responsibility for preventing harm appeared to act as "cognitive multipliers" for compulsive urges, as manipulations of these variables significantly influenced participants' anxiety, urges to check, and (in the case of threat only) urges to seek reassurance. Thus, our findings generally supported our first hypothesis. However, while manipulations of perceived threat significantly affected all three dependent variables (i.e., anxiety, urges to check and urges to seek reassurance), perceived responsibility did not influence participants' urges to seek reassurance. This non-significant finding appears to contradict the hypothesis that OCD-related reassurance seeking is intended to spread responsibility for preventing harm to others (e.g., Rachman, 2002; Salkovskis, 1985, 1989), and it is important to acknowledge this possibility. However, there are several possible alternative explanations for this result.

First, increases in responsibility for preventing harm may not play as large a role in eliciting urges to seek reassurance as urges to check. Following this reasoning, increases in perceived responsibility for harm may lead people to check potential sources of threat *themselves*, rather than to rely on reassurance from others. Particularly when perceived responsibility is high, reassurance seeking behaviour may be reserved for situations in which checking would be difficult (e.g., due to physical removal from the source of concern), and thus, reassurance seeking might be best understood as a 'backup-to-checking strategy'. Consequently, our responsibility manipulation may have had a limited influence on participants' urges to seek reassurance, relative to their urges to check. However, our data does not fully support this contention, as participants' urges to seek reassurance were comparable in strength to their urges to check across responsibility conditions (see Table 2), suggesting that participants' preference for checking over reassurance seeking in threatening situations was slight.

A second potential explanation for this finding is that our responsibility manipulation was not as effective as our threat manipulation, thus limiting statistical power to detect the effect of responsibility on urges to seek reassurance. Consistent with this interpretation, the threat manipulation check yielded a large effect size, compared to a medium effect size for the responsibility manipulation check. In addition, while the main effect of perceived responsibility on urges to seek reassurance was not statistically significant, an inspection of means revealed that group differences were in the expected direction (i.e., participants in the high responsibility conditions reported higher urges to seek reassurance than those in the low responsibility conditions). This suggests that a more effective responsibility manipulation and/or a larger sample size may have yielded significant results. Yet, this interpretation fails to explain why manipulations of perceived responsibility significantly influenced participants' self-reported anxiety and urges to check, but not their urges to seek reassurance. Thus, additional research is required to test whether a more salient manipulation of responsibility (e.g., *very* high *vs. very* low or *no* responsibility) would lead to a significant effect in terms of participants' reassurance seeking urges and/or behaviour.

This study aimed to determine how manipulations of feedback ambiguity impact upon people's anxiety and compulsive urges. Importantly, our findings provide strong and novel evidence that ambiguity of (re)assurance may be an important factor in the perseveration of checking and reassurance seeking behaviour, particularly in the context of OCD-related fears. Consistent with our hypotheses, higher levels of ambiguity were associated with the maintenance of threat-induced anxiety and compulsive urges (as compared to a decrease in these variables under conditions of low ambiguity). These effects were especially apparent under conditions of heightened threat (see Figures 2a-2c), suggesting that a simultaneous increase in perceived threat and ambiguity may have a synergistic effect on compulsive urges and behaviour.

Given recent evidence which suggests that IU may be highly relevant to OCD (Holaway et al., 2006; OCCWG, 1997, 2005; Steketee et al., 1998; Tolin et al., 2003), it is reasonable to suspect that OCD sufferers might respond to ambiguous/uncertain feedback regarding potential threats with greater anxiety and compulsive urges than did our non-clinical sample. Indeed, IU might exacerbate reassurance seeking and/or checking behaviour in OCD via three inter-related processes; individuals who demonstrate high IU (i) may be more likely than non-clinical individuals to interpret obsessional doubts regarding potential threats as indicative of *real* and *intolerable* risks (ii) might require that feedback regarding their fear-related doubts be clear and precise (i.e., non-ambiguous) in order to consider this reassurance "acceptable" (Constans, Foa, Franklin, & Mathews, 1995), and (iii) may be unable to tolerate the anxiety/discomfort evoked by feedback which is perceived as even slightly ambiguous or uncertain, thereby promoting ERS. Similarly, OCD sufferers may experience considerable distress if the reassurance provider displays any signs of irritation or annoyance with their repeated requests for reassurance ("How many times do I have to tell you … I *always* lock the door before I leave the house! Why would I forget today?"), which may lead to further pleas for anxiety-reducing feedback (*c.f.,* Benazon, 2000; Coyne, 1976; Joiner et al., 1992, 1999; Rachman & Hodgson, 1980). Consistent with this theory, recent evidence suggests that believability of feedback (due to a lack of perceived ambiguity and/or insincerity) is a common criterion for terminating reassurance seeking episodes (Parrish & Radomsky, 2010). Thus, it is possible that repeated reassurance seeking might lead to a "self-perpetuating mechanism" akin to that described by Rachman (2002), whereby persistent requests for reassurance (driven in part by perceived threat, responsibility and/or IU) lead to increasingly dismissive and/or ambiguous feedback from others, which, in turn, leads to greater urges to seek (further) reassurance. However, further research is needed to test these predictions,

and to further clarify the mechanisms by which ambiguity exerts its effects on anxiety and compulsive urges.

The present findings have a number of potential clinical implications. First, as proposed by Rachman (2002), our results suggest that the motivations underlying ERS and compulsive checking may be similar in the context of potential threats, since there was corresponding variance in participants' urges to seek reassurance and their urges to check in the hypothetical scenarios across the threat, responsibility and ambiguity conditions[5] (see Table 2). Accordingly, cognitive-behavioural interventions that are routinely employed to diminish compulsive checking in OCD (e.g., exposure and response prevention, behavioural experiments) should also be effective in reducing patients' persistent and maladaptive reassurance seeking (Clark, 2004; Salkovskis & Warwick, 1985; Steketee, 1993). In addition, our findings suggest that perceived threat, which has been established as a key factor in the onset and maintenance of compulsive checking (e.g., Arntz et al., 2007; Foa et al., 2002; Ladouceur et al., 1995; Lopatka & Rachman, 1995; Parrish & Radomsky, 2006; Shafran, 1997), may also contribute to the perseveration of reassurance seeking behaviour. Thus, therapists aiming to reduce their patients' ERS would be well-advised to employ strategies designed to decrease their exaggerated threat appraisals. Lastly, our results indicate that the tendency to interpret reassurance in a biased fashion (e.g., as ambiguous, uncertain, threatening, etc.) may be important to target in treatments aimed at reducing compulsive behaviour.

Several limitations of this study warrant discussion. First, due to ethical and practical constraints, we employed a series of vignettes to examine how manipulations of threat, responsibility and ambiguity of feedback would affect non-clinical participants' anxiety and compulsive urges, rather than manipulating these variables in real-life situations. It has recently been argued that vignette studies offer a practical, efficient and valid means of testing

experimental hypotheses involving proposed causal relationships (Atzmüller & Steiner, 2010). However, the external validity of our results may be questioned, particularly given that participants completed the study online. Accordingly, more ecologically valid tests of the predictions outlined in this study should be conducted to firmly establish the current findings in clinical (OCD) populations. Similarly, we relied solely on three single subjective ratings (i.e., anxiety, urges to seek reassurance, and urges to check) to test our hypotheses. Given the length of the vignettes, we wanted items to be brief and it was important to examine the relationship between participants' urges to check and urges to seek reassurance as this relationship had not previously been demonstrated empirically. However, it will be important for future research in this area to include behavioural and/or physiological indices of people's responses to increased threat, responsibility and ambiguity of feedback, as people's self-reported anxiety and compulsive urges may not always correspond with their actual behaviour.

In addition, the current study assessed only the immediate effects of providing participants with ambiguous *vs.* low-ambiguous feedback regarding potential threats. Given the importance of negative long-term effects (e.g., increases in anxiety and compulsive urges, reinforcement of maladaptive beliefs) in perpetuating compulsive checking and other neutralization behaviour (see Rachman, 2002; Rachman, Shafran, Mitchell, Trant, & Teachman, 1996, Salkovskis, 1985, 1999), additional research that examines the long-term effects of both ambiguous and non-ambiguous feedback on anxiety and compulsive urges is needed. It would be especially informative to examine the specific time course/durability of these effects, as well as to investigate additional factors that might moderate these effects (e.g., quantity and consistency of feedback, IU, feedback expectancy, etc.). Likewise, in the absence of a no-feedback condition, it was impossible to determine whether ambiguous feedback served to *actively maintain* high levels

of anxiety and compulsive urges as proposed, as these ratings might have remained elevated even without the provision of ambiguous feedback.

In summary, the present findings suggest that peoples' anxiety and compulsive urges in potentially threatening situations are influenced by a number of factors, including perceived threat, responsibility for preventing harm, and ambiguity of (re)assurance. Results also showed that perceived threat and ambiguous feedback might increase anxiety and compulsive urges in a synergistic manner, such that ambiguous (re)assurance may be particularly difficult to accept under conditions of high perceived threat. Taken together, these findings suggest that heightened perceptions of threat and responsibility play an important role in the onset and maintenance of checking and (for threat only) ERS, while the provision of ambiguous feedback regarding potential threats may exacerbate these compulsive acts (via further increases in threat and responsibility) once they have already begun. Accordingly, cognitive-behavioural models of OCD would likely benefit from a greater focus on certain internal (e.g., IU) and external (e.g., others' responses to requests for reassurance) factors that are likely to influence OCD sufferers' anxiety and compulsive urges / behaviour. It is hoped that these findings will support future research aimed at gaining a better understanding of the mechanisms that underlie ERS and checking behaviour in OCD.

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Appendix

Sample vignette

High threat, high responsibility version

You and your partner have planned a romantic evening to celebrate his/her recent promotion at work. As part of your plans, you enjoy a candle-lit dinner together at home before going out to the theatre. During dinner, you each have a few glasses of wine and lose track of the time. You soon realize that you will be late for your play if you do not hurry, so you rush to get your things together and ask your partner to call a taxi while you offer to turn off the lights and blow out the candles. As you are turning off the lights in the kitchen, your partner informs you that the taxi will be arriving in two minutes and he/she reminds you to blow out the candles before you go. When the taxi arrives, you run out the door to meet it and barely arrive to the theatre on time. On the way home from the theatre, the taxi driver has the local news on the radio and the reporter announces that there was a house fire in your neighbourhood. Suddenly, your heart begins to race, as you can't remember blowing out the candles after dinner and fear that the fire described on the radio may have occurred at your home.

High ambiguity feedback

Now, imagine that you ask your partner whether or not they saw you blow out the candles, and they respond by hesitating for a moment, and saying: "I think I *might* have … Anyways, everything is *probably* fine."

Low threat, low responsibility version

You and your partner have planned a romantic evening to celebrate his/her recent promotion at work. As part of your plans, you enjoy a candle-lit dinner together at home before going out to the theatre. During dinner, you each have a few glasses of wine and lose track of the time. You soon realize that you will be late for the play if you do not hurry, so you rush to get your things together and call a taxi while your partner offers to turn off the lights and blow out the candles. As your partner is blowing out the candles, you inform them that the taxi will be arriving in two minutes and remind them to turn off the lights before you go. When the taxi arrives, you run out the door to meet it and barely arrive to the theatre on time. On the way home from the theatre, the taxi driver has the local news on the radio and an energy conservation lobbyist is being interviewed. She claims that there is currently a local hydro shortage and is asking listeners to try to limit their use of electricity for the next couple of weeks. As you are listening, you wonder if your partner remembered to turn off the living room lights, to avoid wasting electricity while you were gone.

Low ambiguity feedback

Now, imagine that you ask your partner whether or not they remembered to turn off the lights, and they respond by saying matter-of-factly: "Don't worry; I remember turning off the lights."

Footnotes

[1] Participants in the eight conditions also did not differ on their mean total scores on the OBQ responsibility/threat subscale, $F(7, 168) = 1.50$, *n.s.*

[2] We do not report the main effect of ambiguity condition in our follow-up analyses, since participants' first set of ratings was collected prior to the ambiguity of feedback manipulation.

[3] A 4-way mixed MANCOVA was conducted controlling for IUS scores, given that participants' scores on the IUS differed across the eight conditions. Results remained nearly identical, except in this analysis the main effect of time was no longer significant, $F(3, 164) = 1.78$, *n.s.*, and there was a trend toward a significant time x responsibility x ambiguity condition interaction, $F(3, 164) = 2.18$, $p = .09$. Thus, we did not control for IUS scores in any of the remaining analyses.

[4] Low-ambiguous (but not ambiguous) feedback also led to immediate and significant decreases in perceived threat [time 1 = 49.22(26.65), time 2 = 26.57(22.92)], $F(1, 174) = 85.83$, $p < .001$, $r = .57$, and perceived responsibility for preventing harm [time 1 = 66.34(22.81), time 2 = 48.31(27.78)], $F(1, 174) = 47.06$, $p < .001$, $r = .46$.

[5] Participants' urges to seek reassurance and urges to check were also strongly and significantly correlated at time 1, $r = .80$, $p < .001$, and time 2, $r = .85$, $p < .001$.

Table 1.

Participants' Scores on the BAI, BDI-II, IUS, OBQ-44 and VOCI

Measure	*M (SD)*									
	Condition									
	HT-HR-HA	HT-HR-LA	HT-LR-HA	HT-LR-LA	LT-HR-HA	LT-HR-LA	LT-LR-HA	LT-LR-LA	Total	Max. possible
BAI	13.00 (18.41)	10.59 (7.63)	9.68 (7.47)	13.05 (10.53)	9.41 (5.97)	14.73 (10.04)	13.91 (9.23)	13.86 (7.38)	12.28 (8.51)	63.00
BDI-II	12.36 (8.12)	9.50 (8.18)	8.68 (7.46)	9.45 (8.34)	9.36 (7.12)	12.64 (8.34)	12.23 (9.77)	13.18 (10.01)	10.93 (8.47)	63.00
IUS	72.68 (18.57)	54.55 (17.05)	58.64 (19.08)	63.64 (23.55)	68.23 (18.32)	69.14 (22.31)	70.00 (20.04)	71.41 (22.15)	66.03 (20.75)	135.00
OBQ	132.18 (38.48)	108.00 (35.42)	119.73 (38.67)	121.95 (43.92)	139.18 (40.40)	138.95 (56.87)	150.00 (45.21)	129.59 (45.19)	129.95 (44.35)	308.00
VOCI	24.86 (17.88)	25.00 (25.00)	15.68 (11.48)	29.41 (39.03)	31.09 (23.95)	37.18 (31.82)	31.68 (21.75)	32.91 (29.47)	28.48 (26.48)	220.00

BAI = Beck Anxiety Inventory, BDI-II = Beck Depression Inventory-II, IUS = Intolerance of Uncertainty Scale, OBQ = Obsessive Beliefs Questionnaire-44 total score, VOCI = Vancouver Obsessive-Compulsive Inventory total score.

Table 1 (continued).

HT-HR-HA = high threat-high responsibility–high ambiguity condition *(n=22)*, HT-HR-LA = high threat-high responsibility–low ambiguity condition *(n=22)*, HT-LR-HA = high threat-low responsibility–high ambiguity condition *(n=22)*, HT-LR-LA = high threat-low responsibility–low ambiguity condition *(n=22)*, LT-HR-HA = low threat-high responsibility–high ambiguity condition *(n=22)*, LT-HR-LA = low threat-high responsibility–low ambiguity condition *(n=22)*, LT-LR-HA = low threat-low responsibility–high ambiguity condition *(n=22)*, LT-LR-LA = low threat-low responsibility–low ambiguity condition *(n=22)*, Total = total sample (*n = 176)*.

Table 2.

Participants' mean ratings across time and condition.

Rating (0-100) *M (SD)*	Threat condition				Responsibility condition				Ambiguity condition			
	Low		High		Low		High		Low		High	
	TI	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Urge to seek reassurance	57.44 (22.37)	38.97 (25.78)	75.17 (23.06)	54.10 (30.55)	65.04 (25.42)	45.02 (30.71)	67.57 (23.27)	48.05 (27.68)	65.56 (24.88)	31.60 (24.80)	67.05 (23.88)	61.46 (25.46)
Urge to check	56.83 (23.38)	45.44 (26.11)	75.56 (23.29)	58.82 (30.81)	60.55 (26.63)	47.12 (30.81)	71.84 (22.20)	57.14 (26.86)	64.77 (25.57)	36.57 (25.71)	67.62 (24.67)	67.69 (23.89)
Anxiety	47.63 (20.18)	38.37 (24.80)	69.01 (21.19)	52.29 (29.01)	54.46 (24.27)	42.41 (29.06)	62.18 (21.64)	48.25 (26.33)	58.89 (23.75)	30.18 (23.18)	57.76 (22.86)	60.48 (23.52)

TI = time 1 (pre-ambiguity manipulation), T2 = time 2 (post-ambiguity manipulation).

Figure Captions

Figure 1a. Time x ambiguity condition interaction effect for anxiety ratings.

Figure 1b. Time x ambiguity condition interaction effect for urges to seek reassurance.

Figure 1c. Time x ambiguity condition interaction effect for urges to check.

Figure 2a. Change in participants' anxiety ratings from time 1 to time 2 in high *vs.* low threat and high *vs.* low ambiguity conditions.

Figure 2b. Change in participants' urges to seek reassurance from time 1 to time 2 in high *vs.* low threat and high *vs.* low ambiguity conditions.

Figure 2c. Change in participants' urges to check from time 1 to time 2 in high *vs.* low threat and high *vs.* low ambiguity conditions.

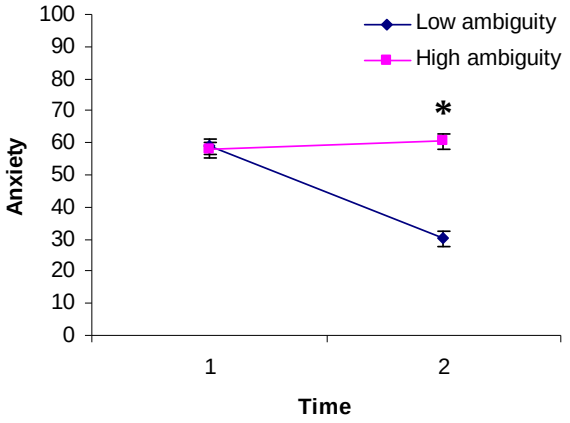

Figure 1a.

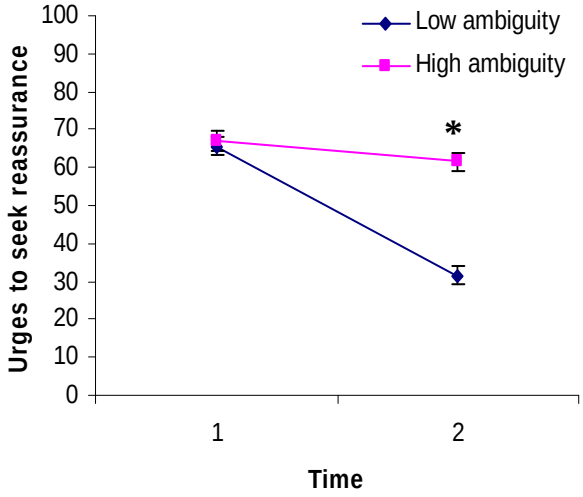

Figure 1b.

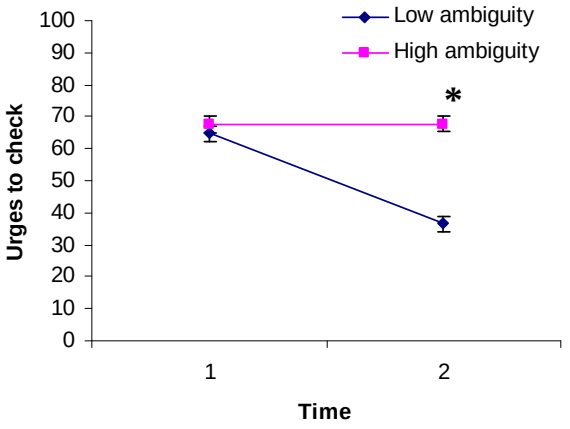

Figure 1c.

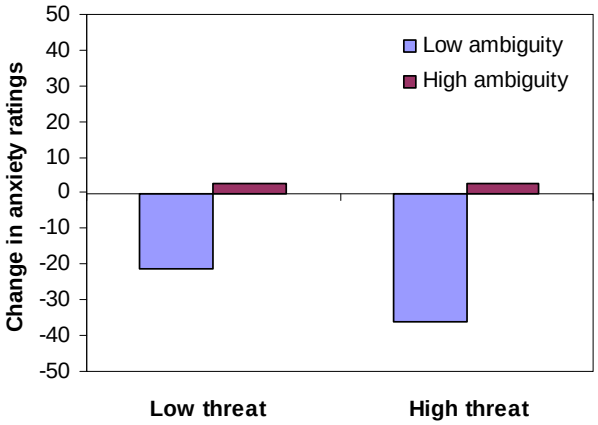

Figure 2a.

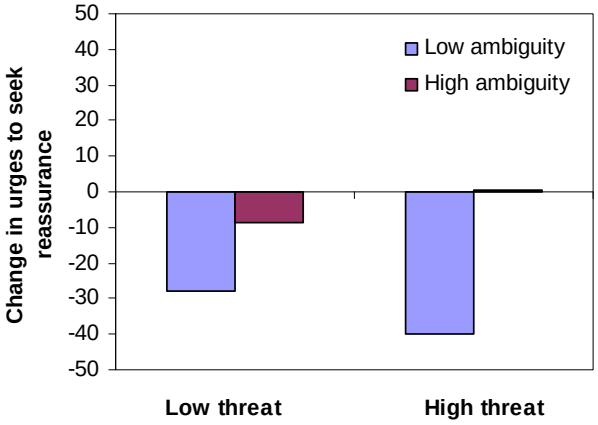

Figure 2b.

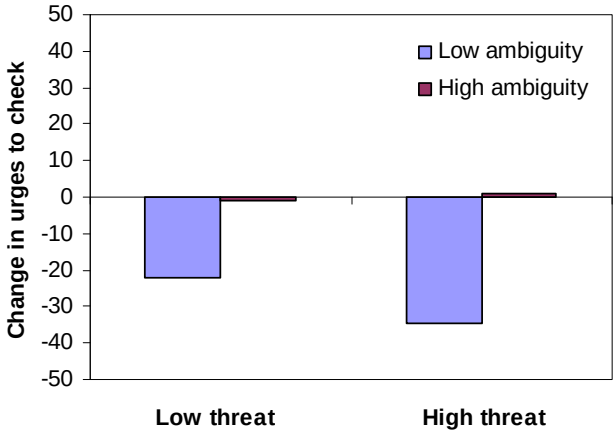

Figure 2c.